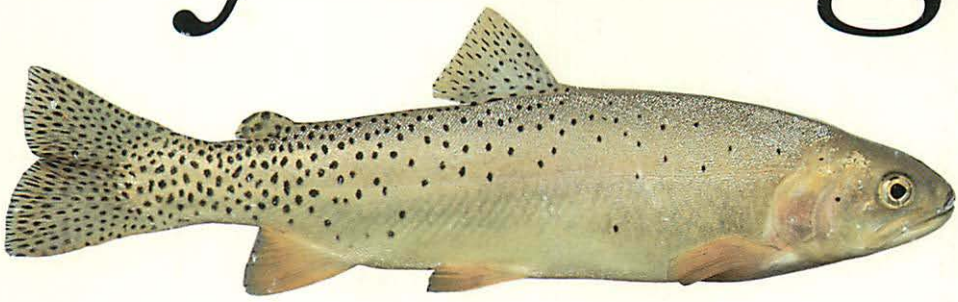
Fishes of Wyoming



by George T. Baxter
and Michael D. Stone

photography by LuRay Parker

Fishes of Wyoming

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additional photographs courtesy of William H. Mullins, Richard T. Bryant, the Nebraska Game and Parks Commission, and the Colorado Division of Wildlife

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front cover: Yellowstone cutthroat trout by LuRay Parker

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foreword

This edition of *Fishes of Wyoming* supersedes a 1970 edition of Wyoming Fishes. The 1970 edition listed 78 species of fishes which are native to Wyoming and extant, or which have been introduced and established. Six species, all introduced species now known to be established, have been added to the list of Wyoming fishes. Seven species have been deleted from the list for various reasons (see page 269). The text has been updated and the format revised.

Fish species distribution maps used in this publication are based on the sixteen river systems described on pages 8-11. Each drainage where a species is known to occur is shaded. Exceptions were made where locales are shaded to more accurately portray extremely limited distributions. We caution that species distributions are subject to change and that a species will not occur in all waters within a shaded drainage.

A major change from the 1970 edition is the inclusion of color photographs. Many persons have contributed to this modification. We are especially indebted to LuRay Parker for most of the color photographs. Fred Copes, University of Wisconsin, Stevens Point, and photographers with the Nebraska Game and Parks Department, Kansas Wildlife and Parks Department and Colorado Division of Wildlife also contributed excellent transparencies. Art work for the drawings for the keys was done by Elizabeth Rahel, a major contribution.

Shaela Roof drafted the distribution maps. Dr. Frank Rahel made many useful suggestions regarding updating of this bulletin. Dr. Robert Behnke read the section on the salmonids and made helpful suggestions. Dr. D.L. Blackstone read a draft of the chapter on zoogeography and distribution and made helpful suggestions. We are indebted to Drs. Reeve M. Bailey and Gerald R. Smith, Museum of Zoology, University of Michigan, for their recommendations relative to the nomenclature of the fishes of Wyoming.

The many persons who contributed to the 1970 edition of *Wyoming Fishes* by assisting in the collection and photographing of fish were acknowledged in the foreword of that edition. We again wish to express our appreciation of their efforts.

Persons who have made special contributions to the present edition include George Holton, Montana Game and Fish Department; Lawrence Ostresh, Department of Geography, University of Wyoming; and John Baughman, Kerry Connell, Dave Dufek, Glen Dunning, Jon Erickson, Mark Fowden, Kevin Johnson, John Kiefling, Robert McDowell, Ron McKnight, Don Miller, Doug Mitchum, Bill Wichers and Robert Wiley all of the Wyoming Game and Fish Department. Appreciation is extended to Tim Patton for updating information from his 1993 survey of the North Platte and South Platte river drainages.

physiography and hydrography of Wyoming

Knowledge of the physiography and hydrography of a region is essential to understanding the distribution of its fishes. Fish distributions in Wyoming are importantly influenced by altitude, drainage basin and other physiographic features.

Surface features of the state may be classified as mountains, plains, river basins, and a single closed basin, the Great Divide Basin. Major mountain ranges in Wyoming include the Teton, Absaroka, Wind River, Big Horn and Medicine Bow ranges. The Medicine Bow Range is subdivided into the Laramie, Snowy and Sierra Madre ranges. Smaller mountain ranges in the state include the Black Hills in the northeastern corner of the state, the Ferris, Rattlesnake, Seminoe, Shirley and Owl Creek mountains in central Wyoming and the Wyoming Range in western Wyoming. The Uinta Range, a range running from east to west in the extreme southwestern corner of the state, is mostly in Utah.

About one-fourth of the area of Wyoming is mountainous. The topography of the remainder of the state is plains, intermontane basins and river valleys. The lowest elevations in the state are found in the valleys of the river systems. Extremes in elevation are at approximately 3,125 feet near the Wyoming-South Dakota border, where the Belle Fourche River leaves Wyoming, and 13,804 feet at the summit of Gannett Peak in the Wind River Mountains. The mean elevation of the state is approximately 6,700 feet (Martner 1986).

The Continental Divide enters Wyoming near the northwest corner in Yellowstone National Park, crosses the state diagonally along the backbone of the Absaroka and Wind River mountain ranges, divides to encircle the Great Divide Basin in south-central Wyoming and forms the crest of the Sierra Madre Range to the Wyoming-Colorado state line.

Four of the major drainage systems of North America have headwaters in Wyoming: the Colorado River basin, the Great Basin, the Columbia River basin, and the Missouri River basin. Approximately three-fourths of the area of the state lies within the Missouri River basin.

The river systems of the state, shown on pages 12-13, may be summarized as follows:

A. Missouri River Basin (east of the Continental Divide).

1. Madison River. This system drains the west-

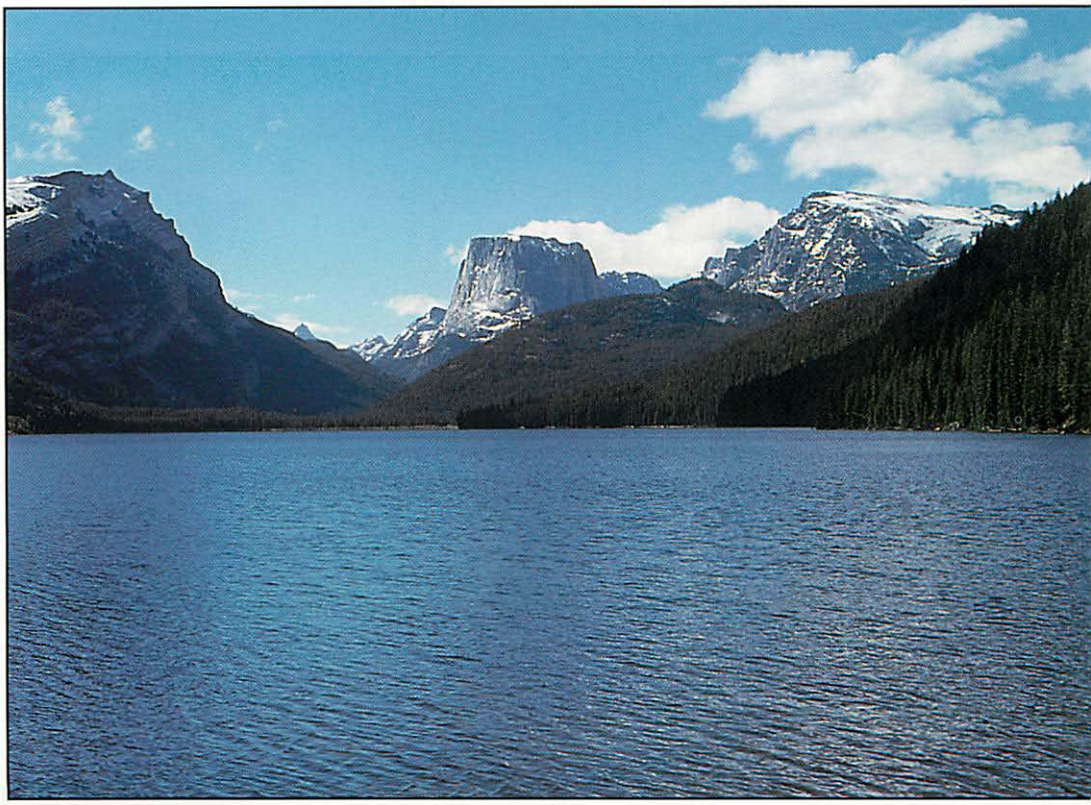
central section of Yellowstone National Park; major tributaries are the Gibbon and Fire Hole rivers.

2. Yellowstone River. This river system drains parts of the Absaroka and Beartooth ranges in and adjacent to Yellowstone National Park; major tributaries are the Lamar and Gardner rivers in the park and Clark's Fork of the Yellowstone in Park County.

3. Wind-Big Horn River. The Wind River heads in the Wind River and Absaroka ranges, becomes the Big Horn River at the "Wedding of the Waters" in the Wind River Canyon below Boysen Reservoir and enters Big Horn Reservoir near the Wyoming-Montana state line. Its major tributaries include the Little Wind and Popo Agie rivers in Fremont County, the Greybull, Wood and Shoshone rivers from the west and Paint Rock,Tensleep and Shell creeks draining the west side of the Big Horn Mountains.

4. Tongue River. This system drains the northeast end of the Big Horn Range. Major tributaries are the Little Big Horn River, Big and Little Goose creeks and the Little Tongue River.

5. Powder River. The Powder River system drains the southern and southeastern slopes of the Big Horn Range



Green River Lakes by LuRay Parker

and the Powder River basin in north-central Wyoming; major tributaries include the Little Powder River and Clear and Crazy Woman creeks.

6. Little Missouri River. This system drains the plains region north and west of the Black Hills in Crook and Campbell counties.

7. Belle Fourche River. Drains the Black Hills and adjacent plains; major tributaries are Inyan Kara, Beaver, Sand and Red Water creeks.

8. Cheyenne River. This system drains the arid plains of east-central Wyoming; many tributaries and the river itself are intermittent; a major tributary, Stockade-Beaver Creek drains the south slope of the Black Hills.

9. Niobrara River. The Niobrara River also drains the plains of east-central Wyoming; most of the system is intermittent; a major tributary is Van Tassel Creek.

10. North Platte River. The North Platte River heads in Colorado, flows north to Casper and then southeast to the Wyoming-Nebraska state line. Major tributaries include the Encampment, Sweetwater and Laramie rivers and several creeks draining the north and east slopes of the Laramie Range.

11. South Platte River. This drainage is represented by Lodgepole, Crow, Lonetree and Dale creeks in

Greys River by LuRay Parker

extreme southeastern Wyoming.

B. Colorado River Basin (west of the Continental Divide).

12. Little Snake River. The Little Snake River system drains the west slope of the Sierra Madre Range and adjacent plains; a major tributary is Savery Creek.

13. Great Divide Basin. This closed basin in central Wyoming contains only Hays Reservoir and a few springs.

14. Green River. This large system arises on the west and south slopes of the Wind River Range and drains the Green River basin; major tributaries include the New Fork River, Big Sandy Creek, and the Hams Fork, Blacks Fork and Henrys Fork rivers.

C. Great Basin (west of the Continental Divide).

15. Bear River. The Bear River system drains the Uinta and Wyoming ranges in southwestern Wyoming; major tributaries include the Thomas Fork and Smiths Fork.

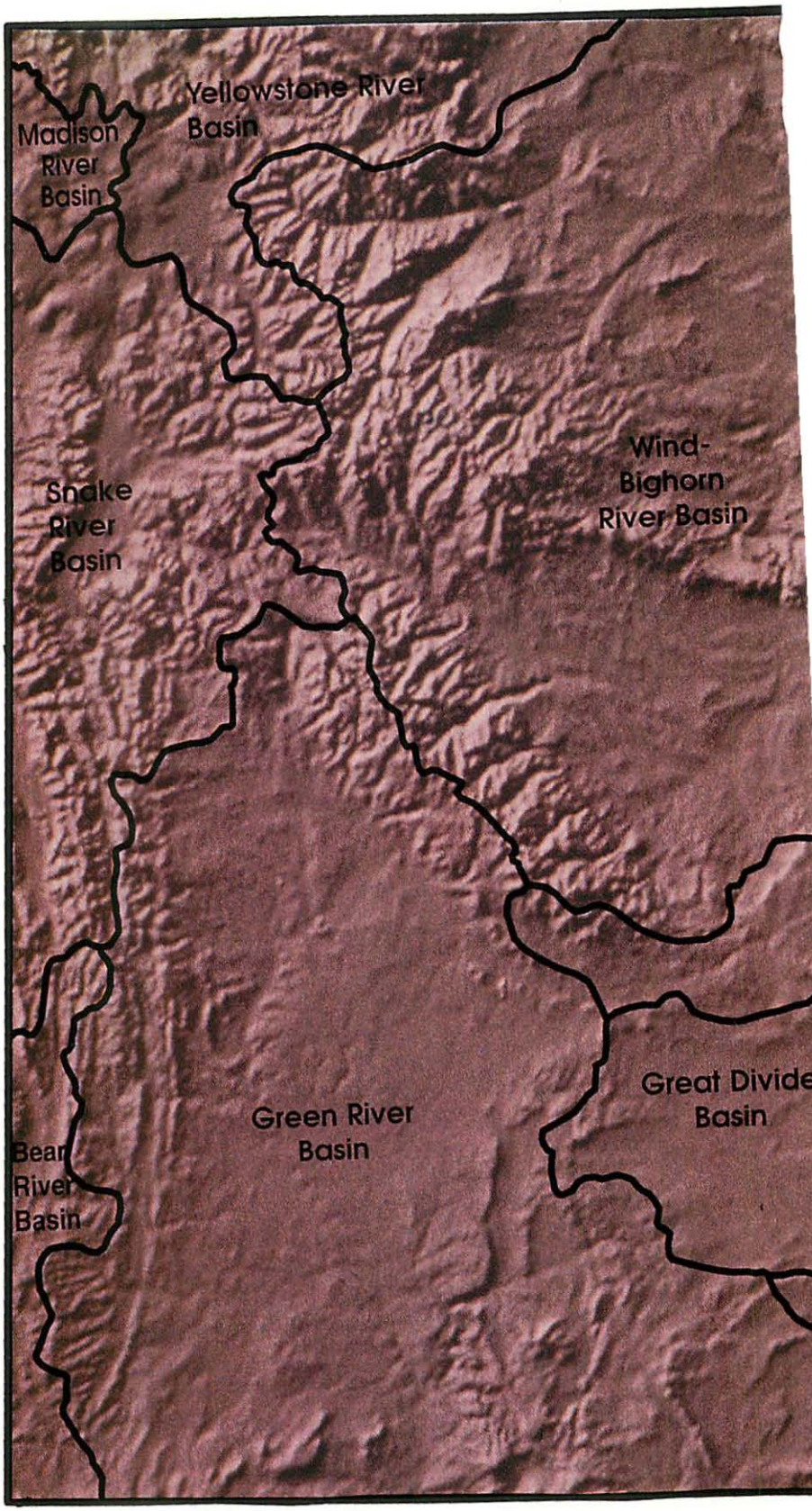
D. Columbia Basin (west of the Continental Divide).

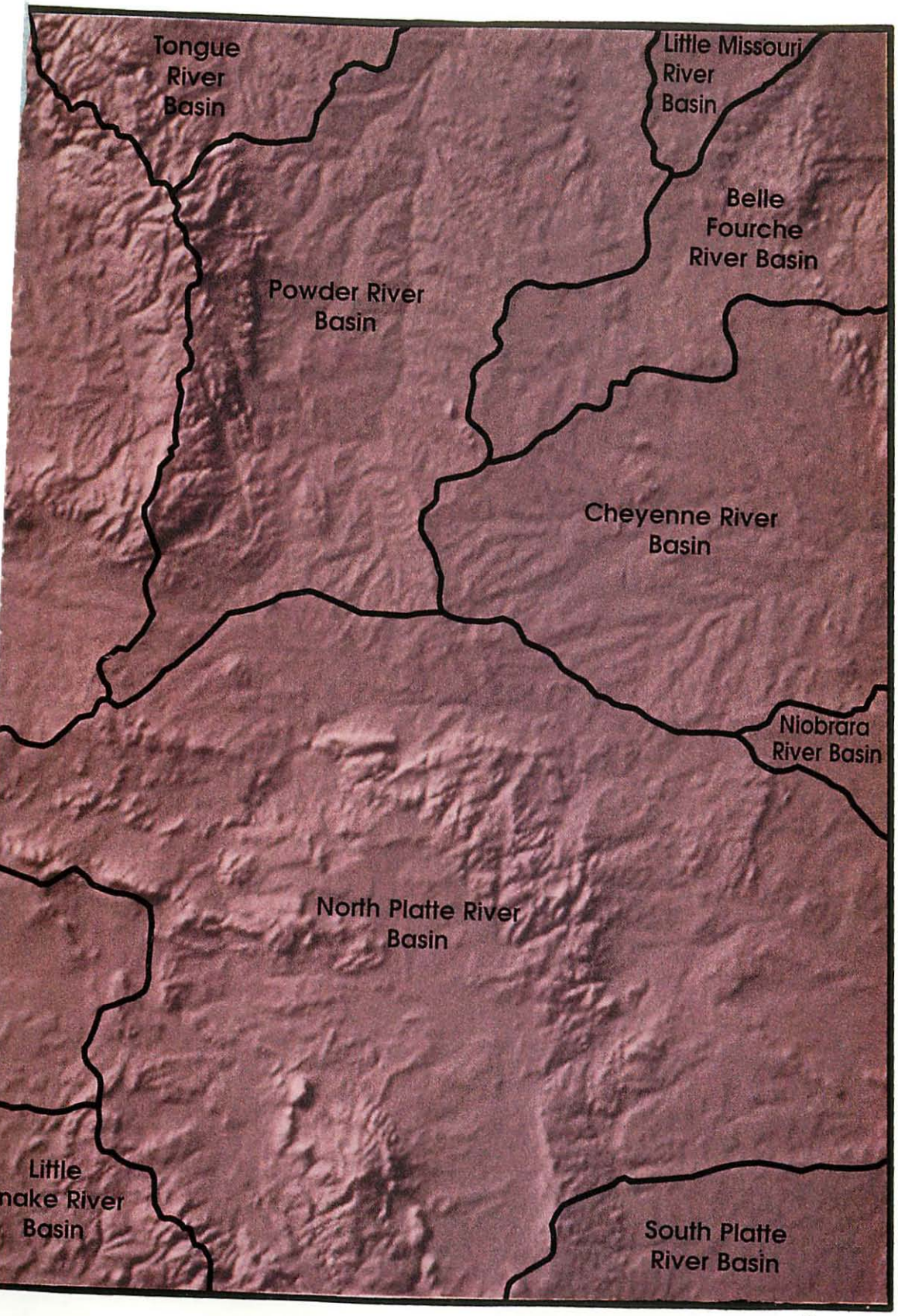
16. Snake River. This system arises in Yellowstone National Park and drains portions of the Absaroka and Teton ranges and, in part, the west slope of the Wind River Range; major tributaries include the Buffalo Fork, Gros Ventre River, Fish Creek, Hoback River, Greys River and the Salt River.

Wyoming has about 300,000 acres of lakes and reservoirs outside of Yellowstone National Park. Most of the natural lakes are relatively small montane lakes. Yellowstone Lake, (90,000 acres) is the largest natural lake in Wyoming. Other larger natural lakes are the glacial-dug lakes on both the north and south slopes of the Wind River Mountains (see pages 12-13).

In this century, man-made reservoirs have become of increasing importance in the hydrography of Wyoming. Larger reservoirs which are of importance in the distribution and management of fish include Buffalo Bill, Boysen and a portion of Big Horn in the Wind-Big Horn River drainage; DeSmet in the Powder River drainage; Keyhole in the Belle Fourche River drainage; Seminoe, Kortes, Pathfinder, Alcova, Glendo, Guernsey and Grayrocks in the North Platte River drainage; Flaming Gorge, Fontenelle and Big Sandy in the Green River drainage; and Jackson Lake and the small upper portion of Palisades Reservoir in the Snake River drainage. These reservoirs are shown on pages 12 and 13.

Wyoming waters




Tongue River Basin
Little Missouri River Basin
Belle Fourche River Basin
Powder River Basin
Cheyenne River Basin
Niobrara River Basin
North Platte River Basin
Little nake River Basin
South Platte River Basin

annotated checklist of indigenous and introduced fishes of Wyoming

(Common and scientific names of fish from Robins, et al. [1991]; extinct and provisional species, listed on pages 267-268, are not included here)

Class Osteichthyes: bony fishes.

SubClass Actinopterygii: ray-finned fishes.

SuperOrder Chondrostei: sturgeons.

Order Acipenseriformes: sturgeons.

Family Acipenseridae: sturgeons.

1. *Scaphirhynchus platorynchus* (Rafinesque), shovelnose sturgeon.
Seasonal migrant in lower Powder River.

SuperOrder Teleostei: modern fishes.

Order Osteoglossiformes: bonytongues.

Family Hiodontidae: mooneyes.

2. *Hiodon alosoides* (Rafinesque), goldeye.
Present in Powder, Little Powder and Little Missouri rivers. Formerly in North Platte River drainage.

Order Clupeiformes.

Family Clupeidae: herrings.

3. *Dorosoma cepedianum* (Lesueur), gizzard shad.
Now introduced to many reservoirs east of the Continental Divide.

Order Cypriniformes: minnows, suckers.

Family Cyprinidae: minnows.

4. *Campostoma anomalum* (Rafinesque), central stoneroller.
Formerly common. Now uncommon in the North Platte, South Platte and Niobrara river drainages.

5. *Carassius auratus* (Linnaeus), goldfish.
Introduced. Incidental in lower elevation lakes, reservoirs and ponds.

6. *Couesius plumbeus* (Agassiz), lake chub.
Common in some northern drainages of the state.

7. *Ctenopharyngodon idella* (Valenciennes), grass carp.
Introduced into some lakes and ponds east of the Continental Divide.

8. *Cyprinella lutrensis* (Baird and Girard), red shiner.
Common in lower North Platte River drainage; introduced into Keyhole Reservoir.

9. *Cyprinus carpio* Linnaeus, common carp.
Introduced. Widespread at lower elevations.

10. *Gila atraria* (Girard), Utah chub.
Widespread in drainages west of the Continental Divide. A single specimen was taken from Brooks Lake (Wind River drainage) in 1985.

11. *Gila copei* (Jordan and Gilbert), leatherside chub.
Rare in the Bear and Snake river drainages.

12. *Gila robusta* Baird and Girard, roundtail chub.
Common in Green River and Little Snake River drainages.

13. *Hybognathus argyritis* Girard, western silvery minnow.
Rare in the Wind-Big Horn, Powder, and Little Missouri river drainages.

14. *Hybognathus hankinsoni* Hubbs, brassy minnow.
Common in the North Platte and South Platte river drainages; rare elsewhere in other drainages east of the Continental Divide.

15. *Hybognathus placitus* Girard, plains minnow.
Common in most drainages east of the Continental Divide but rare or extirpated from the North Platte River drainage.

16. *Luxilus cornutus* (Mitchill), common shiner.
Common in some North Platte River tributaries.

17. *Macrhybopsis gelida* (Girard), sturgeon chub.
Formerly found in North Platte River, Powder River, and Big Horn River; now may be restricted to Powder River in Wyoming.

18. *Margariscus margarita* Cope, pearl dace.
Occurs in lower Niobrara River drainage.

19. *Nocomis biguttatus* (Kirtland), hornyhead chub.
Formerly found in North Platte River drainage. Now restricted to North Laramie River drainage.

20. *Notemigonus crysoleucas* (Mitchill), golden shiner.
Introduced. Not uncommon in eastern drainages at lower elevations.

21. *Notropis atherinoides* Rafinesque, emerald shiner.
Introduced into several reservoirs in the state.

22. *Notropis dorsalis* (Agassiz), bigmouth shiner. Common in North Platte and South Platte river drainages.

23. *Notropis hudsonius* (Clinton), spottail shiner.
Introduced and established in several Wyoming reservoirs.

24. *Notropis stramineus* (Cope), sand shiner.
Common at lower elevations in the North Platte and South Platte river drainages. Rare in northeastern drainages, introduced in some habitats in the Wind-Big Horn River drainage.

25. *Phenacobius mirabilis* (Girard), suckermouth minnow.
Rare in the lower North Platte River drainage.

26. *Phoxinus neogaeus* Cope, finescale dace.
Rare in Niobrara and Belle Fourche river drainages.

27. *Pimephales promelas* Rafinesque, fathead minnow.
Widespread east of the Continental Divide; introduced into the Green River drainage west of the Continental Divide.

28. *Platygobio gracilis* (Richardson), flathead chub.
Common in drainages east of the Continental Divide.

29. *Rhinichthys cataractae* (Valenciennes), longnose dace.
Endemic in all drainages except the Green and Little Snake river drainages. Now introduced to the Green River drainage.

30. *Rhinichthys osculus* (Girard), speckled dace.
Native. Widespread west of the Continental Divide.

31. *Richardsonius balteatus* (Richardson), redside shiner.
Widespread west of the Continental Divide.

32. *Semotilus atromaculatus* (Mitchill), creek chub.
Common in eastern drainages and introduced to Little Snake and Green river drainages.

Family Catostomidae: suckers.

33. *Carpiodes carpio* (Rafinesque), river carpsucker.
Common in larger streams in drainages east of the Continental Divide.

34. *Carpiodes cyprinus* (Lesueur), quillback.
Common in the North Platte River drainage.

35. *Catostomus ardens* Jordan and Gilbert, Utah sucker.
Common in the Bear and Snake river drainages.

36. *Catostomus catostomus* (Forster), longnose sucker.
Common in drainages east of the Continental Divide.

37. *Catostomus commersoni* (Lacepède), white sucker.
Widespread east of the Continental Divide. Introduced into the Green and Little Snake river drainages.

38. *Catostomus discobolus* Cope, bluehead sucker.
Common in Green River drainage; uncommon in the Little Snake, Bear and Snake river drainages.

39. *Catostomus latipinnis* Baird and Girard, flannelmouth sucker.
Common in Little Snake and Green river drainages.

40. *Catostomus platyrhynchus* (Cope), mountain sucker.
Present in all drainages except the Niobrara and South Platte rivers; rare or now extirpated from the North Platte River drainage.

41. *Moxostoma macrolepidotum* (Lesueur), shorthead redhorse.
Common in larger streams in drainages east of the Continental Divide.

Order Siluriformes: catfishes.

Family Ictaluridae: bullhead catfishes.

42. *Ameiurus melas* (Rafinesque), black bullhead.
Present in drainages east of the Continental Divide.

43. *Ictalurus punctatus* (Rafinesque), channel catfish.
Present in the lower North Platte, Wind-Big Horn, Powder, Tongue and Belle Fourche river drainages. Introduced into some other drainages.

44. *Noturus flavus* Rafinesque, stonecat.
Common in most drainages east of the Continental Divide.

Order Salmoniformes.

Family Esocidae: pikes.

45. *Esox lucius* Linnaeus, northern pike. Introduced into Keyhole Reservoir.

Family Salmonidae: trouts.

46. *Oncorhynchus aguabonita* (Jordan), golden trout. (formerly *Salmo aguabonita*).
Introduced into many high mountain lakes.

47. *Oncorhynchus clarki* (Richardson), cutthroat trout. (formerly *Salmo clarki*).
Five subspecies in various drainages in the state: *bouvieri*, *lewisi*, *utah*, *pleuriticus*, and an unnamed subspecies, the fine-spotted Snake River cutthroat trout.

48. *Oncorhynchus mykiss* (Walbaum), rainbow trout. (formerly *Salmo gairdneri*)
Introduced, widespread.

49. *Oncorhynchus nerka* (Walbaum), kokanee, sockeye salmon.
Introduced into several reservoirs.

50. *Prosopium williamsoni* (Girard), mountain whitefish.
In all the western drainages, also found in the Wind-Big Horn and Tongue river drainages.

51. *Salmo letnica* (Karaman), Ohrid trout.
Introduced. May be found in a few reservoirs.

52. *Salmo trutta* Linnaeus, brown trout.
Introduced. Widespread.

53. *Salvelinus fontinalis* (Mitchill), brook trout.
Introduced. Widespread.

54. *Salvelinus namaycush* (Walbaum), lake trout.
Introduced. Common in some drainages.

55. *Thymallus arcticus* (Pallas), Arctic grayling.
Indigenous in Madison River drainage in Yellowstone National Park. Introduced into a number of montane and high plains habitats in other drainages in the state.

Order Gadiformes: cods, other families.

Family Gadidae: cods.

56. *Lota lota* (Linnaeus), burbot.
Indigenous in Wind-Big Horn River drainage. Formerly in Tongue River drainage.

Order Atheriniformes: killifishes, other families.

Family Cyprinodontidae: killifishes.

57. *Fundulus sciadicus* Cope, plains topminnow.
Common in North Platte, South Platte and Niobrara river drainages.

58. *Fundulus zebrinus* Jordan and Gilbert, plains killifish.
Indigenous in North Platte, South Platte and Niobrara river drainages; introduced into Cheyenne and Wind-Big Horn river drainages, now present in the Powder River.

Family Poeciliidae: livebearers.

59. *Gambusia affinis* (Baird and Girard), western mosquitofish.
Introduced into some habitats in southeastern Wyoming for mosquito control. Rare.

Order Scorpaeniformes: mail-cheeked fishes.

Family Cottidae: sculpins.

60. *Cottus bairdi* Girard, mottled sculpin.
Common in drainages west of Continental Divide.
Introduced to upper Wind River in that drainage.

61. *Cottus beldingi* Eigenmann and Eigenmann, Paiute sculpin.
Common in the Snake River drainage.

Order Perciformes: perches, other families.

Family Centrarchidae: sunfishes.

62. *Ambloplites rupestris* (Rafinesque), rock bass.
Introduced. Present in some lakes and streams in the northeastern drainages.

63. *Lepomis cyanellus* Rafinesque, green sunfish.
Introduced. Common and extending its range at lower elevations east of the Continental Divide.

64. *Lepomis gibbosus* (Linnaeus), pumpkinseed.
Introduced. Established in lakes and ponds at lower elevations east of the Continental Divide.

65. *Lepomis macrochirus* Rafinesque, bluegill.
Introduced. Established in some lakes and farm ponds at lower elevations east of the Continental Divide.

66. *Micropterus dolomieu* Lacepède, smallmouth bass.
Introduced into several reservoirs.

67. *Micropterus salmoides* (Lacepède), largemouth bass.
Introduced into many lakes and ponds at lower elevations east of the Continental Divide.

68. *Pomoxis annularis* Rafinesque, white crappie.
Introduced. Established in some habitats at lower elevations east of the Continental Divide.

69. *Pomoxis nigromaculatus* (Lesueur), black crappie.
Introduced. Established in some lakes and reservoirs east of the Continental Divide.

Family Percidae: perches.

70. *Etheostoma exile* (Girard), Iowa darter.
Common in North Platte, South Platte and Niobrara river drainages.

71. *Etheostoma nigrum* Rafinesque, johnny darter.
Common and apparently expanding its range in the North Platte and South Platte river drainages. Also in Ocean Lake in Wind-Big Horn River drainage.

72. *Etheostoma spectabile* (Agassiz), orangethroat darter.
Originally present in lower North Platte and South Platte river drainages. Present in Lodgepole Creek.

73. *Perca flavescens* (Mitchill), yellow perch.
Introduced. Common and widespread in most drainages east of the Continental Divide.

74. *Stizostedion canadense* (Smith), sauger.
Common in the Wind-Big Horn River drainage. Less common in Tongue and Powder river drainages.

75. *Stizostedion vitreum* (Mitchill), walleye.
Introduced. Established in a number of larger reservoirs east of the Continental Divide.

Family Sciaenidae: drums.

76. *Aplodinotus grunniens* Rafinesque, freshwater drum.
Introduced. Presently found in Keyhole and Grayrocks reservoirs where it was apparently inadvertently introduced.

identification of fishes

A primary objective of this book is to provide keys and descriptions that make possible the accurate identification of the fishes found in Wyoming. Users should be familiar with standardized methods of counting scales, fin rays and other anatomical features used in identification.

After a fish has been tentatively identified by use of one or more of the keys, the physical description in the account of species should be consulted for verification.

The standardized methods for making counts, summarized below, follow those outlined by Hubbs and Lagler (1958).

All counts of paired structures should be made on the left side of a fish; for museum specimens, any dissection or removal of body parts should be done on the right side.

Fin ray counts. The fins of two different soft-rayed fish, and the standard method for counting the rays of the dorsal and anal fins are shown in Figure 1.

Dorsal and anal fins. In soft-rayed fishes, the first major ray of the dorsal and anal fins is not branched and is jointed only near its tip. Small, rudimentary rays, often not visible without dissection and some magnification, may precede this first ray. The remaining rays are branched and jointed. In minnows and suckers, by convention, the standard count is all branched rays plus one. In other families of soft-rayed fishes, such as the trouts, pikes and topminnows, the standard count is *all* rays including the rudimentary rays. For all soft-rayed fish, when the last ray of the dorsal or anal fin is branched near its base, it is counted as only 1 ray.

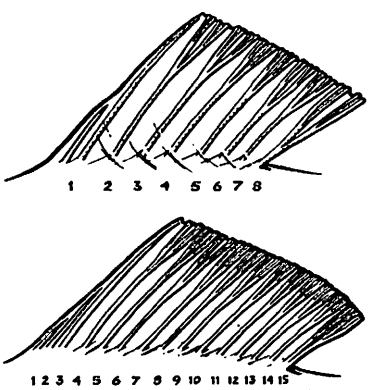


Figure 1. Counting the rays of the dorsal fins of soft-rayed fishes.

Caudal fin. In the caudal fin, there are unbranched rays at both the upper and lower margin of the fin. The standard count is the number of branched rays plus 2.

Paired fins. For the paired fins the standard count is all rays, including any rudimentary rays.

Scale counts. The most widely used scale count is the number of scales in the lateral line from the shoulder girdle to the base of the caudal fin (Figure 2). In most fish, the lateral scales overlying the lateral line have a distinct pore. If the lateral line is complete, extending

clearly from shoulder girdle to the base of the caudal fin, the count of lateral line scales is those pored scales. In the killifishes, the lateral line is not visible externally, and the lateral line of darters and sculpins, for example, may be incomplete. The lateral line scale count for these fish is the number of scale rows crossed by an imaginary line from the shoulder girdle to the base of the caudal fin.

Other scale counts such as scales above the lateral line, scales below the lateral line and circumferential scales are shown in Figure 2.

Pharyngeal tooth counts. This count refers to the teeth on the fifth pharyngeal arch of minnows, a useful character in identification of these fish. A simple formula describes the distribution of these teeth. The formula (2,5-4,1) shows that there are 2 teeth in the secondary row on the left arch and 5 teeth in the primary row; there are 4 teeth in the primary row on the right arch, and 1 tooth in the secondary row. Some cyprinids have a third row of pharyngeal teeth; the formula 1,1,3-3,1,1 for the carp shows a single tooth in both secondary and tertiary rows.

Body proportions are often diagnostic in the identification of fishes. These are expressed as an integer. For example, the head 4-5 into the standard length, or the eye 2.5-3.5 into the head length.

Other external measurements of fish are illustrated in Figure 2.

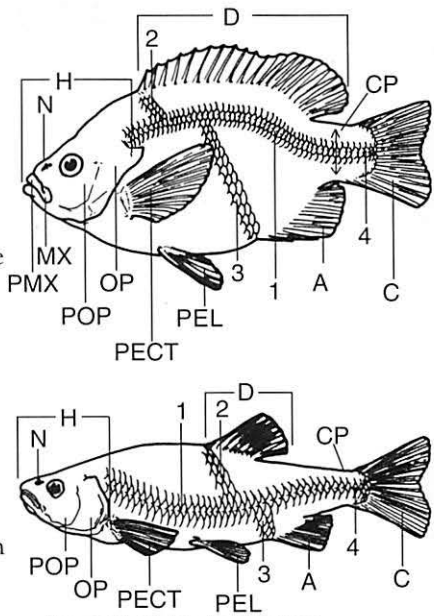
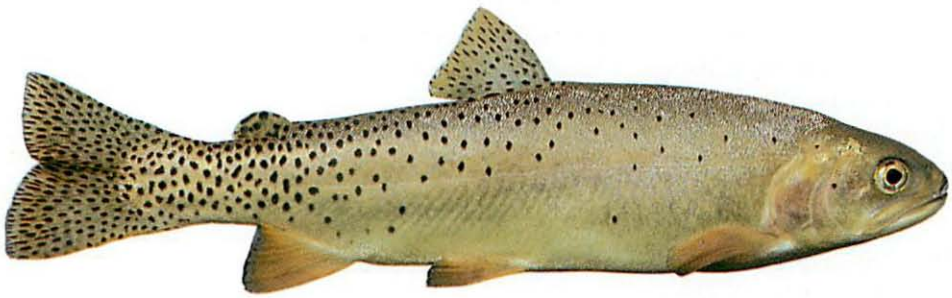


Figure 2. Guide to external anatomy and standard measurements of spiny- and soft-rayed fishes. A: anal fin; C: caudal fin; CP: caudal peduncle; D: dorsal fin; H: head length; MX: maxilla; N: nares; OP: opercle; PECT: pectoral fin; PEL: pelvic fin; PMX: premaxilla; POP: preopercle. 1: scales in the lateral line; 2: scales above the lateral line; 3: scales below the lateral line; 4: last scale counted when enumerating scales in the lateral line.

Use of keys

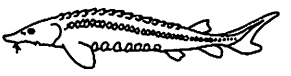
A key for identification is a numbered series of couplets of alternative descriptive statements. A subject for identification will be described correctly by only one of the alternatives. Following that alternative will be either the correct name of the subject or the number of the next couplet to consider. In this bulletin, the user should first consult the key to the families of fishes and then the key to the genera and species. When only a single representative of a family of fishes occurs in the state, no key beyond the family key is required.

key to the families of Wyoming fishes



families of Wyoming fishes

1a. Upper lobe of the caudal fin much longer than the lower lobe; body with 5 rows of bony plates; mouth ventral and protrusible, preceded by 4 fringed barbels. **Family Acipenseridae** (sturgeons). In Wyoming, a single species, ***Scaphirhynchus platorynchus*, the shovelnose sturgeon.**



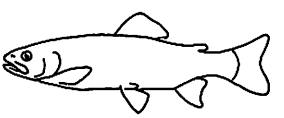
1b. Lobes of the caudal fin of about equal length; body naked or covered with scales; mouth usually not protrusible ——— 2.

2a. With adipose fin ——— 3.

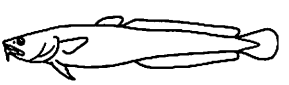
2b. Without adipose fin ——— 4.

3a. Body naked; top of head and lower jaw with long barbels; pectoral fin with a bony spine. **Family Ictaluridae** (bullhead catfishes).

3b. Body scaled; head and jaw lacking barbels; pectoral fin lacking a spine. **Family Salmonidae** (trouts, salmon, whitefish, grayling).



4a. With a median chin barbel. **Family Gadidae** (cods, burbot). In Wyoming, a single species, ***Lota lota*, the burbot.**



4b. Without a median chin barbel ——— 5.

5a. Dorsal fin double ——— 6.

5b. Dorsal fin single ——— 8.

6a. Spines of the first dorsal fin weak and flexible — 7.

6b. Spines of the first dorsal fin bony and sharp — 16.

7a. First dorsal fin with 7-10 soft spines, barely separated from the second dorsal; body scaleless. **Family Cottidae** (sculpins).

7b. First dorsal fin well separated from the second fin and with fewer than 7 spines; body with scales. **Family Atherinidae** (silversides). The brook silversides has been planted in Wyoming with unknown success.

8a. Fins with soft rays only, or if a serrate spine is present in the dorsal and anal fins, scales cycloid ——— **9.**

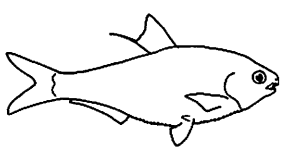
8b. Fins with spines; scales ctenoid ——— **15.**

9a. Jaws modified into a ducklike beak. **Family Esocidae** (pikes). In Wyoming, a single species, ***Esox lucius*, the northern pike.**

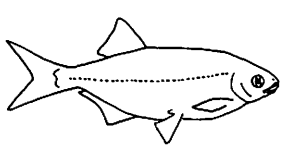
9b. Jaws not modified into a ducklike beak ——— **10.**

10a. Anal fin with 18 or more rays; body compressed laterally ——— **11.**

10b. Anal fin with fewer than 18 rays; body usually not compressed laterally ——— **12.**



11a. Lateral line absent; belly saw-toothed; last ray of dorsal fin elongate. **Family Clupeidae** (herrings, shads). In Wyoming, a single species, ***Dorosoma cepedianum*, gizzard shad.**



11b. Lateral line present; belly not saw-toothed; last ray of dorsal fin not elongate. **Family Hiodontidae** (mooneye, goldeye). In Wyoming, a single species, ***Hiodon alosoides*, the goldeye.**

12a. Jaws with teeth; lateral line inconspicuous; caudal fin rounded; head with scales ——— **13.**

12b. Jaws lacking teeth; lateral line evident; caudal fin not rounded; head lacking scales ——— **14.**

families of Wyoming fishes

13a. Anal fin of male not modified into an intromittent organ; dorsal fin rays 9 or more. **Family Cyprinodontidae** (killifishes).

13b. Anal fin of male modified into an intromittent organ; dorsal fin rays 7 or fewer. **Family Poeciliidae** (livebearers).

14a. Dorsal fin with 9 or fewer rays, or if there are more than 9 rays, first ray is a hardened spine; pharyngeal teeth in 1-3 rows, with six or fewer teeth in the primary row. **Family Cyprinidae** (minnows).

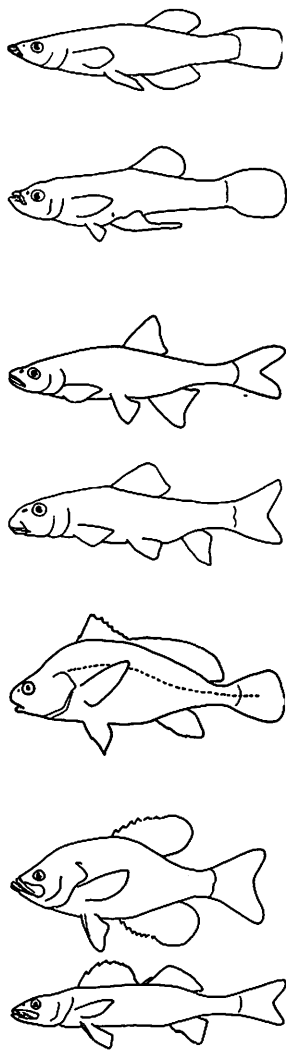
14b. Dorsal fin with 10 or more rays, and first dorsal ray not a hardened spine; pharyngeal teeth in a single row with 20 or more teeth. **Family Catostomidae** (suckers).

15a. Lateral line extending onto the caudal fin; second ray of anal fin conspicuously flattened laterally. **Family Sciaenidae** (drum). In Wyoming, a single species, ***Aplodinotus grunniens*, freshwater drum.**

15b. Lateral line not extending onto the caudal fin; second ray of anal fin not conspicuously flattened —**16.**

16a. Anal fin with 3 or more spines. **Family Centrarchidae** (sunfishes).

16b. Anal fin with 1 or 2 spines. **Family Percidae** (perch, pikeperches, darters).

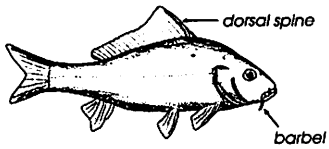


key to the family Cyprinidae (minnows)

1a. First ray of the dorsal fin a strong, serrate spine —**2.**

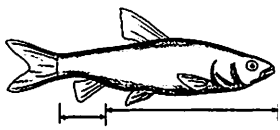
1b. First ray of the dorsal fin not a serrate spine ——**3.**

minnow family

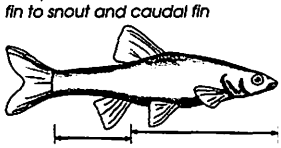


2a. Mouth with barbels; lateral line scales 35 to 38–***Cyprinus carpio*, common carp.**

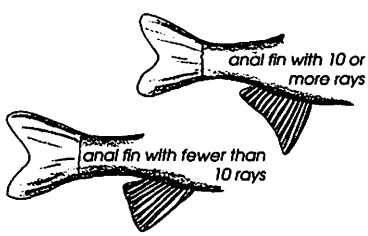
2b. Mouth lacking barbels; lateral line scales 26 to 30–**Carassius auratus, goldfish.**



3a. Distance from the front of the anal fin to the base of the caudal fin goes more than 3 times into the distance from the front of the anal fin to the snout–***Ctenopharygodon idellus*, grass carp.**

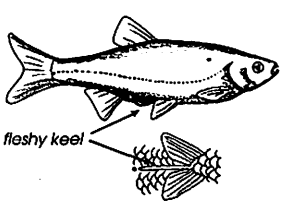


3b. Distance from the front of the anal fin to the base of the caudal fin is contained in the distance from the front of the anal fin to the snout less than three times ——**4.**



4a. Anal fin with 10 or more rays ——————**5.**

4b. Anal fin with fewer than 10 rays ——————**7.**

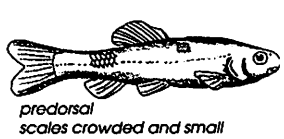


5a. An unscaled fleshy keel present on the ventral midline between the pelvic fin and the anus; mouth very small and oblique; lateral line strongly decurved-***Notemigonus chrysoleucas*, golden shiner.**

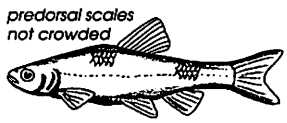
5b. No fleshy keel on the ventral midline; mouth not so oblique; lateral line not strongly decurved————**6.**

6a. Scale rows in the lateral line more than 45; body of adult fish usually with red splashing–***Richardsonius balteatus*, redside shiner.**

6b. Scale rows in the lateral line fewer than 45; body of adult fish not splashed with red (see also couplet 30)–***Notropis atherinoides*, emerald shiner.**

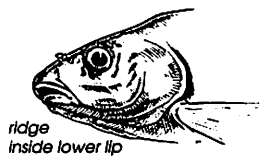


7a. Predorsal scales crowded, smaller than those on the remainder of the body; second dorsal ray (the first is rudimentary) blunt, short and distinctly separated from the third ray (this character is not easy to see in immature fish)–***Pimephales promelas*, fathead minnow.**


predorsal scales not crowded

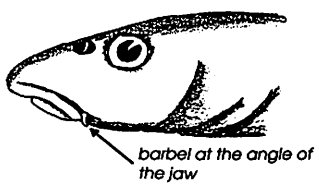
7b. Predorsal scales not crowded; second dorsal ray slender and not separated from the third ray ——————**8.**

8a. Lower jaw with a prominent cartilaginous ridge inside the lower lip; intestine uniquely looped around the gas bladder – ***Campostoma anomalum*, central stoneroller.**


ridge inside lower lip

8b. Lower jaw without a prominent cartilaginous ridge inside the lower lip; intestine not looped around the gas bladder——————————————————**9.**

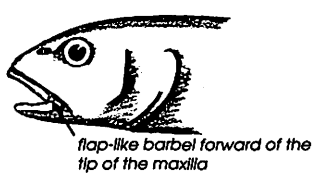
9a. A small, slender barbel present at or near the angle of the jaw (magnification may be required to see this)–
——————————————————**10.**


barbel at the angle of the jaw

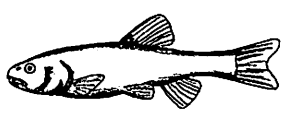
9b. No barbel present at or near the angle of the jaw –**17.**

10a. Barbel round, situated at or just above the posterior end of the maxillary bone ——————————**12.**

10b. Barbel flap-like, situated slightly forward from the tip of the maxilla in the groove between the maxilla and the fused skull bones (this barbel is absent in some populations in Wyoming)——————————**11.**


flap-like barbel forward of the tip of the maxilla

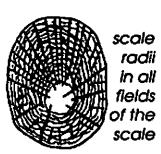
11a. A distinct black spot present, in mature specimens, at the base of the first few dorsal fin rays; body not mottled by pigmented regeneration scales; mature males lacking bright red coloration during the breeding season–***Semotilus atromaculatus*, creek chub.**


black spot at base of dorsal fin rays

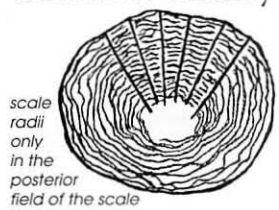
11b. No distinct black spot present at the base of the anterior dorsal rays; body mottled by pigmented regeneration scales; mature males with bright red coloration during the breeding season–***Margariscus margarita*, pearl dace.**


body mottled by pigmented regeneration scales

12a. Scale radii present in all fields of the scale ——**13.**

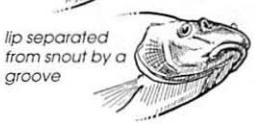

scale radii in all fields of the scale

minnow family

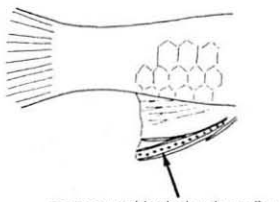


12b. Scale radii present only in the posterior field of the scale——14.

13a. Premaxillae not protractile, that is, a bridge, or "frenum" connects the upper lip with the snout–***Rhinichthys cataractae,*** **longnose dace.**



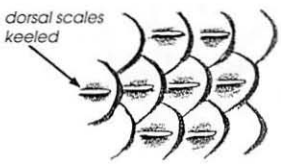
13b. Premaxillae protractile, the upper lip typically separated from the snout by a groove – ***Rhinichthys osculus,*** **speckled dace.**



14a. Compound taste buds present on the first, and sometimes second, interradial membranes of the paired and anal fins——15.

14b. Compound taste buds absent from interradial membranes of the fins——16.

15a. Dorsal scales keeled; adult size less than 4 inches–***Macrhybopsis gelida,*** **sturgeon chub.**



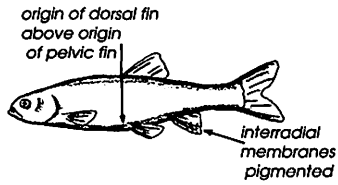
15b. Dorsal scales not keeled; adult size more than 4 inches – ***Platygobio gracilis,*** **flathead chub.**

16a. Lateral line scales fewer than 50; males with a distinct red spot on the head, behind the eye – ***Nocomis biguttatus,*** **hornyhead chub.**

16b. Lateral line scales more than 50; males without a distinct red spot on the head, behind the eye – ***Couesius plumbeus,*** **lake chub.**

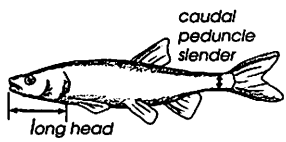
17a. Lateral line scales 50 or more (among the fishes keyed below, only the Utah chub rarely has fewer than 50 lateral line scales)——18.

17b. Lateral line scales fewer than 50 (among the fishes keyed below, only the suckermouth minnow rarely has as many as 50 lateral line scales——24.

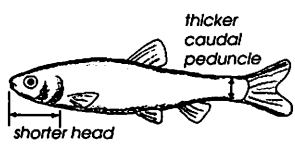


18a. Origin of the dorsal fin directly above the origin of the pelvic fin; lateral line scales fewer than 65; interradial membranes pigmented – ***Gila atraria*, Utah chub.**

18b. Origin of the dorsal fin behind that of pelvic fin; lateral line scales more than 65; interradial membranes not pigmented ——————————————————**19.**



19a. Caudal peduncle very slender; length of the head usually more than 3.5 times the depth of the caudal peduncle – **Gila robusta, roundtail.**



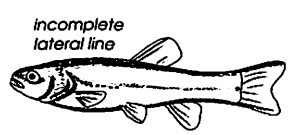
19b. Caudal peduncle thicker; length of the head usually less than 3 times the depth of caudal peduncle –**20.**

20a. Lateral line scales usually 70 or more ————**21.**

20b. Lateral line scales usually 65 or fewer (creek chubs and pearl dace lacking a barbel will key out here ——**23.**

21a. Size of adult fish less than 8 inches, mouth small, the angle of the jaw does not extend behind the eye ——**22.**

21b. Size of adult fish more than 8 inches, mouth very large, the angle of the jaw extends behind the eye – ***Ptychocheilus lucius*, Colorado squawfish.**



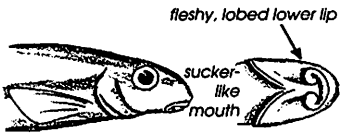
22a. Lateral line incomplete; body with a distinct dark lateral stripe – ***Phoxinus neogaeus*, finescale dace.**

22b. Lateral line complete; body without a dark lateral stripe – ***Gila copei*, leatherside chub.**

23a. With a distinct black spot at the base of the first few dorsal rays – ***Semotilus atromaculatus*, creek chub.**

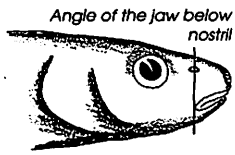
23b. Without a distinct black spot at the base of the first few dorsal rays – ***Margariscus margarita*, pearl dace.**

minnow family

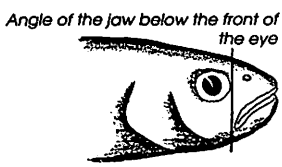


24a. Lower lip with fleshy lateral lobes; mouth sucker-like – **Phenacobius mirabilis, suckermouth minnow.**

24b. Lower lip without fleshy lateral lobes; mouth not suckerlike ——— **25.**

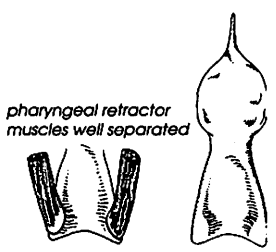


25a. Intestine long and coiled; mouth small, the angle of the jaw meets a vertical line at about the level of the nostril– (genus ***Hybognathus***) ——— **26.**



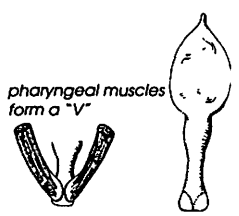
25b. Intestine short, s-shaped; mouth larger, the angle of the jaw meets a vertical line behind the nostril, usually at about the anterior margin of the eye– (genus ***Notropis***) – ——— **28.**

26a. Scale with about 20 weak radii; body usually with a dusky lateral stripe – ***Hybognathus hankinsoni,*** **brassy minnow.**



26b. Scale with 10-16 strong radii; body silvery, lacking a dusky stripe ——— **27.**

27a. Eye quite large, 4.0 to 5.5 in the length of the head; scale rows across the belly 11-17; difficult to distinguish from the next species without dissection of the retractor muscles of the pharyngeal arch. These muscles are well separated in *argyritus* and form a distinct V in *placitas* – ***Hybognathus argyritis,*** **western silvery minnow.**



27b. Eye smaller, 5 to 7 in the length of the head; scale rows across the belly 15-22; retractor muscles of the pharyngeal arch form a distinct V – ***Hybognathus placitus,*** **plains minnow.**

28a. Teeth in 2 rows: 1 or 2,4-4, 1 or 2 ——— **29.**

28b. Teeth in 1 row: 4-4 ——— **32.**

29a. Principal anal rays 9-13 ——— **30.**

minnow family

29b. Principal anal rays 7 or 8 ——————————**31.**

30a. Body slender. Origin of the dorsal fin well behind the origin of the pelvics, nearer the base of the caudal than the tip of the snout – ***Notropis atherinoides*, emerald shiner.**

30b. Body deep. Origin of the dorsal fin ahead to very shortly behind the origin of the pelvic, nearer the tip of the snout than the base of the caudal – ***Luxilus cornutus*, common shiner.**

31a. A large, circular, well-defined black spot at the base of the caudal fin – ***Notropis hudsonius*, spottail shiner.**

31b. No black spot at the base of the caudal fin; scales usually absent from the dorsal surface in front of the dorsal fin in Wyoming specimens (the sand shiner is similar but has scales in front of the dorsal fin) – ***Notropis dorsalis*, bigmouth shiner.**

32a. Body relatively short and laterally compressed, its depth 2.7 to 3.7 in the standard length; teeth almost always 4-4, rarely 1,4-4,1 or 1,4-4,0 – ***Cyprinella lutrensis*, red shiner.**

32b. Body elongate and rounded, its depth 3.5 to 5.5 in the standard length; teeth 4-4. But this species difficult to distinguish from the bigmouth shiner. Compare the presence of scales in front of the dorsal fin – ***Notropis stramineus*, sand shiner.**

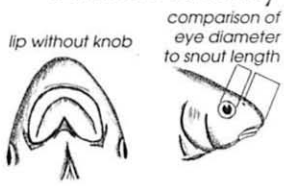
key to the family Catostomidae (suckers)

1a. Dorsal fin elongate, more than 20 principal rays —**2.**

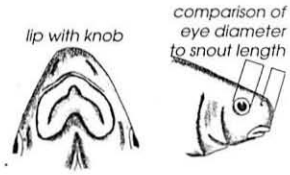
1b. Dorsal fin shorter, fewer than 20 principal rays —**3.**

2a. Scales in the lateral series 37 to 40; lower lip without a median, nipple-like knob; the distance from the tip of the

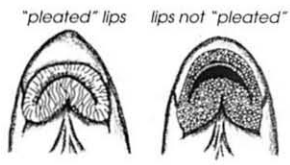
sucker family



snout to the anterior nostril is greater than the diameter of the eye – ***Carpiodes cyprinus*, quillback.**



2b. Scales in the lateral series 33 to 37; lower lip with a median, nipple-like knob; the distance from the tip of the snout to the anterior nostril is less than the diameter of the eye – ***Carpiodes carpio*, river carpsucker.**



3a. Scales large, fewer than 50 in the lateral series; lips full and pleated – ***Moxostoma macrolepidotum*, shorthead redhorse.**

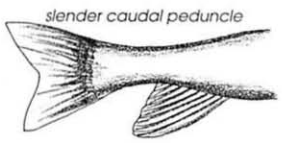
3b. Scales more than 50 in the lateral series; lips not pleated ——— **4.**

4a. Lips with a distinct lateral notch on each side; jaws inside the lips with a cartilaginous biting edge – (subgenus *Pantosteus*) ——— **8.**

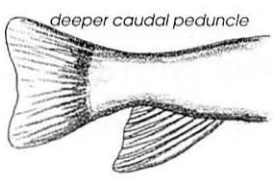
4b. Lips without a lateral notch; jaws inside the lips lacking a cartilaginous biting edge (subgenus ***Catostomus***) **5.**

5a. Scales in the lateral series 80 or more ——— **6.**

5b. Scales in the lateral series fewer than 80 ——— **7.**



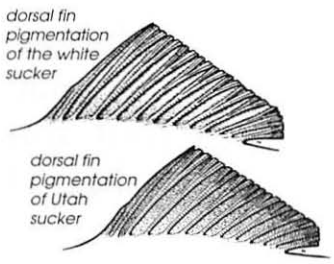
6a. Caudal peduncle slender, its least depth less than one-third the head length; dorsal fin large; its depressed length more than half the distance from the tip of the snout to the anterior edge of the dorsal fin – ***Catostomus latipinnis*, flannelmouth sucker.**



6b. Caudal peduncle deeper, its least depth more than one-third the head length; dorsal fin shorter, its depressed length less than half the distance from the tip of the snout to the anterior edge of the dorsal fin – ***Catostomus catostomus*, longnose sucker.**

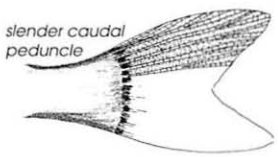
7a. Interradial membranes of the dorsal fin with very fine pigmentation and pigment granules concentrated mostly

sucker family

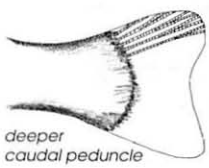


at the edges of the membrane, the distal third of the membrane almost immaculate – ***Catostomus commersoni*, white sucker.**

7b. Interradial membranes of the dorsal fin rays with coarse pigmentation and pigmented to the tips of the rays– ***Catostomus ardens*, Utah sucker.**

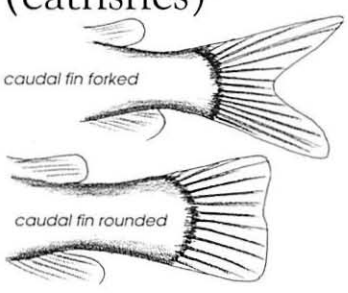


8a. Caudal peduncle slender, its least depth contained 2.5 to 3.0 times in the length of the head; interradial membrane of the caudal fin pigmented – ***Catostomus discobolus*, bluehead sucker.**



8b. Caudal peduncle deeper, its least depth contained less than 2.5 times in the length of the head; interradial membrane of the caudal fin not pigmented – ***Catostomus platyrhynchus*, mountain sucker.**

key to the family Ictaluridae (catfishes)



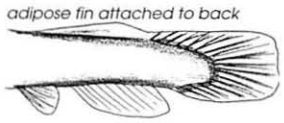
1a. Caudal fin deeply forked – ***Ictalurus punctatus*, channel catfish.**

1b. Caudal fin rounded or but slightly forked ——— **2.**

2a. Lower jaw protruding beyond the upper jaw; pectoral fin spine with teeth along both the anterior and posterior edge of the spine – ***Pylodictis olivaris*, flathead catfish.** (a provisional species in Wyoming, see page 267.)

2b. Upper jaw protruding beyond the lower jaw; pectoral fin spine with teeth along only the posterior edge of the spine ——— **3.**

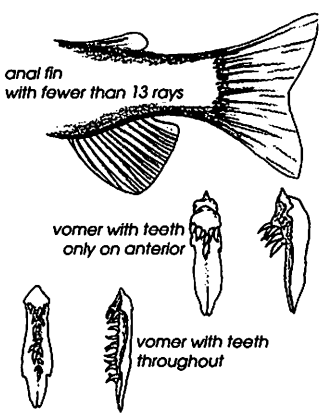
3a. Adipose fin attached to the back along its entire length, not free posteriorly – ***Noturus flavus*, stonecat.**



3b. Adipose fin not attached along its entire length, free at its posterior end – ***Ameiurus melas*, black bullhead.**

key to the family Salmonidae (trout and salmon)

Figure 56. anal fin.



1a. Scales in the lateral line fewer than 100 ——— **2.**

1b. Scales in the lateral line more than 100 ——— **3.**

2a. Dorsal fin with 18 or more rays – ***Thymallus arcticus*, grayling.**

2b. Dorsal fin with fewer than 18 rays – ***Prosopium williamsoni*, mountain whitefish.**

3a. Anal fin with 13 to 15 principal rays; gill rakers on the first gill arch 44; branchiostegals 13 to 19 – ***Oncorhynchus nerka*, kokanee.**

3b. Anal fin with fewer than 13 principal rays; gill rakers 20 or fewer; 20 or fewer; branchiostegals 12 or fewer — **4.**

4a. Body without black spots; vomer with teeth restricted to the anterior end ——— **5.**

4b. Body with black spots; vomerine teeth distributed along the entire length of the vomer ——— **7.**

5a. Body without red or orange spots ——— **6.**

5b. Body with red or orange spots – ***Salvelinus fontinalis*, brook trout.** (See also 6b, below)

6a. Caudal fin deeply forked – ***Salvelinus namaycush*, lake trout.**

6b. Caudal fin rounded, not deeply forked – **splake.** (adult male splake may show red spots, see 5b, above)

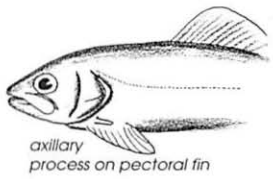
7a. Color pattern of many small, diffuse black spots or large, rounded black spots; never with pale bordered red, orange, yellow or pink spots ——— **9.**

7b. Color pattern of large black or maroon spots together

with red, orange or pink spots which, in younger fish usually have a pale border or halo ——————8.

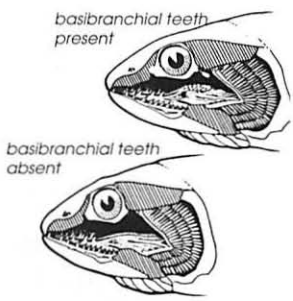
8a. Pale bordered spots of adult fish red or maroon; axillary process of the pectoral fin absent – ***Salmo trutta,*** **brown trout.**

8b. Pale bordered spots of adult fish orange; axillary process of the pectoral fin present – ***Salmo letnica,*** **Ohrid trout.**



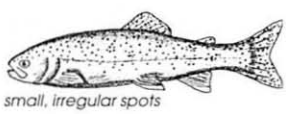
9a. Black spots usually large and rounded, if small they are concentrated in the caudal peduncle; scales smaller, 150-180 in the lateral line; basibranchial teeth normally present ——————————————————10.

9b. Black spots small, diffuse, not noticeably concentrated in the caudal peduncle; scales larger, 120-140 in the lateral line; basibranchial teeth absent – ***Oncorhynchus mykiss,*** **rainbow trout.**



10a. Spots on body and caudal fin large, rounded——11.

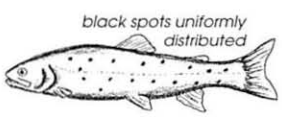
10b. Spots on the body and caudal fin very small and irregular in shape – ***Oncorhynchus clarki*** **ssp., Snake River cutthroat.**



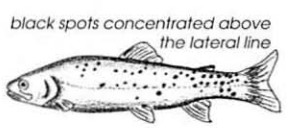
11a. Background colors of the body drab and silvery, without bright red and orange ——————12.

11b. Background colors of the body sometimes bright red and orange ——————————————13.

12a. Black spots distributed uniformly over the body – ***Oncorhynchus clarki utah,*** **Bonneville cutthroat.**



12b. Black spots concentrated above the lateral line especially in the caudal peduncle – ***Oncorhynchus clarki bouvieri,*** **Yellowstone cutthroat.**



13a. Pelvic and pectoral fins with white borders; spotting

trout and salmon family

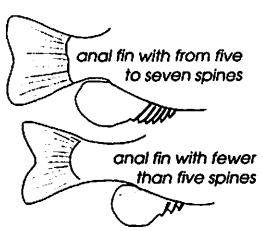
almost entirely restricted to the area above the lateral line and posterior to the dorsal fin – ***Oncorhynchus aguabonita,*** **golden trout.**

13a. Pelvic and pectoral fins uniformly brown, red or purple, without white borders; spotting not restricted to the caudal peduncle and behind the dorsal fin ——— **14.**

14a. Black spots somewhat diffuse, intermediate in size, scattered uniformly over the body – ***Oncorhynchus clarki lewisi,*** **West slope cutthroat.**

14b. Black spots large, concentrated in the caudal peduncle – ***Oncorhynchus clarki pleuriticus,*** **Colorado River cutthroat.**

key to the family Centrarchidae (sunfishes)



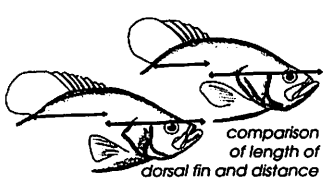
1a. Anal fin with from 5 to 7 spines ——— **2.**

1b. Anal fin with fewer than 5 spines ——— **4.**

2a. Dorsal fin much longer than the anal fin and with more than 9 spines – ***Ambloplites rupestris,*** **rock bass.**

2b. Dorsal fin shorter than the anal fin and with fewer than 9 spines ——— **3.**

3a. Dorsal spines 5 or 6; length of dorsal fin contained almost twice in the distance from the snout to the anterior end of the dorsal fin – ***Pomoxis annularis,*** **white crappie.**

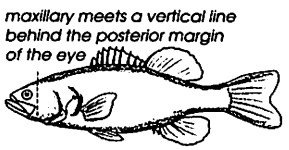


3b. Dorsal spines 7 or 8; the length of the dorsal fin is contained less than twice in the distance the snout to the anterior end of the dorsal – ***Pomoxis nigromaculatus,*** **black crappie.**

4a. Scales in the lateral line more than 55; body elongate ——— **5.**

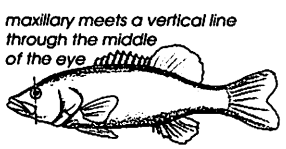
sunfish family

4b. Scales in the lateral line less than 55; body short and compressed laterally ——————————**6.**



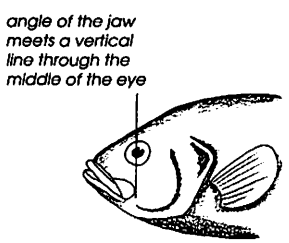
5a. Dorsal fin almost divided into two parts; mouth large, the maxillary meets a vertical line behind the posterior margin of the eye; the soft part of the dorsal fin not scaled at the base; posterior spine of the spiny dorsal less than half the length of its longest spine; scales on the cheeks in 9-12 rows – ***Micropterus salmoides*, largemouth bass.**

5b. Dorsal fin less completely divided; mouth smaller, the maxillary meets a vertical line at about the middle of the eye; soft part of the dorsal scaled at the base; posterior spine of spiny dorsal more than half the length of its longest spine; scales on the cheeks in more than 12 rows – ***Micropterus dolomieu*, smallmouth bass.**



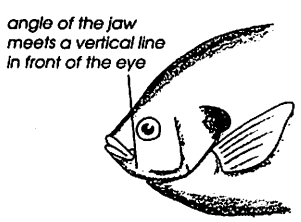
6a. Opercular flap with a red spot; lower pharyngeals broad, with blunt, paved teeth; gill rakers short and blunt– ***Lepomis gibbosus*, pumpkinseed.**

6b. Opercular flap without a red spot; lower pharyngeals narrow, sharp, not paved; gill rakers long and sharp —**7.**



7a. Opercular flap stiff to the margin; mouth large, the angle of the jaw meets a vertical line at about the middle of the eye; young fish never with dark vertical bars – ***Lepomis cyanellus*, green sunfish.**

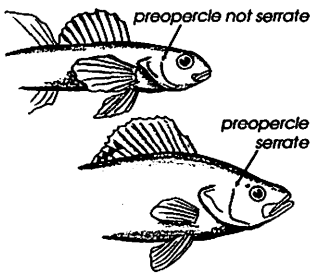
7b. Opercular flap flexible; mouth smaller, the angle of the jaw meets a vertical line in front of the eye; vertical dark bars usually present on young fish – ***Lepomis macrochirus*, bluegill.**



key to the family Percidae (perches)

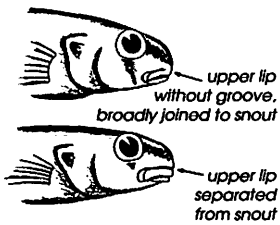
1a. Adult size small, less than 4 inches; mouth small; preopercle not serrate ——————————**2.**

perch family



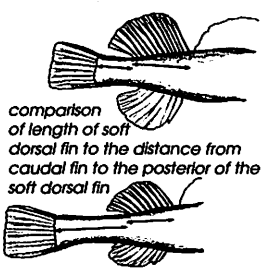
1b. Size of adult fish exceeding 4 inches; mouth large, preopercle serrate ——————————————**4.**

2a. Lateral line incomplete, usually not extending far behind the first dorsal fin; upper lip broadly joined to the snout at the midline by a bridge of skin; anal spines 2; body with vertical bars ——————————————**3.**



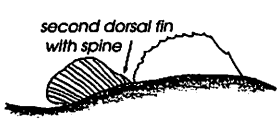
2b. Lateral line complete, extending beyond the second dorsal fin; upper lip completely separated from the top of the snout by a distinct groove; anal spine single; body with a lateral series of W-shaped marks – ***Etheostoma nigrum*, johnny darter.**

3a. Distance from the posterior tip of soft dorsal fin to the base of the caudal fin not more than half the length of the soft dorsal; cheeks usually naked; dorsal soft rays usually 12 or more – ***Etheostoma spectabile*, orangethroat darter.**

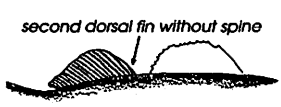


3b. Distance from the posterior tip of soft dorsal fin to the base of the caudal fin greater than one-half the length of the soft dorsal; cheeks scaled; dorsal soft rays usually fewer than 12 – ***Etheostoma exile*, Iowa darter.**

4a. Body with distinct black vertical bars; pelvic fins close together, the distance between their bases less than the width of either fin base; jaws without large canine-like teeth; second dorsal fin with an anterior spine – ***Perca flavescens*, yellow perch.**



4b. Body without distinct black vertical bars; pelvic fins separated by a distance equal to or greater than the width of the base of the fin; jaws with large canine-like teeth; second dorsal without a spine ——————————**5.**



5a. Dorsal fin with distinct rounded black spots; soft rays of the dorsal fin 17 to 20; pyloric caeca 5 to 8 – ***Stizostedion canadense*, sauger.**

perch family

5b. Dorsal fin without rounded black spots, but with a large black blotch near the base of the posterior spines; soft rays of the dorsal fin 19 to 22; pyloric caeca usually three – ***Stizostedion vitreum*, walleye.**

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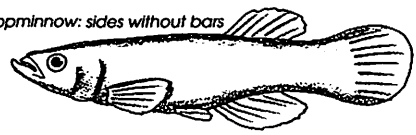
key to the family Cyprinodontidae (killifishes)

1a. Side with distinct vertical bars – ***Fundulus zebrinus*, plains killifish.**

1b. Side without distinct vertical bars – ***Fundulus sciadicus*, plains topminnow.**

killifish: side with distinct bars

topminnow: sides without bars



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key to family Poeciliidae (livebearers)

1a. Adult males with a sword-like extension of the caudal fin–***Xiphophorus helleri*, green swordtail.** (Species is provisional in Wyoming; see page 267.)

1b. Adult males without a sword-like extension of the caudal fin–**2.**

2a. Adult males smaller than females and brightly colored – ***Lebistes reticulatus*, guppy.** (Species is provisional in Wyoming; see page 267.)

2b. Adult males not noticeably smaller than females, and not brightly colored – ***Gambusia affinis*, western mosquitofish.**

---

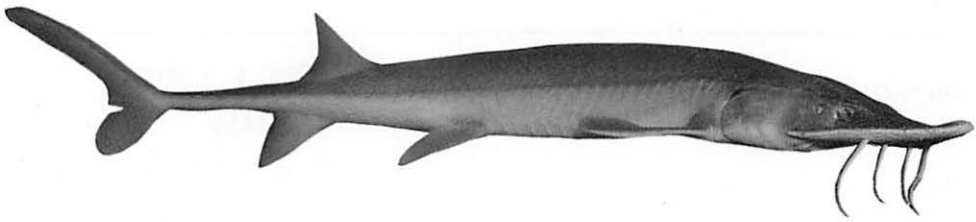
key to the family Cottidae (sculpins)

1a. With more than 1 preopercular spine; palatine teeth present – ***Cottus bairdi*, mottled sculpin.**

1b. With a single preopercular spine; palatine teeth absent – ***Cottus beldingi*, Paiute sculpin.**

Family Acipenseridae

Sturgeons



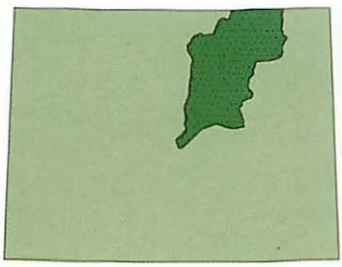
Sturgeons are anadromous and freshwater fishes occurring throughout the Northern Hemisphere. They are primitive fishes. Distinctive features of sturgeons are the absence of typical scales and the presence of 5 rows of bony plates extending the length of the body. Other features include a largely cartilaginous skeleton, a spiral intestine, and a heterocercal caudal fin. The elongate snout, a protrusible, inferior mouth, toothless in adult fish, and 4 elongate barbels on the lower surface of the snout are characters related to bottom-feeding habits. The flesh and eggs (caviar) are highly prized as food; sturgeons have been heavily exploited commercially in many parts of their range.

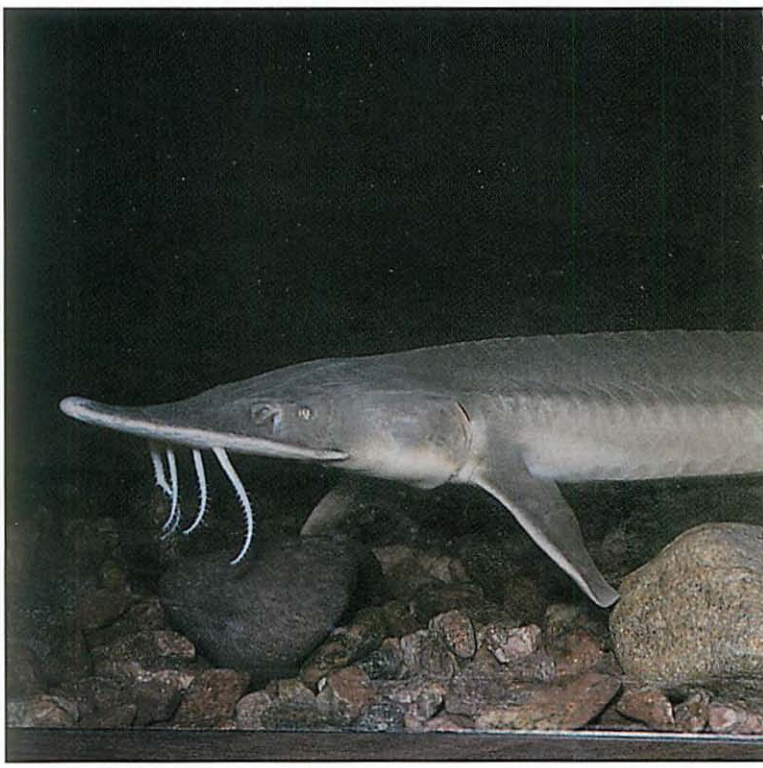
Shovelnose sturgeon *Scaphirhynchus platorynchus*

Scaphirhynchus-- shovelnose; *platorynchus*-- flatnose

Description: Body elongate; caudal peduncle narrow; upper lobe of the heterocercal caudal elongate, especially in young individuals; snout broad and flat, extending far beyond the mouth; mouth protrusible; four fringed barbels situated about half way between the tip of the snout and the mouth; 5 rows of bony shields, 1 dorsal, 2 lateral and 2 ventrolateral, extend from the head back to onto the caudal fin; belly with small scales. Intestine spiral rather than elongate as in most freshwater fish. Color variable; yellow, brown, olive or gray dorsally; white below. Length to about 2.5 feet; weight to about 5 pounds.

Distribution: The shovelnose sturgeon is widespread in the Mississippi River drainage. Before 1900, this fish occurred in Wyoming in the North Platte and Powder River (Evermann and Cox 1896) and probably in the Big Horn River. It is now rare in Wyoming. In recent years, it has been collected in the lower Powder River and in Crazy Woman Creek. In the mid-1980s, a number of adult shovelnose sturgeons were trap-netted in the Powder River near the Wyoming-Montana state line. Those fish were believed to be upstream spawning migrants in years of high runoff. Adult fish tagged in





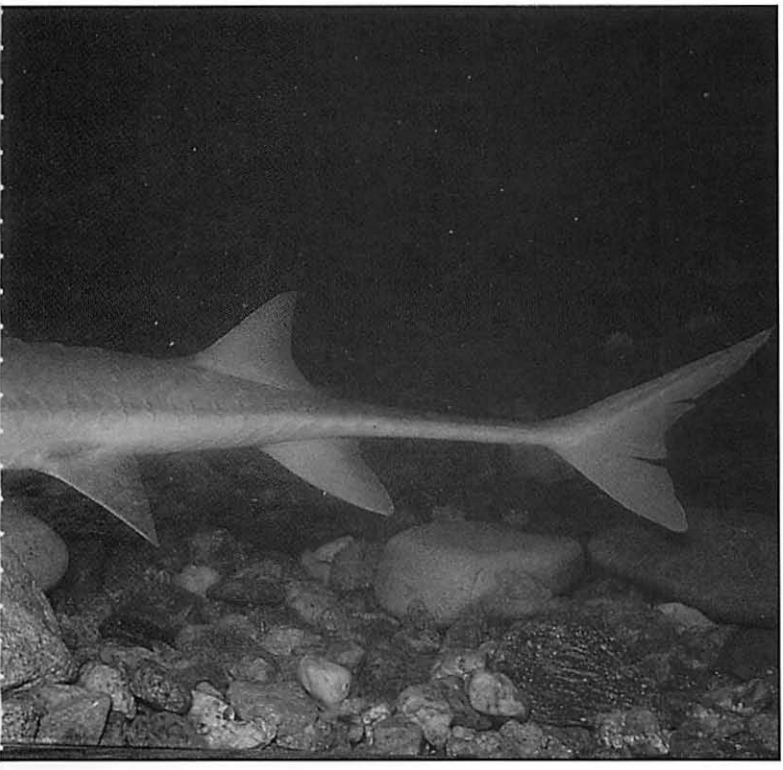
Wyoming were subsequently caught in the Yellowstone River near Miles City and Glendive, Montana, some 200-250 miles from where they were tagged. A natural barrier in Montana prevents substantial upstream migration during low-water years. In earlier years, there were unconfirmed reports of sturgeons in the Big Horn and Greybull rivers in Wyoming.

Distinguished from:

all other Wyoming fishes by the rows of bony plates on its body and its heterocercal caudal fin.

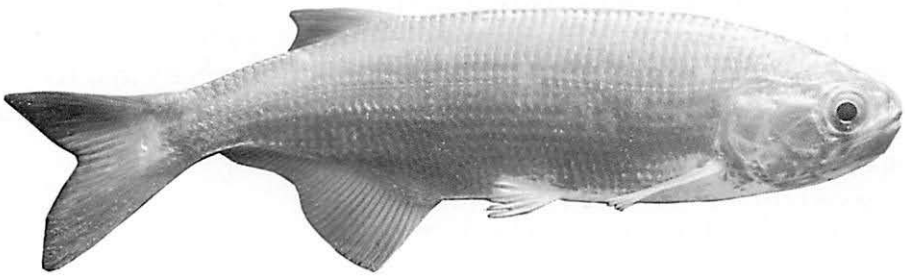
Natural history: The preferred habitat of the shovelnose sturgeon is at or near the bottom of large rivers with a sand substrate. Little is known of the breeding behavior. It spawns in the spring, migrating upstream to spawn. Spawning migrants have been observed in Wyoming from mid-June through early July. Brown (1971) stated that the eggs are adhesive and that the incubation period is probably about 1 week at 60 to 70 degrees F. Food consists largely of bottom dwelling invertebrates and includes some minnows and some vegetation.

Literature references: *Scaphirhynchus platorynchus*. Evermann and Cox 1896:385. (North Platte River at Casper and Douglas); Simon 1951:26 (North Platte River near the Wyoming-Nebraska state line).



Family Hiodontidae

Mooneyes



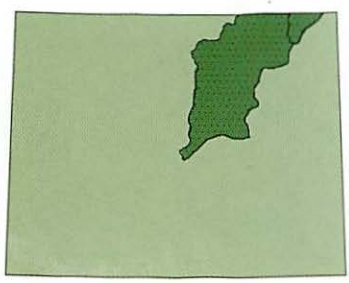
The mooneyes take their name from their very large eyes. This family of fishes is found only in North America. The family is represented by a single genus, *Hiodon*, and 2 species, the mooneye, *Hiodon tergisus*, and the goldeye, *Hiodon alosoides*. Characterized uniquely by the presence of teeth on both the tongue and on the parasphenoid bone in the roof of the mouth, this family is included in the order Osteoglossiformes, the order which takes its name from a predominant family Osteoglossidae, the bonytongues. Bonytongues are tropical fishes found in Africa, South America and Australia.

Goldeye *Hiodon alosoides*

Hiodon-- toothed tongue; *alosoides*-- shad-like

Description: Body strongly compressed; no adipose fin; dorsal fin taking origin behind the origin of the anal fin; eye large and yellow (translucent in the live fish), and with membranous "eyelids." Head short; mouth terminal and toothed; lateral line present. Scales in the lateral series 55-60; dorsal rays 9 or 10; anal rays 30-32. Teeth present on the parasphenoid bone in the roof of the mouth. Color blue-gray or greenish-gray dorsally, very silvery on the sides; belly white. Average adult size about 10 inches and less than a pound. An exceptional fish collected by a field party of the Wyoming Game and Fish Department in 1938 from the North Platte River 2 miles below Alcova Reservoir was 16 inches in length and weighed 2 pounds, 11 ounces (Simon 1951).

Distribution: The goldeye ranges from the Hudson Bay drainage in Saskatchewan through the Missouri and Mississippi river drainage basins east to Ohio, south to Tennessee and west to Texas. In Wyoming, the goldeye is found in the Powder, Little Powder and Little Missouri rivers and in Clear and Crazy Woman creeks. It has been extirpated from the North Platte River in Wyoming where it was found in earlier years.



Natural history: The goldeye is adapted to living in large rivers and associated backwaters and marshes, or in the shallow waters of larger lakes and reservoirs. The large eye enables this species to live in very turbid waters and to feed at the surface in twilight and after dark. In Montana, Hill (1966) found that the goldeye spawned in the Teton River between April 7 and June 8. Battle and Sprules (1960) described the eggs of this species as semi-bouyant, indicating that the eggs normally float in the open water. Scott and Crossman (1973) state that spawning takes place in standing waters but that the spawning act has never been observed (in turbid waters where it normally takes place). In Manitoba, male goldeyes reach sexual maturity 1 year earlier than females. Females between 12 and 15.5 inches in length produced an average of 14,150 eggs (Battle and Sprules 1960). Young goldeyes have never been found in Wyoming, and it is believed

that the few populations residing in the northeastern counties of the state are maintained by migration of adult fish seeking spawning grounds. Goldeyes are surface feeders on a wide variety of invertebrates, particularly surface-dwelling aquatic insects.

Relation to man: This fish is caught by anglers on a variety of baits including grasshoppers, minnows, worms, and small spinners. The goldeye is not classified as a game fish in Wyoming. It is considered a nuisance fish in the upper Missouri River (Hill 1966), but a valuable food fish in Canada where smoked goldeye is considered a delicacy (Kennedy and Sprules 1967).

Nomenclature: Simon (1951) used the name *Amphiodon alosoides* for the goldeye. This was the name originally used by Rafinesque in 1819. Both the mooneye and the goldeye were included in the genus *Hiodon* upon the recommendation of Bailey (1956).

Literature references: *Hiodon alosoides*. Evermann and Cox 1896:412 (Platte River, Casper; Clear Creek, Clermont [sic]). *Amphiodon alosoides*. Simon 1951:27 (North Platte, Little Missouri, Big Horn and Powder rivers, and Clear Creek).

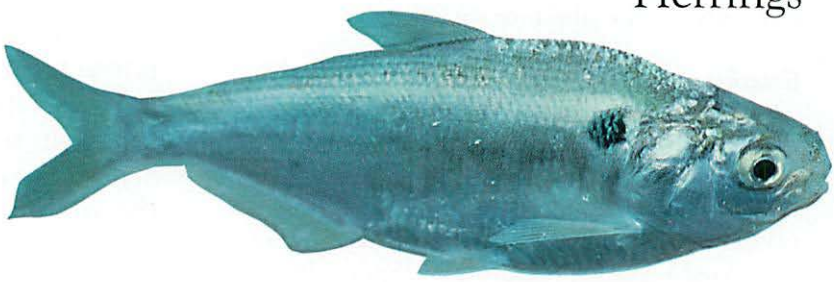
Distinguished from:

the mooneye, a near relative not found in Wyoming, by its dorsal fin origin which is behind the origin of the anal fin;

the gizzard shad by its smooth (not saw-toothed) belly, its teeth, its external lateral line, and absence of an elongate last dorsal ray.

Family Clupeidae

Herrings



This family of fishes includes the herrings and the shads. Most herrings are marine or anadromous; shads live in fresh or brackish waters, ascending freshwater streams to spawn. Shads and herrings are soft-rayed fishes with large, silvery scales and usually a saw-toothed belly. The lateral line is not evident externally. Marine herrings are important food fishes.

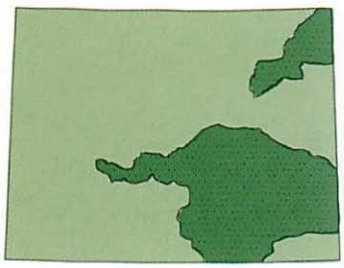
Gizzard shad *Dorosoma cepedianum*

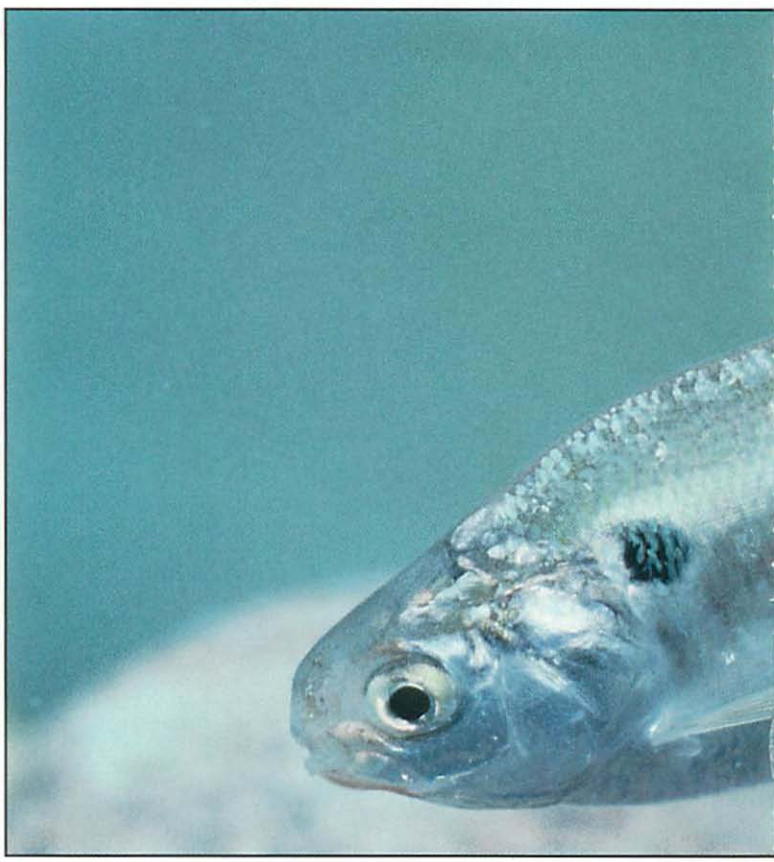
Dorosoma--lance-body; *cepedianum*--after Lacepède, a French ichthyologist

Description: Body deep and compressed laterally; belly sharp with a saw-toothed ventral border. Eye large with transparent, adipose lids. No (external) lateral line. About 60 rows of scales in the lateral series. Dorsal rays about 12; the last ray filamentous and prolonged. Anal rays about 30. No adipose fin. Color dusky above, very silvery laterally; the belly white. Young and subadults with a dark blotch behind the opercle. Adult length averages about 10 inches.

Distribution: The gizzard shad is widely distributed in eastern and middle western North America. It has been introduced into reservoirs in the western states as a forage fish. In Wyoming, it has been introduced into reservoirs east of the Continental Divide.

Natural history: The gizzard shad takes its name from the gizzard-like nature of its stomach. It inhabits large rivers, especially backwaters and side pools. Spawning takes place in late spring; eggs are released into the open water and sink slowly, adhering to submerged vegeta-





tion or other submerged objects. No nest is prepared, and young are not cared for. Gizzard shad are primarily filter feeders, feeding on a variety of animal plankton, benthic invertebrates, and vegetation (Becker 1983). Scott and Crossman (1973) state that this fish feeds on the bottom and is one of few native North American fishes capable of existing almost solely on vegetable materials.

Distinguished from:

the goldeye by its elongate last dorsal ray and its saw toothed belly.

Relation to man: Gizzard shad, like most herrings, are intolerant of low temperatures and rapid temperature changes and experience high mortalities in the winter. Overwinter survivors or adult fish planted into a lake or reservoir fishery from an overwintering population produce huge numbers of young. These young fish provide a food item in reservoirs managed for such game species as walleye and northern pike. Aside from their importance as forage fish, gizzard shad have little or no commercial importance. Cross (1967) noted that gizzard shad "cannot be caught on hook and line except by sheerest accident."

Family Cyprinidae

Minnows

The minnow family contains some 1,600 species and is the largest family of fishes. Minnows are variously known as carps, shiners, dace, and chubs. The superorder Ostariophysi contains the minnows, suckers, catfishes, characins, and other families of South American and African fishes. Fishes in this superorder are uniquely characterized by a series of small bones, the Weberian apparatus, which connects the gas bladder of the fish with the internal ear and functions in the transmission of sound.

Minnows are fish with cycloid scales and soft fin rays. The pelvic fins are situated behind the pectorals; the gas bladder is connected with the gut by the pneumatic duct. These fishes lack pyloric caeca, nor do they have teeth in the jaw bones or in the bones of the roofs of their mouths. Instead, a minnow has highly specialized "pharyngeal" teeth on the last gill arch which shred the fish's food.

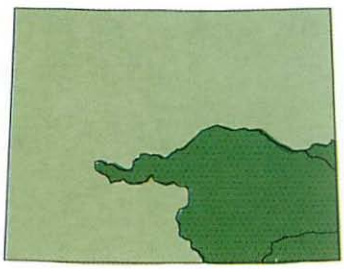
Minnows are widespread in fresh waters of North America, Eurasia, Malaysia, and Africa. North American minnows are usually small fish, less than 12 inches in length. An exception is the squawfish of the Colorado River drainage which is reported to reach weights of 80 pounds (Simon 1951).

By virtue of their fecundity and their tolerance of a wide range of environmental conditions, minnows are often extremely abundant in both streams and lakes. Minnows are important forage fish for larger, predacious game fishes and are also widely used as bait.

In technical usage, all "minnows" are members of the family Cyprinidae. The use of "trout-minnow" or "perch-minnow" in reference to the fingerling or fry of trout or perches is erroneous.

Central stoneroller *Campostoma anomalum*

(*Campostoma*-- curve-mouth; *anomalum*-- extraordinary, referring to the looping of the intestine around the gas bladder)



Description: Body stout; belly flat; snout blunt; head short; eye moderate; mouth inferior with cartilaginous biting edges on mouth; barbel absent; scales in the lateral line 41-53; dorsal rays 8; anal rays 7; pharyngeal teeth 0, 4-4, 0; intestine uniquely looped around gas bladder. Color of females, immatures, and non-breeding males olive dorsally, shading to pale yellow on the belly; body mottled or with dusky blotches. Breeding males profusely tuberculate; lips white; eyes orange; the dorsal and anal fins bright orange, the dorsal with a broad black stripe through the fin. Adult size up to 6 inches.

Distribution: The stoneroller occurs from the Rocky Mountains east to the Atlantic coast, south to north-eastern Mexico. In Wyoming, it is found in the Niobrara River and in tributaries of the North and South Platte rivers.

Natural history: This minnow prefers smaller, clear streams with gravel or rubble substrate. Breeding behavior of the stoneroller has been described by Miller (1962), who studied it in New York state. He found this minnow spawning in small, gravel-bottomed streams at water temperatures of 58 to 75 degrees F, usually from April to early June. Males dig small pits in shallow water, either in slow water or in riffles. Using their tubercles and cartilaginous lips, males burrow into the gravel and sometimes remove larger stones from their nests. Fertilized eggs are covered by gravels during subsequent nest building. The stoneroller is primarily herbivorous, using its rather unique mouth to scrape algae and probably some aquatic insect larvae from the substrate.

Relation to man: The stoneroller has declined in numbers through much its range. In Wyoming, it is found in most North Platte River tributaries downstream from Glendo Reservoir (Platte, Goshen, and Laramie counties). Upstream from Glendo, it is found in low numbers in Boxelder, Muddy, and Poison Spider creeks. In 1954, when an isolated section of Lodgepole Creek in Laramie County was treated with piscicide, this species was observed to be extremely susceptible to

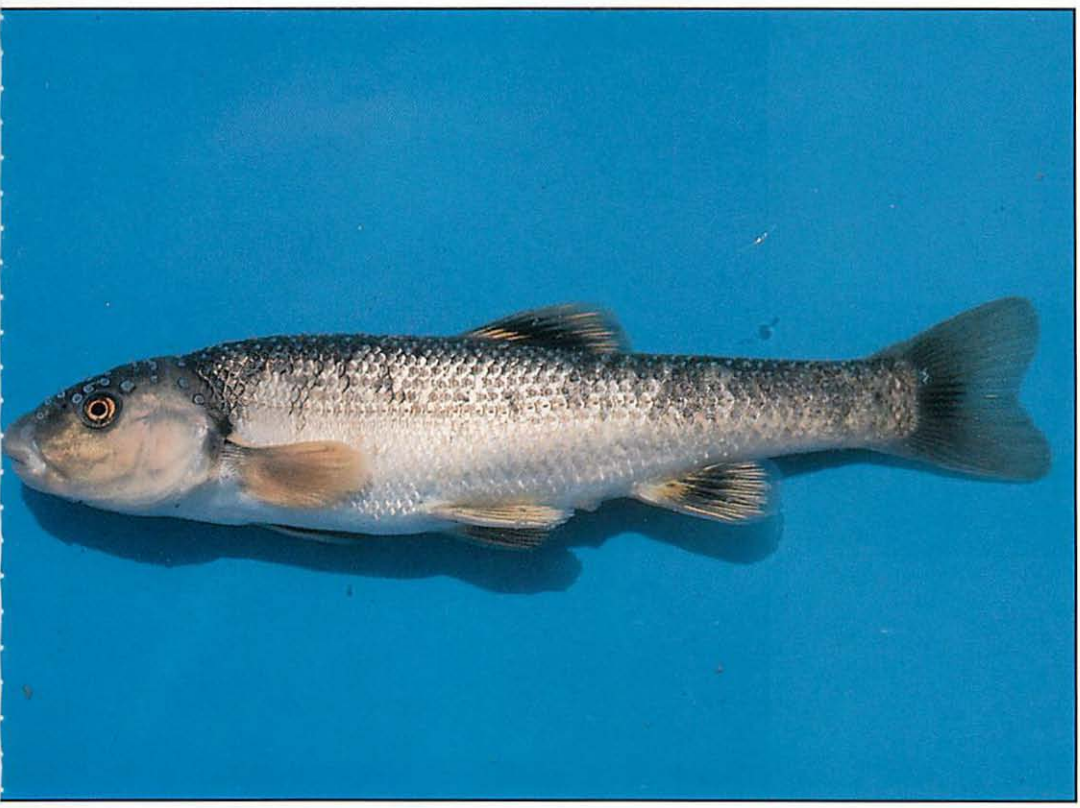
rotenone (Baxter 1955). It did not reappear in that stream section for many years. The stoneroller was relatively abundant in all samples collected from Lodgepole Creek in 1993.

Nomenclature: Two subspecies of the stoneroller have been recognized; *Campostoma anomalum plumbeum*, a western, reportedly smaller-scaled variety, was studied and rejected as a subspecies by Metcalf (1966).

Literature references: *Campostoma anomalum*. Evermann and Cox 1896: 395 (Deer Creek, Glenrock); *Campostoma anomalum plumbeum*. Simon 1951: (North Platte River and tributaries; Muddy Creek, South Platte drainage; Niobrara River).

Distinguished from:

Similar species by the inferior mouth with cartilaginous biting edge, the shape of the body and the dusky mottling. Positive identification is made by dissection. The looping of the intestine around the gas bladder is diagnostic.

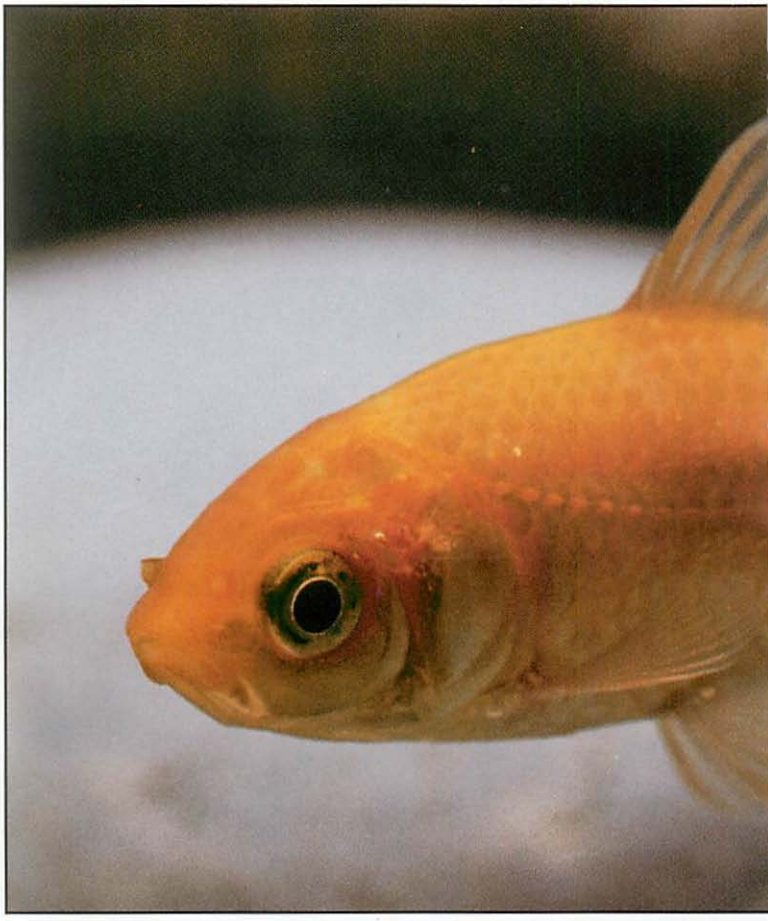


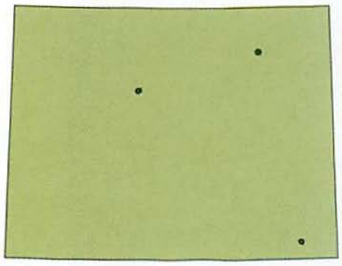
Goldfish
Carassius auratus

(*Carassius*-- Latinization of the Asiatic vernacular name, karass; *auratus*-- gilded)

Description: Body deep and laterally compressed; head moderate, eyes quite large; mouth moderate, lacking barbels; dorsal fin with a serrate spine and 18 to 20 soft rays; anal fin with a serrate spine and 5 to 7 soft rays; scales large, 20 to 30 in the lateral series; pharyngeal teeth, 0, 4-4, 0. Color varied; the brilliant orange or "gold" variety is commonly seen in the wild, but some populations may, in the wild state, revert to a uniform green or bronzy color. Adult size up to 12 inches or more in length.

Distribution: Widespread in North America where it has been released by aquarists, has escaped from decorative fish ponds, or has been distributed via the bait bucket. Goldfish up to 12 inches long have been collected from Sloans Lake in Cheyenne, and chemical treatment of Gillette Fishing Lake has turned up a goldfish 15.8 inches long and 1.5 pounds in weight. Simon





(1951) reported it from that lake and from Lake DeSmet. It no doubt occurs in other lakes and ponds in the state.

Natural history: The goldfish is an Old World minnow which has been introduced. Low water temperatures in Wyoming probably restrict the survival and natural reproduction of this species. In warmer climates, the goldfish reproduces naturally and may become abundant in some lakes. It hybridizes with the common carp, and carp x goldfish hybrids are common in some states. Its habits in the wild are generally similar to those of the common carp. The Koi (Japanese for "carp") is not a carp x goldfish hybrid but a variety of the common carp produced by selective breeding.

Distinguished from:

the carp by the absence of barbels.

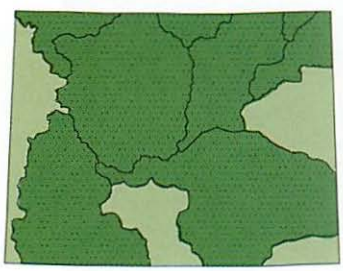
Literature references: *Carassius auratus*. Simon 1951: 68 (introduced).

Lake chub *Couesius plumbeus*

(*Couesius*-- after Elliot Coues; *plumbeus*-- lead-colored)

Description: Body elongate and rounded; fins rounded; head short; eyes large; mouth terminal, quite large; round barbel slightly above the angle of the jaw; scales in the lateral line 58-68; dorsal rays 8; anal rays usually 8; pharyngeal teeth 2, 4-4, 2. Color dusky above with a lighter belly; darker lateral stripe sometimes present but not conspicuous; no black spot or wedge at the base of the caudal fin. Breeding males with a splash of red or orange at the base of the pectoral fins and behind the opercule. Heavily pigmented scales scattered over the body often give a mottled appearance. Both sexes may develop breeding tubercles during the breeding season. Adult size up to 6 inches in some lake populations, usually not more than 4 inches.

Distribution: The lake chub is found throughout central and eastern Canada and in the northern United States from the northern plains east to the Atlantic Coast. It is common in Montana and in northern Wyoming east of the Continental Divide. There is an old record for the lake chub in northern Colorado (Ellis 1914; Woodling 1985), but it has not been collected there in recent years and is considered an extirpated species there (Woodling 1985). In Wyoming, the lake chub was formerly found in Pickett Lake and the Sweetwater River (Simon 1951) but was not found there in the latest survey. It has been introduced, probably via the bait bucket, into Yellowstone Lake, and in Big and Little Sandy creeks in the Green River drainage and in the Green River proper.



Natural history: In Wyoming, this minnow is usually found in smaller streams, but it sometimes becomes abundant in lakes. A dense population was once eradicated from the Lake of the Woods, and it is the common minnow in Upper Sunshine Reservoir in Park County.

The lake chub spawns in the spring in both creeks and lakes; it does not build a nest or guard its eggs (McPhail and Lindsey 1970).

Food of the lake chub was reported by Rawson and Elsey (1948) to be microcrustaceans for young fish and aquatic and terrestrial insects for adults. Simon (1951) reported that the lake chub is carnivorous, feeding almost entirely on insect larvae. Stomach contents of the 10 fish examined by Simpson (1941) contained 98% animal remains and the remaining 2% was debris.

Relation to man: The lake chub is one of the minnows commonly used for bait in the Riverton area. It is an important forage and bait fish in some parts of Canada (Scott and Crossman 1973).

Nomenclature: The lake chub was placed in the genus *Hybopsis* (Bailey 1956) but later restored to the monotypic genus *Couesius* (Bailey et al. 1970) on the basis of the position of the round barbel above but slightly in front of the angle of the jaw. Simon (1951) used the subspecific name *dissimilis* for the lake chub; the status of subspecies of *Couesus plumbeus* remains to be studied more carefully, but *dissimilis* is not an available name (Scott and Crossman 1973).

Literature references: *Couesius dissimilis*. Evermann and Cox 1896:410 (Big Goose Creek, Sheridan; south fork of the Tongue River, Sheridan). *Couesius plumbeus dissimilis*. Simon 1951:71 (Wind River, Sweetwater River, Shoshone River, Lake DeSmet, Tongue River and Bighorn River).

Distinguished from:

the creek chub by its rounded barbel and absence of a black spot at the base of the front of the dorsal fin;

from the pearl dace by the rounded barbel (or absence of barbel in the dace); from Rhinichthys *by the character of the radii in the scales.*

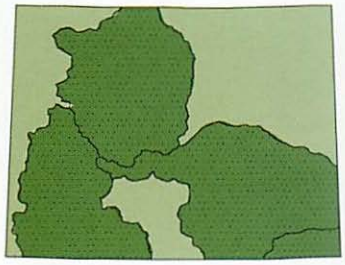
Grass carp *Ctenopharygodon idella*

(*Ctenopharygodon*-- comb-like pharyngeal teeth; *idella*-- distinct)

Description: Body elongate, in contrast with the deep body of the common carp and the goldfish; anal fin situated far back on the body; mouth large, terminal; scales in the lateral line 40-45; pharyngeal teeth 2,4-4,2. Dorsal fin rays 7 or 8; color olive-brown, silvery on the sides and belly. Scales on the sides are pigmented at the margins, producing a cross-hatched color pattern. Adult weight up to 100 pounds in Asia; in the Mississippi River to as much as 21 pounds (Pflieger 1975).

Distribution: Introduced from Asia. Found today in large rivers and some other habitats in the West and Southeast. In Wyoming, sterile grass carp have been introduced experimentally to a few lakes and ponds. No naturally reproducing grass carp populations exist in Wyoming.

Natural history: The native habitat of the grass carp is large Asiatic rivers where, in spawning, fertilized eggs are released into the water column. The eggs hatch as they drift downstream. Young fish are herbivorous,



feeding on rooted aquatic vegetation, and when present in large numbers, may eliminate dense beds of water plants.

Relation to man: Dense beds of aquatic vegetation are sometimes detrimental to a fishery. Fisheries managers introduced the grass carp to North America in the early 1960s to control undesirable aquatic plants. Since that time, this species has been alternately praised as a good agent for biological control and condemned as an exotic fish which, like the common carp, may be a liability to the ecosystem by competing with game fish species. In Wyoming, sterile grass carp have been introduced to a few habitats where dense beds of vegetation have been detrimental to the fishery and where there is little chance of its spreading into habitats where it would be undesirable. Results of these experiments remain to be determined. Grass carp typically grow more slowly and are less efficient at controlling vegetation in the cool waters of the Rocky Mountain Region.

Distinguished from:

native minnows by the posterior location of the anal fin;

the carp and goldfish by the elongate body and the absence of a serrate spine in dorsal and anal fins.

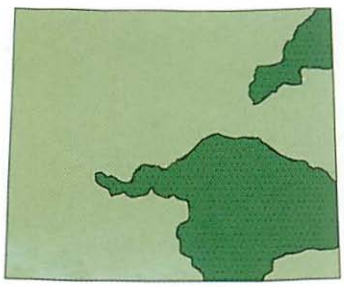
Red shiner *Cyprinella lutrensis*

(*Cyprinella*-- a special suffix to *Cyprinus*; *lutrensis*-- from the otter; this species was named from specimens collected from Otter Creek, Oklahoma)

Description: Body short, compressed laterally, greatest depth in adults about 3.5 times the standard length; fins rounded; head short; eye large; mouth oblique, lacking a barbel; lateral line scales 34-37; dorsal rays 8; anal rays 9 or 10; pharyngeal teeth usually 0,4-4,0. Color olive or tan dorsally, silvery laterally and white below. Breeding males become tuberculate and one of the most colorful of our native fish. The caudal and paired fins and the top of the head become rosy red, the side of the body bright pale blue with a purple crescent behind the head. Size of adults usually 3 inches or less.

Distribution: The red shiner ranges from Wyoming east to Minnesota, Illinois and southward into Mexico. In Wyoming, it is found in the North Platte River and its tributaries in Natrona, Converse, Goshen and Platte counties. It sometimes thrives in reservoirs such as Grayrocks and Packers Lake in Goshen County. It has been introduced into Keyhole Reservoir in Crook County.

Natural history: This minnow prefers medium- sized streams with moderate current. It tolerates turbidity, silting and intermittancy and may be increasing in abundance in the Plains States in response to the same



ecological changes that are causing the common shiner to decrease (Metcalf 1966). In Kansas, Cross (1967) reported that this minnow breeds from May to October at water temperatures of 60 to 80 degrees F, spawning in both lakes and streams. He observed spawning activities adjacent to submerged roots, aquatic plants and debris, the eggs adhering to submerged objects after their emission and fertilization. Simon (1951) reported that the red shiner feeds upon small bits of aquatic vegetation as well as aquatic invertebrates. Sounds produced by ripe females of the red shiner and another shiner, *Notropis venustus*, were recorded by Delco (1960). Male fish responded to these sounds. He did not identify the sound-producing mechanism.

Distinguished from:

associated minnows by the depth of the body of adults relative to the body length (this species is distinctly "slab-sided").

Nomenclature: This minnow has been classified in a subgenus *Cyprinella* which was recently elevated to full generic status (Mayden 1989).

Literature references: *Notropis lutrensis*. Evermann and Cox 1896:404-405 (North Platte River, Douglas). *Notropis lutrensis lutrensis*. Simon 1951:84 (lower North Platte River near Lingle and Torrington: Horse Creek, Laramie River, Lake Guernsey).

Common carp *Cyprinus carpio*

(Cyprinus-- Latin for "carp;" carpio-- low Latin for "carp")

Description: Body deep and laterally compressed; head conical; eye small; mouth small and inferior with four long barbels; dorsal fin elongate, preceded by a heavy serrate spine; soft dorsal rays about 20; anal rays 5 or 6, first ray a serrate spine; scales large, 35-38 in the lateral line; scales lacking or sparse in some populations; pharyngeal teeth in three rows, usually 1,1,3-3,1,1. Color olive green above, shading to bronze and/or yellow on the sides and belly; ventral and caudal fins often with red borders. Adult weight to 74 pounds in the United States, seldom over 10 pounds in Wyoming; a 30-pound carp was taken from Lake DeSmet in Johnson County in 1947 by Wyoming Game and Fish Department personnel.

Distribution: Carp are common at lower elevations in most of the river systems in Wyoming. Exceptions are the Snake River and some other headwater streams where low water temperatures apparently prevent carp from establishing sustaining populations. In the Big Laramie River, the carp is not found above an elevation of about 7,000 feet; the limiting factor is presumably prevailing water temperatures. That elevation probably represents near the upper limits of the range of the carp in other river drainages in the state.

Natural history: The common carp is native to Asia and as far west as the headwaters of the Danube River in eastern Europe. Because of its popularity as a food fish and suitability for pond culture, the carp became widespread in Europe at a very early time. It was introduced into North America as early as 1832 and widely distributed as a food fish as early as 1877 (Sigler 1958). Carp from the United States carp ponds in Washington, D.C., were introduced into Wyoming in 1881 (United States Fish Commission 1881). The carp has since spread into most of the warmer waters of the United States and Canada.

The carp inhabits lakes and lagoons, migrating usually into shallow waters to spawn. It also occurs in rivers, preferring pools and quiet backwater.

The female carp may lay over 2,000,000 eggs; these are scattered in shallow waters where they adhere to vegetation. Spawning carp are conspicuous at the margins of lakes and rivers in early summer when water temperatures rise to over 60 degrees F.

Food of carp includes plant materials and invertebrates, ingested while "rooting" in the bottom mud.

This feeding behavior roils the water, inhibiting rooted aquatic plant life and generally causing a deterioration of habitat for other fish species and waterfowl.

Relation to man: Some benefits are derived from carp populations. Young carp are used as food by game fish. In the winter of 1965, the stomachs of rainbow trout from Seminoe Reservoir contained large numbers of young-of-the-year carp, and young carp are an important item in the diet of the burbot in habitats where the two species are found together. Archers derive some sport from hunting the carp, and anglers can catch it on hook and line. Carp are used to some extent for food in America. When taken from clean, cooler waters and prepared with consideration, its flesh is very satisfactory. Quoting from *Fresh Water Fishes* [of Europe] (Hol'cik and Mihalik 1968), they say of the carp, "It surpasses all other fishes in breeding ability, resistance to disease, and the high quality of its flesh" (and they include several trouts, a perch and a pikeperch [walleye] in their book).

In regions of North America where water temperatures are high enough, carp are very prolific and have a potential for high productivity of animal proteins. This potential is being partially realized in some areas where carp are being harvested commercially for human food. In Wyoming, low average water temperatures statewide probably preclude such use.

Literature references: *Cyprinus carpio.* Simon 1951:67-68 (introduced into Wyoming); Personius and Eddy 1955:42 (headwaters, Missouri River).

Distinguished from:

the goldfish by the presence of barbels on its lips;

other minnows and suckers by the presence of a serrate spine on its dorsal and anal fins.

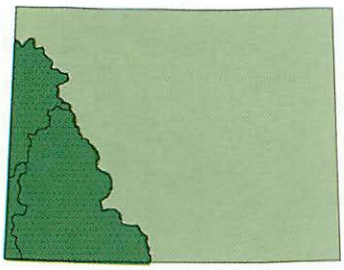
Utah chub
Gila atraria

(*Gila*-- from the Gila River; *atraria*-- black)

Description: Body stout; head short; eye moderate; mouth relatively small, oblique and terminal, lacking a barbel; scales in the lateral line 50-59; dorsal rays usually 9; anal rays 8; pharyngeal teeth 2,5-4,2. Color usually rich brown, sometimes olivaceous or black, with a brassy or yellow cast laterally, the belly yellow, becoming intense orange in spawning males. No nuptial tubercles. Adult body length up to 22 inches but usually 8-10 inches.

Distribution: The Utah chub is native to the Bonneville Basin and the Snake River drainage above Shoshone Falls. It is abundant in Jackson, Two Ocean and Emma Matilda lakes and in the oxbow ponds in the floodplain of the Snake River below Jackson Lake dam in Teton County. It has been introduced into the Colorado River drainage in Utah and Wyoming and into the Missouri River drainage in Montana. In Wyoming, the Utah chub has become established in the Green River and in Flaming Gorge Reservoir. In recent years, this minnow has been collected from Brooks Lake in the Wind River drainage.

Natural history: The Utah chub lives in lakes, sloughs and rivers, usually in warmer waters with considerable amounts of aquatic vegetation. The Utah chub spawns in late summer in shoals and sloughs, apparently scattering its eggs over vegetation or over the bottom when vegetation is absent. In Flaming Gorge Reservoir, spawning activity of this species reached a peak between July 1 and July 12 in 1967, when surface temperatures were about 70 degrees F (Eiserman et al. 1967). Most chubs of both sexes were found to have attained sexual maturity in 3 years. Older fish are more prolific. Age 3 females averaged about 5,000 eggs per female; age 4 fish, 16,000 eggs and age 5 fish, 84,000 eggs.



This large minnow feeds upon both animals and plants. Algae make up an important part of the stomach contents, but aquatic insects are also eaten. Fish have been reported in the diet of the Utah chub, but it is apparently not highly piscivorous. John (1959) stated that the Utah chub becomes more herbivorous as it gets older. In Flaming Gorge (Eiserman et al. 1967), cladocerans and copepods were found to be the predominant foods. Simpson (1941) reported that none of the stomachs of 60 Utah chubs, examined while he was studying the egg-eating habits of the Utah sucker, contained a single trout egg, even though the fish were

taken from over redds on which lake trout were spawning. He found the contents of the stomachs of 8 Utah chubs collected from the Bear River to be: 81.52% (by volume) organic debris, mud and sand; 10.25% algae and 8.25% insect remains.

Relation to man: The Utah chub is used as a bait fish in Jackson Hole and Star Valley, but the associated redside shiner is preferred. The Utah chub is an important forage fish in some Wyoming lakes. Eiserman et al. (1967) reported the common occurrence of 1-year-old Utah chubs in stomachs of rainbow trout from Flaming Gorge Reservoir. In weedy, larger lakes, this prolific species often becomes a nuisance, competing with trout for space, food and (under the ice in winter) oxygen. It has been eliminated by chemical treatment in some instances, only to rebound quickly in the absence of competitor species.

Literature references: *Leuciscus atrarius*. Jordan 1891b:48 (Witch Creek, Yellowstone National Park); Evermann 1892:48 (Jackson Lake; small tributary to Jackson Lake; Snake River, Presidents Camp). *Gila atraria*. Simon 1939:32 (Heart Lake, Witch Creek, Yellowstone National Park); 1951:78-79 (Snake and Bear River drainages; Heart Lake, Yellowstone National Park).

Distinguished from:

associated species by the rich brown and orange of breeding adults, its large size and the absence of a barbel;

from the lake chub and creek chub (as in the Green River drainage where these species have been introduced) by the Utah chub's lack of a barbel.

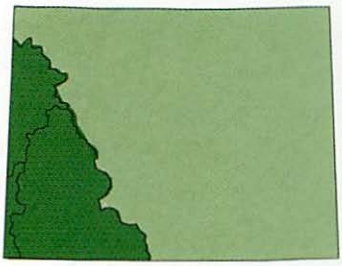
Leatherside chub *Gila copei*

(*Gila*-- from the Gila River; *copei*-- after E.D. Cope)

Description: Body rather robust; skin texture leathery; fins rounded; head short and rounded; eye large; caudal peduncle quite deep; mouth small, oblique, lacking a barbel; scales in the lateral line 68-84, usually about 80; dorsal fin rays 8; anal rays 9; pharyngeal teeth 2,4-4,2 or 1,4-4,1. Color steel-gray above, white below; breeding males with splashes of orange at the base of the pectoral fins. Adult size up to 6 inches, usually 4 inches or less.

Distribution: The leatherside chub occurs in the Bonneville Basin and in the upper Snake River. Sigler and Miller (1963) pointed out that it was never collected from the upper Snake River in Wyoming until 1934 and may have been introduced there. In Wyoming, it is quite common in Sulphur Creek and in the Bear River in Uinta County. It was reported from Pacific Creek in Teton County by Simon (1951) and was collected from the Buffalo Fork near its mouth in the 1950s (Baxter and Simon 1970). It has recently been collected from the North Fork of Slate Creek in the Green River drainage in Lincoln County.

Natural history: This minnow inhabits clear, cool streams and apparently seeks out pools rather than riffles. The life history of the leatherside chub has not been studied in detail. Males from Sulphur Creek in Uinta County were brightly colored when collected in August. A collection from Sulphur Creek contained



hybrids of redside shiners x leatherside chubs, so it probably spawns at the same time and in the same manner as that species. Simon (1951) noted that females taken on August 8, 1942, were distended with eggs. The leatherside chub will readily hybridize with redside shiners and speckled dace. When these species are associated with each other, hybrids will be found in the mixed population.

Distinguished from:

associated species by its smaller scales (giving it a leather look) and by the absence of a barbel.

Relation to man: The leatherside chub is a good bait minnow but too rare in Wyoming to be of importance in this respect. Care should be exercised to preserve this rare and beautiful native minnow in the Bear River drainage in Uinta County.

Nomenclature: The leatherside chub was named *Squalius copei* by Jordan and Gilbert (1881) and was later called *Gila copei*. A new, monotypic genus, *Snyderichthys*, was created to accommodate this species by Miller (1945). Uyeno (1960) studied the genus *Gila* and related genera and, on the basis of that study, relegated *Snyderichthys* to synonymy with *Gila*.

Literature references: *Squalius copei*. Jordan and Gilbert 1881:461 (description, new species, Evanston, Wyoming). *Snyderichthys copei*. Simon 1951:80 (upper Snake River, Pacific Creek).

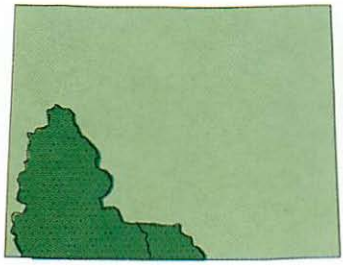
Roundtail chub *Gila robusta*

(*Gila*-- from the Gila River; *robusta* -- robust)

Description: Body very streamlined with a flat head and narrow peduncle, although lake-dwelling populations are sometimes more robust; caudal fin deeply forked; eye small; fins large; scales in the lateral series 73-91; dorsal rays 9 or 10; anal rays 9 or 10; pharyngeal teeth 2,5-4,2. Color dark olive or dusky above, grading rather abruptly to a white belly. Males splashed with bright red when in breeding colors. Size of adults up to 20 inches, usually 8-10 inches.

Distribution: The roundtail chub is restricted to the Colorado River drainage. In Wyoming, it is common in the Green River and the Little Snake River drainages, mostly in larger rivers, but occasionally in small streams such as Muddy Creek in Carbon County. It is sometimes abundant in lakes, for example, Burnt Lake near Pinedale.

Natural history: This species is adapted to living in large rivers where its streamlined form, relatively narrow caudal peduncle and strongly forked tail make it a strong swimmer. Spawning occurs in late spring. Eggs are adhesive and broadcast near shore. Citing



Jonez and Sumner (1954), Sigler and Miller (1963) reported that in Lake Mohave, Nevada, this species spawned on a gravelly shelf in water up to 30 feet deep. Several males attended a single female; the eggs were broadcast and adhered to rocks. The roundtail chub feeds on insects and some algae. With its relatively large size, large mouth and strong locomotion, this species probably preys on smaller fish.

Nomenclature: The bonytail, *Gila elegans*, was at one time considered a subspecies of *Gila robusta* (Miller 1946; La Rivers 1962). Holden (1968) gave *elegans* specific rank, and it was included in the fish fauna of Wyoming by Baxter and Simon (1970). *Gila elegans* has not been identified from Wyoming since construction of Flaming Gorge Reservoir.

Literature references: *Gila grahamii*. Cope 1872:441 (Fort Bridger; Henry's Fork). *Gila gracilis*. Cope 1872:441 (Fort Bridger; Henry's Fork; forks of Green River, Fort Bridger, Wyoming Territory). *Gila robusta robusta*. Simon 1951:79 (Green River drainage).

Distinguished from:

associated species by the streamlined body and the very narrow caudal peduncle;

from young Colorado squawfish by the absence of a dark blotch at the base of the tail (Woodling 1985).

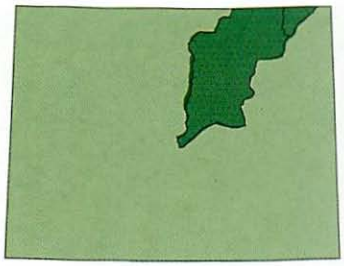
Western silvery minnow *Hybognathus argyritis*

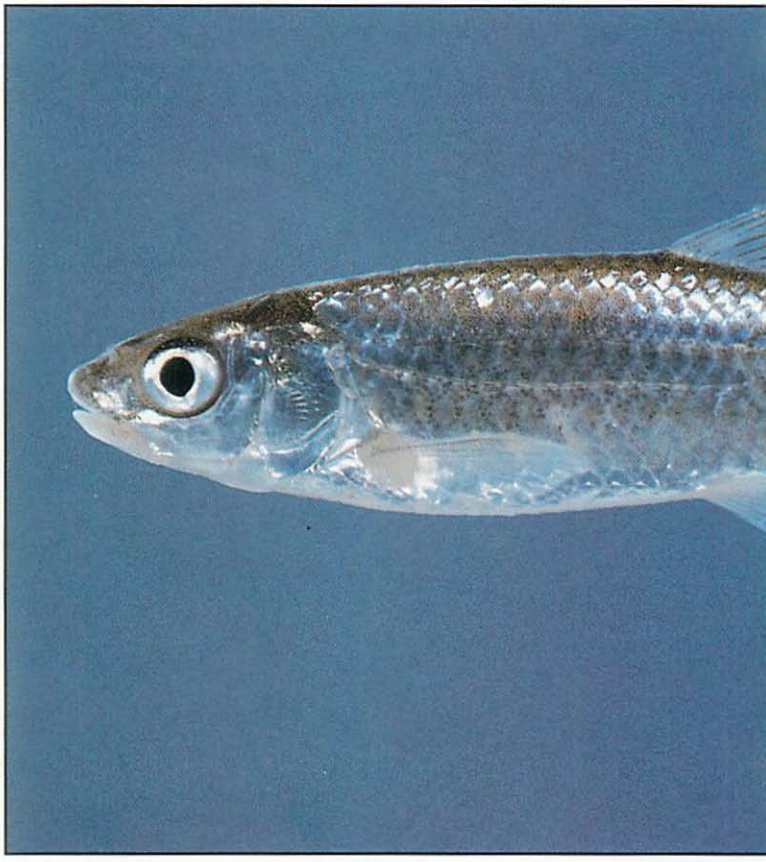
(*Hybognathus*-- gibbous jaw; *argyritis*-- silvery)

Description: Body stout, deeper than that of the plains minnow; fins more falcate than the plains minnow; caudal forked; head short; eye relatively large, its diameter contained less than five times in the head length; scales in the lateral line 34-40, with fewer than 15 radii and these strongly developed; dorsal rays 8; anal rays 8; pharyngeal teeth 0,4-4,0. Color very silvery, white below. Mid-dorsal and lateral stripes are evident in preserved specimens. Size of adults up to 6 inches.

Distribution: The western silvery minnow is found only in the upper Missouri River drainage. In Wyoming, this species is found in the Powder and Little Missouri River drainages, but it is much less common than the plains minnow. Before construction of Big Horn Reservoir, it was found in the Big Horn River near Kane but may have been extirpated there.

Natural history: The western silvery minnow prefers larger rivers. In much of its range, it is associated with the plains minnow. In Wyoming, the western silvery





minnow has been found mostly in larger rivers. Cross (1967) and Scott and Crossman (1973) indicated a preference by this fish for sluggish flow and silted bottoms. The breeding habits and food of the western silvery minnow have not been studied.

Relation to man: In its range, the silvery minnow has some importance as a bait and a forage species, but it is rare in Wyoming.

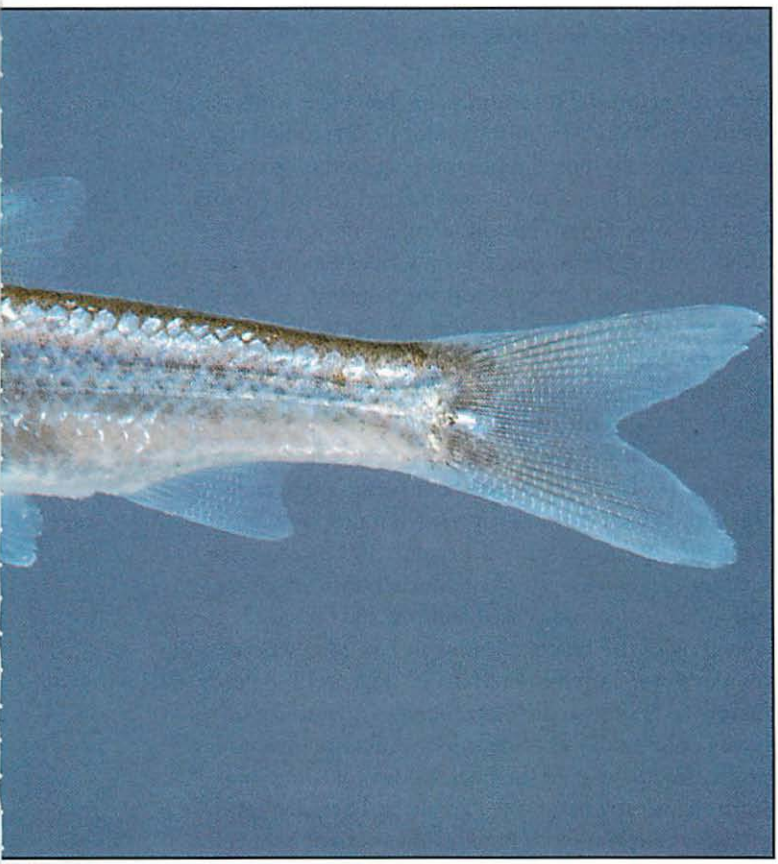
Nomenclature: This species was included in *Hybognathus nuchalis* (sometimes as a subspecies, *nuchalis nuchalis*, found in the western part of its range). Pflieger (1971) re-established the name *H. argyritis*, first given by Girard (1856), to the population found in the upper Missouri drainage.

Literature references: *Hybognathus nuchalis nuchalis*. Simon 1951:88 (Belle Fourche River; Little Missouri River).

Distinguished from:

the plains minnow (with difficulty) by its larger eyes and deeper body (dissection to reveal basioccipital bone may be necessary);

associated minnows by its small mouth; long, coiled gut and absence of barbel (these characters serve to distinguish all the members of the genus Hybognathus).



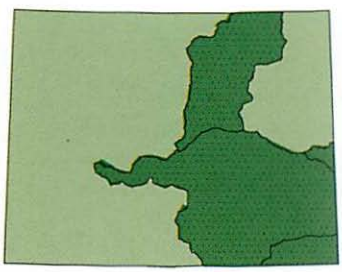
(The fish in this photograph is an eastern silvery minnow, not a western silvery minnow. The superficial characteristics of the two species are identical.)

Brassy minnow *Hybognathus hankinsoni*

(*Hybognathus*-- gibbous jaw; *hankinsoni*-- after T.L. Hankinson)

Description: Body stout, slightly compressed; fins rounded; head short, moderately flattened; eye moderate; mouth very small and terminal, somewhat oblique and lacking a barbel; scales large, 32-39 in the lateral line; dorsal rays 8; anal rays 8; pharyngeal teeth 0,4-4,0; intestine long and coiled, peritoneum pigmented. Color dark green above with a distinct dorsal stripe; sides dusky, silvery or yellowish, becoming brassy in breeding males; belly white. Adult size up to 3.5 inches.

Distribution: The brassy minnow ranges from eastern Wyoming and Montana across the northern states to Ontario and New York, south to Kansas and Missouri. It is rare in the northern counties of Wyoming, indicating intolerance to turbid waters. Bailey and Allum (1962) reported it from eastern South Dakota but classified it as rare in the western streams where they found it only in the Little Missouri River. In southeastern Wyoming, this minnow is common, living in association with the white sucker, creek chub, fathead minnow and Iowa darter in tributaries of the North and South Platte rivers and with the finescale dace and pearl dace in the Niobrara River drainage.



Natural history: This minnow prefers clear waters and weedy ponds and streams. Copes (1970) studied the behavior, food, reproduction and age and growth of a population of brassy minnows in Sand Creek, Albany County, Wyoming. The following account is taken almost entirely from that report. Copes reported that, of the many brassy minnows collected during his study, over 95% were captured in slow runs or pools with mud bottoms. He noted that schooling is a characteristic behavior of this species, the exception being males during the spawning season. Schools of 15 to 50 fish were found in the early morning; these schools merged later in the day and moved about feeding. He noted that the approach of darkness or a sudden drop in water temperature caused schools of up to 500 fish to cease feeding and break up into smaller schools which moved into quiet water and ceased feeding. He observed spawning of the brassy minnow in late May when water temperatures varied from 16 to 27 degrees C. Approximately 85% of sexually mature males acquired the brassy color and "very fine nuptial tubercles were found on the middle rays of the pectoral fins of some males." In the spawning act, from 1 to about 15 males approached a (presumed) female and swam above, below

or beside her. The female swam quickly in either a spiral or straight path, pursued by the males. She would then continue toward a bed of vegetation where spawning took place, males vibrating rapidly from 1 to 3 seconds while pressing against the female. Slightly adhesive eggs were collected from vegetation and mud bottom. The spiraling flight of females from pursuing males produces flashing seen in large schools of brassy minnows during the breeding season. The brassy minnow is almost strictly herbivorous. Stomachs of 100 specimens examined by Copes (1970) contained 94% by volume of algae. Organic debris made up 5% by volume, and animal matter less than 0.5% of stomachs examined. From his age-growth analysis of the Sand Creek population, Copes concluded that few brassy minnows live longer than through 5 summers in that habitat.

Relation to man: The brassy minnow is potentially a bait species; it is quite hardy and of a size suitable for bait.

Literature references: *Hybognathus hankinsoni*. Simon 1951:87 (North Platte River and tributaries; Powder River; Belle Fourche River).

Distinguished from:

minnows in the shiner genera Cyprinella, Luxilus *and* Notropis *by its smaller mouth and the long, coiled intestine with pigmented peritoneum;*

the fathead minnow by its larger scales;

the plains and silvery minnows by the radii on its scales (about 20 weak radii).

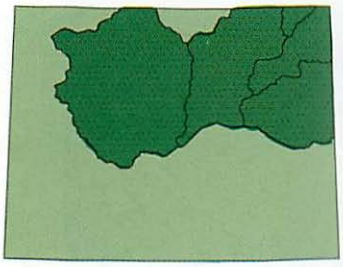
Plains minnow *Hybognathus placitus*

(*Hybognathus*-- gibbous jaw; *placitus*-- gentle)

Description: Body moderately stout; pectoral fins rounded; dorsal fin acute; head short; eye small; mouth small, somewhat inferior, without a barbel. Scales 33-41 in the lateral line; scales with 8-14 apical radii; dorsal rays 8; anal rays 8; intestine long; peritoneum black; pharyngeal teeth 0,4-4,0. Color brown or straw-colored dorsally, very silvery laterally, belly white. Mid-dorsal stripe well developed, lateral dark stripe evident in preserved specimens but not prominent in silvery individuals. Tubercles are present on breeding males. Size of adults up to 6 inches, usually 4-5 inches in Wyoming habitats.

Distribution: The range of the plains minnow is the Plains States chiefly west of the Missouri River from Montana and North Dakota south to central Texas. In Wyoming, this species is found in the Cheyenne, Belle Fourche, Little Missouri, Powder and Big Horn drainages. It was formerly found in the North Platte River from Casper downstream, but it is now likely extirpated from that drainage.

Natural history: The preferred habitat is slower water and side pools of turbid streams. It becomes less common in clear streams; it has been collected with the brassy minnow in Clear Creek, Sheridan County and



with the western silvery minnow in the Big Horn, Powder and Little Missouri rivers. Spawning habits of the plains minnow have not been studied in detail. Gravid females are found throughout the summer, indicating an extended breeding season. Like other members of this genus, the plains minnow is mostly herbivorous, feeding on algae and other vegetable matter from the bottom ooze in quiet waters.

Relation to man: The plains minnow is used as a bait minnow in Kansas (Cross 1967), but he noted "its lack of hardiness outside its stream environment". Its size and habits of congregating in backwaters, where it is easily seined, promote the importance of the plains minnow as a bait species.

Literature references: *Hybognathus evansi.* Girard 1858:236 (Sweet Water, Platte River). *Hybognathus nubilum.* Evermann and Cox 1896:397 (Platte River, Casper; Powder River, Arvada). *Hybognathus placitus placitus.* Simon 1951:88 (North Platte River below Guernsey; Powder River and tributaries). *Hybognathus placita.* Peronius and Eddy 1955:42 (headwaters, Little Missouri River). *Hybognathus placitus.* Al-Rawi and Cross 1964:165 (Powder River at Arvada; Belle Fourche River at Moorcroft).

Distinguished from:

the silvery minnow (with considerable difficulty) by its smaller eyes, more slender body and head (dissection to examine the basioccipital bone and associated muscles is necessary for definitive identification);

the brassy minnow by the smaller number of radii on the plains minnow's scales;

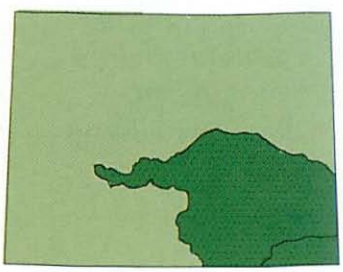
the flathead chub by the absence of a barbel, the rounded rather than falcate pectoral fin and the absence of compound taste buds in its fins.

Common shiner *Luxilus cornutus*

(*Luxilus*-- shiny, lighted; *cornutus*-- horned)

Description: Body deep and compressed laterally; head large, blunt; eyes large; mouth terminal, oblique, without a barbel; scales large, 39-42 in the lateral line, the exposed portions of the scale deep relative to their length; dorsal rays 8 or 9; anal rays 8 or 9; pharyngeal teeth 2,4-4,2. Color dusky above and silvery below with a broad dark, dorsal stripe, and dorso-lateral stripes of iridescent gold that are conspicuous in swimming schools of adult fish. Breeding males become strikingly colored and densely tuberculate, the branchiostegals, operculum, sides and fins rosy red, the sides with purplish iridescence. Adult size up to 6 inches or more.

Distribution: The common shiner is widely distributed in the northern states from the Rocky Mountains to the Atlantic Coast but absent from the turbid waters of the upper Missouri River. In Wyoming, it occurs in clear, gravel-bottomed streams tributary to the North and South Platte rivers. It has become rare in some of the streams in Platte and Goshen counties where it was quite common earlier (see discussion page 270). Its reported occurrence in the Belle Fourche River (Simon 1951) is questionable.



Natural history: The common shiner prefers clean, gravel-bottomed streams but sometimes is found in small lakes. It tolerates cooler waters and is relatively common in the Laramie Basin in Albany County while its populations have declined in numbers at lower elevations in southeastern Wyoming. This minnow is a gravel-nester, spawning in early summer when water temperatures rise to about 65 degrees F. For a relatively short period of time, differing with elevation and seasonal temperatures, the males become very brightly colored and females are distended with eggs. A nest, consisting of a shallow depression in the gravel, is excavated, or the common shiner may use the nest of associated creek chubs or hornyhead chubs (Raney 1940). In the breeding act, the female approaches the nest from downstream, turns sideways to the current and is clasped briefly, while emission of the eggs and fertilization is accomplished. The male curls his body over the female very briefly during clasping. The diet of the common shiner includes aquatic insects and some vegetable matter. Forbes and Richardson (1920) reported that about one-third of the food of 21 specimens in Illinois was vegetable matter and that one specimen had eaten only fish.

Relation to man: The common shiner is a popular bait fish in the Middle West, although the ease with which scales are removed in handling detracts from their appearance. This minnow will take an artificial fly readily. It is sometimes used for food.

Nomenclature: The generic name *Luxilus* was first used for this shiner by Rafinesque (1820). Minnows of the genus *Notropis* have been subdivided into subgenera, the common shiner classified in the subgenus *Luxilus*. Recently, the several subgenera have been elevated to generic status (Mayden 1989). Simon (1951) used the subspecies *frontalis* for Wyoming populations; that subspecies is no longer recognized.

Literature references: *Plargyrus bowmani* Girard 1856:190 (Sweet Water, a tributary of Platte or Nebraska River); Girard 1858:263-264 (Sweet Water fork of Platte [Nebraska] River). *Notropis cornutus*. Evermann and Cox 1896:405-406 (Deer Creek, Glenrock). *Notropis cornutus frontalis*. Simon 1951:83-84 (North Laramie River; North Platte and South Platte river drainages and the Belle Fourche River).

Distinguished from:

associated species by its relatively large size and its deep, diamond-shaped scales which are easily shed (among immature specimens of sand and bigmouth shiners, the common shiner's eye is distinctly larger);

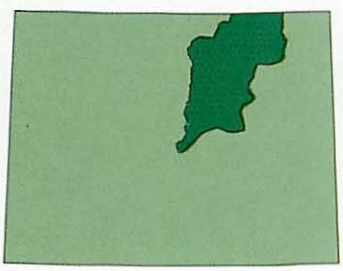
hybrids with the creek chub show characters intermediate between parent species.

Sturgeon chub *Macrhybopsis gelida*

(*Macrhybopsis*-- large Hybopsis, a related genus; *gelida*-- frozen)

Description: Body very slender, streamlined; pectoral and caudal fins large; caudal fin deeply forked; mouth inferior, with a conspicuous barbel; compound taste buds present in the first and second interradial spaces of the pectoral and anal fins; eye small; scales in the lateral line 41-46, those above the lateral line with a unique keel; dorsal rays 8; anal rays 8; pharyngeal teeth 1,4-4,1. Color dusky above, silvery on the sides and belly; specimens from less turbid waters are speckled. Size of adults about 3 inches.

Distribution: The sturgeon chub occurs in the Mississippi River in Louisiana and, primarily, in the Missouri River drainage in Kansas, Nebraska, the Dakotas, Montana and Wyoming. In Wyoming, it occurs today in the Powder River from the Montana state line upstream to about the mouth of Salt Creek. It was collected from the Big Horn River in the late 1960s but may be extirpated from that drainage. Before the turn of the century it was found in the North Platte River (Evermann and Cox 1896), but it has disappeared from that drainage in Wyoming. Stewart (1981) found that the sturgeon chub was apparently thriving in the Powder River between the Montana state line and the mouth of Salt Creek. Above the mouth of Salt Creek, where the water of the Powder River is normally clear, the sturgeon chub was no longer present. In the turbid waters of the Powder River, he found the sturgeon chub in association with the flathead chub, plains minnow and five other species of minnows, suckers and catfishes. The sturgeon chub belongs to an assemblage of fish species that are adapted to a river habitat with relatively unstable substrate and high turbidity. This assemblage included (historically) the shovelnose sturgeon, goldeye, flathead chub, plains minnow and western silvery minnow (Pfleiger and Grace 1987; Cross and Moss 1987). In Wyoming, this assemblage has, except for the flathead chub, disappeared from the North Platte River but is still present in the Powder River. Pfleiger and Grace (1987) reported that in the lower Missouri River, below the mouth of the Platte, the sturgeon chub has increased in abundance in the past 40 years, while the flathead chub, western silvery minnow and plains minnow have decreased in numbers. Cross and Moss (1987) found only a single specimen of the sturgeon chub in collections made in 1977 and 1978 on the Missouri River above St. Joseph, Missouri.



Natural history: This little minnow lives in riffles over sand, gravel and small rubble in larger, turbid rivers. Stewart (1981) described the preferred habitat in the Powder River as "highly turbid waters and rock-riffle zones with an average depth of 22.9 cm and an average velocity of 1.83 feet per second". The sturgeon chub is adapted to life in fast current and turbid waters by virtue of its streamlined body, large, deeply forked caudal fin and quite narrow caudal peduncle and the unique keels on the dorsal scales. With the flathead chub and some other turbid-water species of minnows, the sturgeon chub has compound taste buds in the fins which, with the large barbel, are presumably used in location of food and proper identification of physical structures present in the twilight zone of turbid waters (Moore 1950).

Distinguished from:

associated species by its keeled dorsal scales and its compound taste buds in pectoral and anal fins.

Relation to man: The sturgeon chub is one of the rare species of fish found in the state and the existing population in the Powder River merits protection.

Nomenclature: This minnow has been variously placed in the genus *Hybopsis* and in a separate genus *Macrhybopsis*, where it is presently classified (Mayden 1989).

Literature references: *Hybopsis gelidus*. Evermann and Cox 1896:409 (Powder River, Arvada; North Platte River). *Macrhybopsis gelidus*. Simon 1951:73 (Big Horn and Powder rivers). *Hybopsis gelida*. Bailey and Allum 1962:42 (distribution map, page 47).

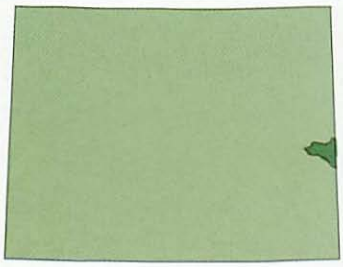
Pearl dace
Margariscus margarita

(*Margariscus*-- reference to pearls; *margarita*-- little pearl)

Description: Body elongate, rounded; fins relatively small and rounded; head short; snout blunt; eyes moderate; mouth moderate, a flap-like barbel situated slightly in front of the angle of the jaw (this barbel is sometimes rudimentary or absent on one or both sides); scales in the lateral line 61-78; dorsal rays 8; anal rays 8; pharyngeal teeth 2,5-4,2. Color dark greenish above, silvery laterally and white below; a lateral dark stripe is poorly defined in adult fish; heavily pigmented scales scattered randomly among the other scales, give most individuals a speckled appearance. Breeding males become bright red on the sides and belly. Adult size to about 6 inches, but mostly less than 4 inches in Wyoming.

Distribution: The pearl dace ranges throughout most of Canada, and in the United States, it is found in the northern half of the Lake States, east to New York and Virginia, west to Montana. Relict populations occur in cool, gravel-bottomed streams in southern South Dakota, Nebraska and eastern Wyoming. In Wyoming, this species is found in the Niobrara River and Van Tassel Creek in eastern Niobrara County.

Natural history: Preferred habitat is clear, cool streams with gravel substrate. In the Niobrara River, the pearl dace lives in gravel-bottomed riffles with the creek chub



and stoneroller, rarely in slower water with weedy-pond species such as the finescale dace, brassy minnow and plains killifish. Spawning has been described by Langlois (1929). It lays eggs over gravel but does not construct a nest of pebbles like the creek chub. Dobie et al. (1948) found that the diet of this minnow included insects, molluscs, surface drift, water mites and phytoplankton.

Relation to man: This beautiful little fish is too rare in Wyoming to be considered important as a bait or forage fish. The small, relict population living in the Niobrara River and Van Tassel Creek near the Wyoming-Nebraska state line is precariously close to extirpation and deserves protection.

Nomenclature: Simon (1951) recorded the pearl dace as *Margariscus margarita nachtriebi*, and Baxter and Simon (1970) listed it as *Semolitus margarita nachtriebi*. M.M. Coburn and T.M. Cavendar (1992) resurrected *Margariscus* for this species. The subspecies *nachtriebi* recognized as a western variety with smaller scales (Bailey and Allum 1962; Scott and Crossman 1973) is the subspecies found in Wyoming.

Literature references: *Margariscus margarita nachtriebi.* Simon 1951:70 (new state record, Niobrara River).

Distinguished from:

the creek chub by its smaller mouth, the absence of a black spot at the anterior edge of the dorsal fin and its speckled appearance;

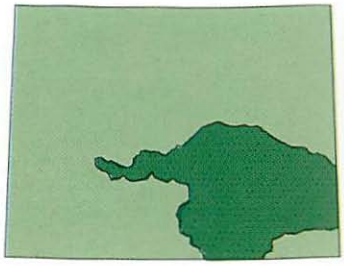
the lake chub and all other Wyoming minnows by its flattened barbel (when the barbel is lacking, the pearl dace can be identified by the bright red color of breeding males and the drainage from which the fish is collected).

Hornyhead chub *Nocomis biguttatus*

(*Nocomis*-- an Indian name; *biguttatus*-- two-spotted, in reference to the paired red spots on the head of the male)

Description: Body robust; head large, snout blunt; mouth large, slightly oblique, barbel conspicuous; eyes moderate; scales large, 42-44 in the lateral line; dorsal rays 8; anal rays 7; pharyngeal teeth 1,4-4,1. Breeding males with conspicuous nuptial tubercles on head and body. Color olivaceous above, dark in younger specimens; belly white; a lateral dusky stripe condenses into a conspicuous black spot at the base of the caudal fin. A round red spot present behind the eye of adult males. Adult size about 6 inches.

Distribution The hornyhead chub ranges from New York State to the Rocky Mountains, south to Arkansas; it occurs only in the southern parts of Michigan, Wisconsin and Minnesota. In Wyoming, this species was collected from the Sweetwater River and named *N. nebrascensis* by Girard (1856); it was common in tributaries of the Laramie River in Platte County especially in the North Laramie River until in the 1960s. Simon (1946, 1951) reported it from Box Creek in Converse County and from Rawhide Creek, Goshen County. It is now very rare in the North Platte River drainage in Wyoming. The hornyhead chub was



collected only in the North Laramie River during a 1993 survey.

Natural history: The hornyhead chub is a fish of clear, gravel-bottomed streams where, in spawning, it constructs a gravel nest. The food habits of the hornyhead chub were studied in New York State by Lachner (1950), who reported that the diet includes insects, crustaceans and molluscs; some vegetation in the stomach was believed to have been taken with animal food.

Relation to man: This minnow is used for bait in the Middle West; it is rare in Wyoming and existing populations merit protection.

Literature references: *Nocomis nebracensis*. Girard 1856 (Sweet Water, a tributary of Platte or Nebraska River). *Nocomis biguttatus*. Simon 1951:70 (Rawhide Creek, Goshen County; Box Creek, Converse County). *Hybopsis biguttata*. Metcalf 1966:106 (zoogeography; creeks in eastern Wyoming).

Distinguished from:

the sturgeon chub by its lack of keeled dorsal scales;

from associated species by its large scales and barbel;

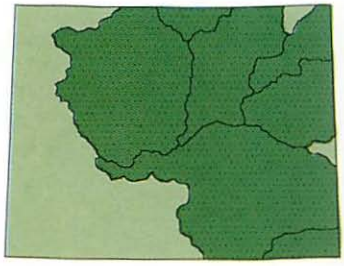
adult males of any other Wyoming minnow by the male hornyhead's red spot behind the eye.

Golden shiner *Notemigonus crysoleucas*

(*Notemigonus*-- back-half-angle, in reference to the body shape; *crysoleucas*-- gold-white)

Description: Body deep, laterally compressed; dorsal and anal fins falcate; the caudal fin forked; head small; eyes large; mouth small and oblique, slightly superior; barbel absent; belly with an unscaled keel between the anus and the pelvic fins; lateral line strongly decurved; lateral line scales 41-50; dorsal rays 8; anal rays varied, usually 11-15, but varying from 8-19 (Scott and Crossman 1973). Color olive above, sides and belly silvery in immature specimens, brassy in mature fish in the breeding season. Adult size up to 8 inches.

Distribution: The golden shiner ranges in North America from the Atlantic Coast west to the Dakotas and Texas. Introduced as a bait fish to several western states, it is not native to Wyoming and was probably introduced with shipments of largemouth bass, either as forage for bass or accidentally. Simon (1951) believed that this minnow was brought into the state with consignments of bass under the name of "bream," but the date and location of such an introduction is not



known. It occurs in a number of ponds and lakes, usually at lower elevations and in the same habitat with bass, where it is sometimes introduced to provide forage.

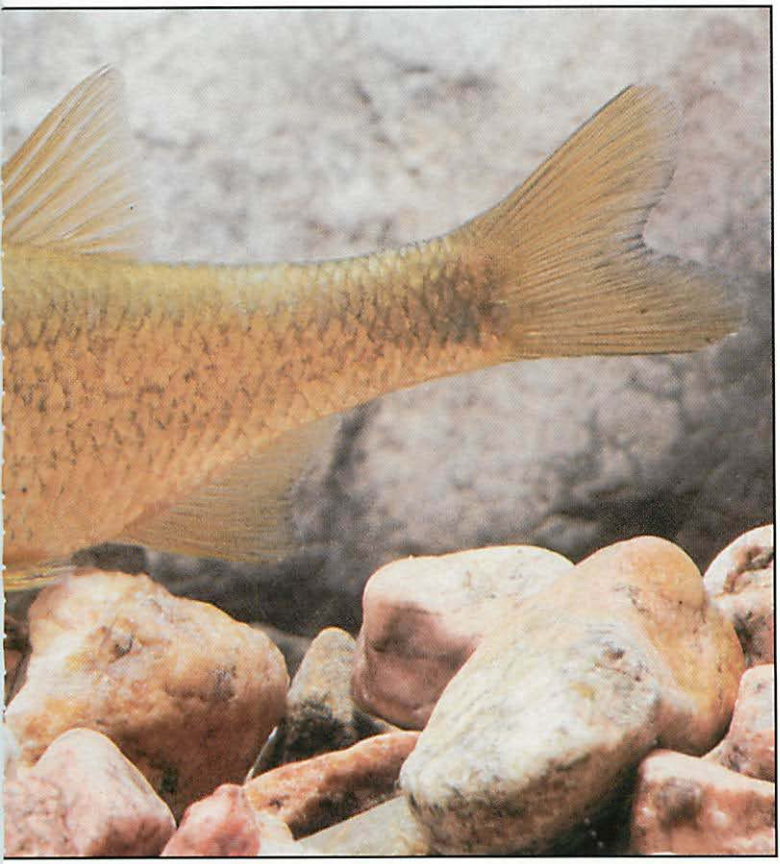
Natural history: Preferred golden shiner habitat is standing or slow-moving water with an abundance of vegetation. It spawns in the spring and summer, scattering its eggs over aquatic vegetation. Kramer and Smith (1960) reported golden shiners laying eggs in the nests of the largemouth bass. They found that golden shiners experienced higher reproductive success when exhibiting this behavior. Food of this minnow includes zooplankton, macroinvertebrates and some fish.

Relation to man: Golden shiners are propagated artificially as a bait and forage fish.

Literature references: *Notemigonus crysoleucas auratus*. Simon 1951:82 (introduced into Wyoming).

Distinguished from:

other minnows by the keel on its belly, its distinctive brassy color and its larger number of anal rays (in Wyoming, only the brassy minnow is similarly colored, and only the redside and emerald shiners have as many as 11 anal rays).

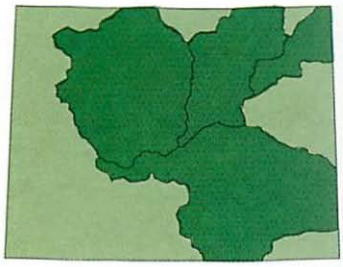


Emerald shiner *Notropis atherinoides*

(*Notropis*-- back keel; *atherinoides*-- silversides)

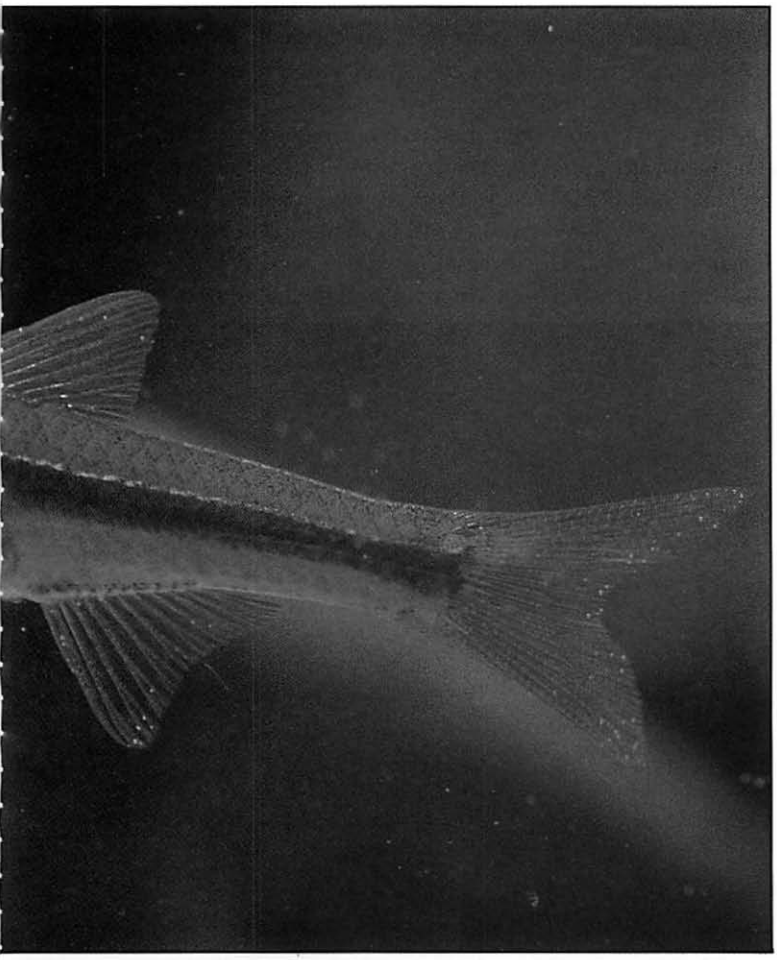
Description: Body very slender and elongate and also laterally compressed; eyes large; mouth large, terminal, lacking a barbel; scales in the lateral line 38-43; dorsal rays usually 8; anal rays 11-13 usually 11; pharyngeal teeth usually 2,4-4,2. Color dusky or blue green above, very silvery laterally and silvery white ventrally. A lateral dark stripe may be present but is often ill-defined. Adult size usually 2-3 inches.

Distribution: The emerald shiner is widely distributed in Canada and in the Plains and Lake states east to New York and south to the Gulf of Mexico. In Wyoming, it was introduced in the early 1980s into Seminoe Reservoir where it became established and has spread downstream to the lower reservoirs and the North Platte River. Since that time, the emerald shiner has been established in Lake DeSmet and other Wyoming reservoirs.



Natural history: This minnow is an inhabitant of large lakes and reservoirs and large rivers. It lives in the open water feeding on plankton as an adult. The emerald shiner spawns in early summer in the open water. Pelagic eggs hatch quickly and newly hatched fry feed upon phytoplankton for a period of growth. Zooplankton becomes the principal item in the diet of older fish. Algae and aquatic insects are also eaten (Fuchs 1967; Scott and Crossman 1973).

Relation to man: In Canada and the Northern Plains and Lake States, the emerald shiner is an important bait fish. Even though it is quite fragile, and sheds its scales easily, it is used fresh, frozen, salted and pickled as bait for whitefish and yellow perch (Scott and Crossman 1973). In Wyoming, this minnow was introduced to add an open-water, plankton-feeding forage fish to the reservoir ecosystems.



Distinguished from:

associated minnows by its large scales, absence of a barbel and the short (rather than coiled) gut;

the minnows of the shiner genera Cyprinella, Luxilus *and* Notropis *by its slender, elongate form and large number of anal fin rays.*

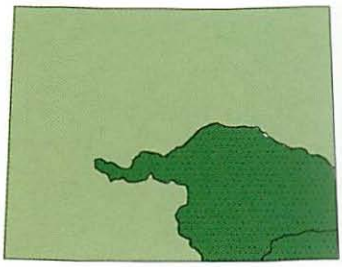
Bigmouth shiner *Notropis dorsalis*

(*Notropis*-- back keel; *dorsalis*-- of the back)

Description: Body slender, fusiform; head relatively long, flattened above; eyes large, the slight upward displacement of the entire eye and also the pupil giving this minnow the appearance of looking upward; mouth slightly subterminal, large, lacking a barbel; scales in the lateral series 32-39; predorsal scales few or usually entirely absent; dorsal rays 8; anal rays 7 or 8; pharyngeal teeth 1,4-4,1. Color dusky above, silvery laterally and white below. A mid-dorsal and lateral stripe and a small spot at the base of the caudal are usually present; scales often outlined by melanophores. Length of adults up to 3 inches.

Distribution: The bigmouth shiner occurs from Wyoming and Colorado eastward to New York State. In Wyoming, it is found in smaller streams in the North Platte River drainage.

Natural history: The bigmouth shiner's preferred habitat is small, clear streams with sand or small gravel substrate, where it is usually associated with the sand shiner. In the Little Medicine Bow River in Carbon County, it is much more common than the sand shiner. The bigmouth shiner sometimes occurs in lakes. Bailey and Harrison (1945) reported that it was common locally on gravel and sandy shoals in shallow water in Clear Lake, Iowa. The bigmouth shiner spawns in July and August in Wyoming. Moore (1944) suggested that



the bigmouth shiner, like some other species in this genus, may spawn in the open water, the pelagic eggs drifting downstream while hatching. Such a pattern of spawning would account for the fact that, although they are often found together in small sandy streams, hybrids between the bigmouth and the sand shiner, which apparently deposits its eggs in the substrate, are not common.

The bigmouth shiner is an insectivore, feeding on aquatic and terrestrial insects and other aquatic invertebrates.

Relation to man: This hardy shiner, like the sand shiner, is sometimes used as a bait minnow and is an important forage fish in habitats where it is abundant.

Nomenclature: Western populations of the bigmouth shiner, which ordinarily lack scales in front of the dorsal fin, have been recognized as a separate subspecies *piptolepis* by some workers. Simon (1951) used that name. Underhill and Merrell (1963) found that some eastern (Minnesota) populations *(N. d. dorsalis)* had a scaleless nape and questioned the separation into subspecies.

Literature references: *Notropis dorsalis piptolepis*. Simon 1951:85 (North Platte and South Platte river drainages).

Distinguished from:

the sand shiner by the absence of predorsal scales, the position of its eyes and the absence of a dark "dash" on the dorsal fin;

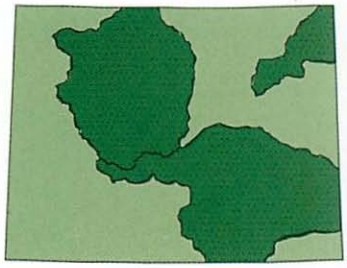
the suckermouth minnow by its lack of fleshy lips.

Spottail shiner *Notropis hudsonius*

(*Notropis*-- back keel; *hudsonius*-- from the Hudson River)

Description: Body stout, compressed laterally; eyes large; mouth moderate, lacking a barbel; scales in the lateral series 38-42; dorsal rays 8; anal rays usually 8; pharyngeal teeth usually 2,4-4,2, but variable. Color dusky or green above, silvery laterally and ventrally. In younger fish, the distinct elongate oval black spot at the base of the caudal fin is the distinguishing mark of this minnow. In older fish, this black spot may be obscured, although it is evident in preserved specimens. Adult size usually 3-4 inches.

Distribution: The spottail shiner is widely distributed in central and eastern Canada and in the Lake States. In Wyoming, it was introduced to Keyhole Reservoir in the late 1970s. It has since been introduced to Boysen Reservoir and thrives in the North Platte River reservoirs.



Natural history: The spottail shiner is an open-water dweller like the emerald shiner but shows more orientation toward the shoreline than the emerald shiner. Unlike the emerald shiner, this minnow spawns over shoals or may migrate into mouths and lower reaches of tributary streams to spawn (Scott and Crossman 1973). The diet seems to be primarily zooplankton (cladocerans and copepods) but can include aquatic insects, some algae and even its own eggs and fry (McCann 1959).

Relation to man: The spottail shiner is an important bait fish in some parts of its range; in Wyoming, it has been introduced to provide an open water, planktivorous forage fish in reservoirs and large lakes.

Distinguished from:

the minnows of the shiner genera Cyprinella, Luxilus *and* Notropis *by the distinct black spot on the caudal fin.*

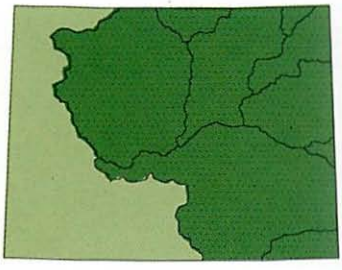
Sand shiner
Notropis stramineus

(*Notropis*-- back keel; *stramineus*-- straw-colored)

Description: Body quite slender; head short; eyes large, not displaced dorsally; mouth terminal, without a barbel; scales in the lateral line 32-39; dorsal rays 8; anal rays 7; pharyngeal teeth 0,4-4,0. Color pale olive or dusky above, silvery laterally and white below; a weak mid-dorsal stripe is accented by a dash within the dorsal fin; dorsal and lateral scales outlined by melanophores; lateral line accented by paired black dots near the pores. Adult size up to 4 inches, usually about 3 inches.

Distribution: The sand shiner occurs from Montana and Wyoming east to the St. Lawrence River drainage. In Wyoming, it is found in all the drainages east of the Continental Divide except the headwaters of the Yellowstone and Madison rivers in Yellowstone Park. This species is found in the Powder and lower Big Horn rivers and has been collected from Teapot Creek and Clear Creek in the Powder River drainage. It occurs also in Ocean Lake in Fremont County, where it may have been introduced by bait users.

Natural history: The sand shiner's preferred habitat is creeks and rivers with sand or small gravel substrate; it occurs occasionally in lakes. Spawning behavior has not been described in any detail, but this minnow probably deposits its eggs on or in sand or gravel substrates. Spawning occurs in mid-summer at which time adults develop nuptial tubercles, and females are distended with eggs. The diet of this carnivorous



minnow includes a variety of aquatic invertebrates (Starrett 1951).

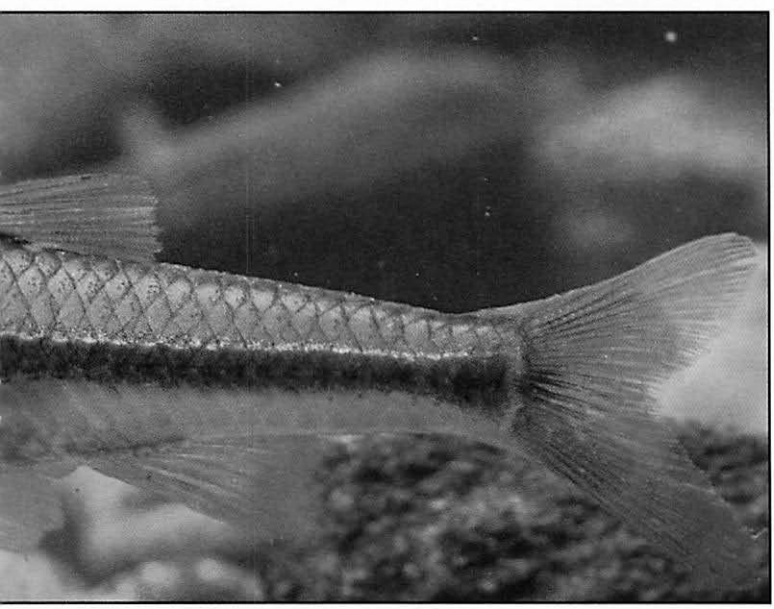
Relation to man: The sand shiner is an important bait minnow in much of its range and is undoubtedly important as a forage fish in habitats where it is abundant.

Distinguished from:

the bigmouth shiner by its predorsal scales, its distinctly terminal mouth, the position of its eyes (central in the head), and the more prominent black dots along its lateral line.

Nomenclature: Ichthyologists recognize two subspecies of the sand shiner: *N.s. stramineus* with larger scales ranges generally east of the Missouri River proper. Western populations with smaller scales are placed in the subspecies *missouriensis* (Bailey and Allum 1962; Metcalf 1966). Simon (1951) used the name *deliciosus missouriensis* for sand shiners from Wyoming; *deliciosus* is an older specific name. Suttkus (1958) found that the name *deliciosus* was not acceptable and adopted the next available name, *stramineus*.

Literature references: *Notropis blennius* (misidentification?). Evermann and Cox 1896:402-403 (Deer Creek, Glenrock; Platte River, Glenrock; Garden Creek, Casper; Platte River, Douglas). *Notropis deliciosus missouriensis*. Simon 1951:85-86 (North Platte, South Platte, Little Missouri, and Belle Fourche River drainages, and Beaver Creek in Weston County); Personius and Eddy 1955:42 (headwaters, Little Missouri River). *Notropis stramineus missouriensis*. Metcalf 1966:127 (North Laramie River, Platte County).

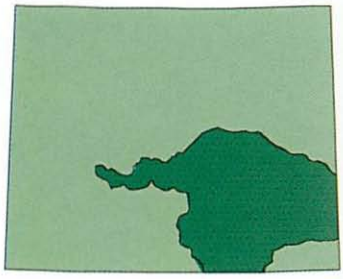


Suckermouth minnow *Phenacobius mirabilis*

(*Phenacobius*-- deceptive life; *mirabilis*-- wonderful)

Description: Body fusiform; head short; eyes large; mouth inferior, lips with fleshy lateral lobes; barbel absent; scales in the lateral line 43-50; dorsal rays 7 or 8; anal rays 7; pharyngeal teeth 0,4-4,0. Color dusky olive above, white below, with a mid-dorsal dark streak and an elongate dark spot at the base of the caudal fin. Both sexes may become tuberculate, and males may become bright yellowish-olive during breeding. Size of adult fish up to 5 inches.

Distribution: The range of the suckermouth minnow centers in the western Mississippi Valley from South Dakota to Texas; it has apparently expanded its range eastward into the Ohio River Valley in recent decades (Trautman 1957). In Wyoming, it is found rarely in tributaries of the North Platte River in Goshen County; it is presently quite common in lower Horse Creek. Simon's report of this species in Lodgepole and Muddy creeks in the South Platte River drainage is questionable; a large collection of fish from Lodgepole Creek



made in 1954 when that stream was treated with rotenone did not contain a single specimen of the suckermouth minnow (Baxter 1955).

Natural history: The suckermouth minnow is a riffle fish, preferring clear water and a sand, gravel or rubble substrate. May be found in lakes. It is widespread in the streams of Kansas. Cross (1967) stated that this species seems more tolerant of fluctuating water levels and high turbidity than are other species that inhabit riffles. Spawning apparently continues through the summer months (Cross 1967). Food of this minnow includes aquatic insects and other bottom dwelling invertebrates.

Literature references: *Phenacobius mirabilis* (Girard). Simon 1951:86-87 (smaller streams tributary to the North Platte River; Muddy Creek, Lodgepole Creek, South Platte River drainage).

Distinguished from:

the bigmouth and sand shiners by its inferior mouth and the fleshy lateral lobes of the mouth;

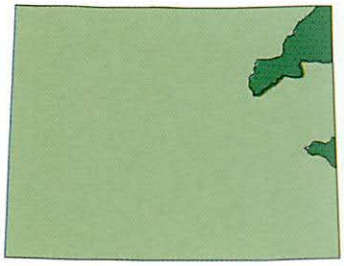
suckers by the number of its dorsal fin rays.

Finescale dace *Phoxinus neogaeus*

(*Phoxinus*-- tapering; *neogaeus*-- new world)

Description: Body terete(cylindrical and tapering): fins rounded; head short; eyes relatively small; mouth large, lacking a barbel; scales small, 70-84 in the lateral series; dorsal rays 8; anal rays 8; pharyngeal teeth 1,5-4,1; sometimes 2,5-4,2; lateral line incomplete. Color dark olive above and silvery below with a dark lateral stripe separated from the dark back by a dusky area. A distinct black spot at the base of the caudal fin. In breeding males, the silvery belly becomes brassy with some red. The first ray of the pectoral fin in breeding males is strongly decurved. Males with a patch of nuptial tubercles just above the base of the anal fin. Size, about 3 inches in adult fish.

Distribution: The finescale dace is a northern species occurring from northwestern Canada to New England, south into northern Minnesota, Wisconsin, Michigan and New York. In Wyoming, it occurs as a glacial relict with the pearl dace in the Niobrara River near the Wyoming-Nebraska state line. It is also found in several habitats in Crook County, near the Wyoming-South Dakota state line.



Natural history: This species lives in cool, weedy, small streams, ponds and small lakes. In Wyoming, where found, it is associated with the brassy minnow, the fathead minnow and, rarely, the pearl dace. The life history has not been studied in Wyoming. In Minnesota, Stasiak (1977) studied the biology of this species in beaver ponds in Itasca State Park. Spawning takes place early in the spring. Stasiak observed spawning behavior only in an aquarium. The male uses the sharply curved pectoral to hold the female in the spawning act. Eggs are apparently deposited in the mud or sand under the cover of submerged objects. The diet includes algae, molluscs and a variety of aquatic insects.

Nomenclature: This fish was first included in the genus *Leuciscus* and then in the genus *Chrosomus*. Banarescu (1964) relegated *Chrosomus* to *Phoxinus*.

Literature references: *Leuciscus neogaeus* Evermann and Cox 1896 p. 335: (Montana Lake near Beulah); *Chrosomus neogaeus*. Bailey and Allum 1962:(map of distribution).

Distinguished from:

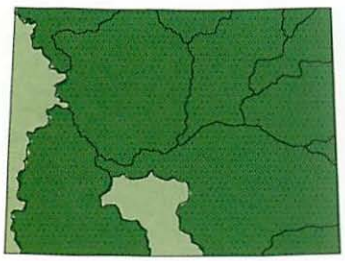
associated minnows by its very small scales and incomplete lateral line (only the leatherside and roundtail chubs of the Green and Bear river drainages have more than 70 scales in the lateral series).

Fathead minnow *Pimephales promelas*

(*Pimephales*-- fat head; *promelas*-- black in front)

Description: Body short and stout; head short and blunt; eyes small to moderate; mouth small; scales in lateral line series 40-48; lateral line usually incomplete; scales crowded anteriorly; dorsal rays 8, the first ray short and blunt; anal rays 7; pharyngeal teeth 0,4-4,0; intestine long and coiled. Males in breeding condition with nuptial tubercles and a spongy predorsal pad extending from the nape to the dorsal fin. Color quite dark dorsally with a darker lateral stripe, grading to pale below; most mature fish show a purplish iridescence on the crowded anterior scales, a useful character for field identification. Spawning males are very dark with a jet black head and brownish body. Adult size up to 3.5 inches.

Distribution: The fathead minnow ranges throughout eastern North America from Great Slave Lake south to Mexico. It has been introduced as a bait fish into the western states and is probably the most widespread minnow in the United States. In Wyoming, this minnow is common east of the Continental Divide, found in smaller streams and in many lakes. It has been introduced into the Green River drainage where it has become common. Simon (1951) reported the occurrence of this species at an altitude of 9,400 feet in the Big Horn Mountains.



Natural history: The preferred habitat of the fathead minnow is slow-flowing streams and shallow lakes and ponds. The absence of many competitors is also a preference. It is tolerant of intermittancy and very tolerant of rotenone, being one of the last fish to succumb in habitats treated with that piscicide. In Wyoming, spawning of this species takes place from late May into June. Fathead minnows lay their eggs on the underside of floating or submerged objects. When lily pads are present, these are used. The breeding habits of the fathead minnow make pond and laboratory propagation relatively easy. Shingles or tiles are placed in ponds or laboratory tanks for spawning sites. A spawning pair of fatheads deposits fertilized eggs onto the spawning surface. The dorsal pad of the male is believed to produce mucous, and perhaps, chemical signals which, as he contacts the spawning surface and the eggs, enhance hatchability and survival (Smith and Murphy 1974). The male guards the nest, periodically bringing his dorsal pad into contact with the eggs, and aerating them by means of movements of the pectoral fins. He

also drives off intruders of his own or other species of fish. Eggs from more than one female may be deposited in a nesting site. Markus (1934) noted that a single female, when enclosed with a single male, deposited eggs 12 times between May 16 and July 23 in New York State. Eggs hatch in about 5 days. In warm climates, fatheads may mature in the first summer of life, but, in cooler waters, maturity may not be reached until age 2 (Scott and Crossman 1973). It is unlikely that many fathead minnows survive beyond age 3 in the wild. Food habits of the fathead minnow were studied by Simpson (1941), who found that the diet was mostly vegetable matter, but included about 5% animal remains, mostly insects. Fathead minnows in the Laramie Basin are often parasitized by the body cavity tapeworm.

Relation to man: The fathead minnow is cultivated in ponds as a bait minnow in many states and has been spread throughout the United States as a result. This minnow is used widely in laboratory studies of toxicology; it is easy to propagate in captivity, and the fry are good test animals.

Literature references: *Pimephales promelas*. Evermann and Cox 1896:397-399 (Clear Creek, Clermont [sic]); Simon 1951:89-90 (most Wyoming drainages east of the Continental Divide); Personius and Eddy 1955:42 (Little Missouri River).

Distinguished from:

other minnows by its blunt first dorsal ray, incomplete lateral line (in most populations) and its crowded anterior scales;

(young-of-the-year fish are difficult to distinguish from small creek chubs and small brassy minnows).

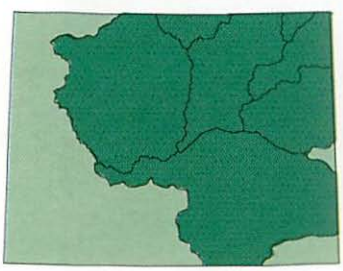
Flathead chub *Platygobio gracilis*

(*Platygobio*-- broad-minnow; *gracilis*-- slender)

Description: Body elongate, streamlined; dorsal and pectoral fins falcate; caudal fin deeply forked; head broad and flattened; eye small; mouth subterminal with a conspicuous barbel; pectoral, pelvic and anal fins with compound taste buds in the interradial spaces; scales in the lateral line 42-56; dorsal rays 8; anal rays 8; pharyngeal teeth 2,4-4,2. Color dusky olive or brown above, very silvery laterally, belly white; no dark lateral stripe. Adult size 10 inches or more.

Distribution: The flathead chub inhabits large, turbid rivers on the Great Plains from the Northwest Territories in Canada south to Oklahoma and New Mexico. In Wyoming, it is common in turbid rivers.

Natural history: The flathead chub prefers to live in large, turbid rivers; its streamlined form and large fins adapt it to living in swift current, and the large barbel and special sensory organs adapt it to turbid waters by giving the fish a wider field in which to detect the presence of food (Moore 1950). The flathead chub apparently spawns relatively late in the summer when the rivers are lower, warmer, and the bottom more stable (Olund and Cross 1961). Spawning behavior has not been described. Cross (1967) noted that males become tuberculate in late summer. This species is omnivorous, feeding mainly on aquatic invertebrates, some terrestrial invertebrates and vegetation. McPhail and Lindsey (1970) reported that some small fish appear in the stomachs of the flathead chub.



Relation to man: Small flathead chubs undoubtedly provide forage for predacious game fish in large rivers, and it is sometimes used for bait.

Nomenclature: Simon (1951) recognized two subspecies of the flathead chub. These were *Platygobio gracilis communis*, the subspecies found in the drainages of northern and northeastern Wyoming, and *P. gracilis gulonellus*, the subspecies in the North Platte drainage. The genus *Platygobio* was included in the large genus *Hybopsis* by Bailey (1951). Olund and Cross (1961) recognized a subspecies (*H. gracilis gracilis*) with a higher vertebrae count in the Missouri River drainages and a southern subspecies (*H. gracilis gulonella*) with fewer vertebrae, found in the Arkansas and Rio Grande river

drainages. The genus *Platygobio* has recently been restored (Mayden 1989).

Literature references: *Pogonichthys communis*. Girard 1856:188 (Sweet Water, a tributary stream of Nebraska or Platte River): Girard 1858:247-248 (Sweet Water fork of Platte River). *Pogonichthys (Platygobio) gulonellus*. Cope 1864:277 (description of new species near Bridger's Pass). *Platygobio communis*. Gill 1876:408-410 (Green River, Utah [sic] and in the Platte Valley). *Platygobio gracilis*. Evermann and Cox 1896:412 (Clear Creek, Clermont [sic]; North Platte River at Glenrock, Casper and Douglas; Powder River at Arvada; Deer Creek at Glenrock). *Platygobio gracilis communis*. Simon 1951:72 (Big Horn, Powder, Tongue, and Little Missouri rivers). *Platygobio gracilis gulonellus*. Simon 1951:72-73 (North Platte River drainage).

Distinguished from:

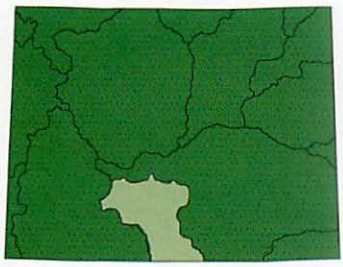
Similar species by the conspicuous barbel, the very long and sharply tapering pectoral fin, and the presence of special sensory organs in the interradial spaces of the ventral fins.

Longnose dace *Rhinichthys cataractae*

(*Rhinichthys*-- snout fish; *cataractae*-- of the cataract)

Description: Body elongate and streamlined, more slender than the speckled dace; snout long; fins rounded, caudal fin moderately forked; head short; eye moderate; mouth small and inferior with a small barbel; premaxilllaries not protractile; upper lip continuous with the snout; scales with radii in all fields; scales in the lateral line 58-72; dorsal rays usually 8; anal rays usually 7; pharyngeal teeth usually 2,4-4,2. Color olive or brownish above and lighter below with individual iridescent scales scattered over the body; males with red at the base of the fins and on the lips during the breeding season; immature fish have a distinct black lateral stripe. Adult size usually 3-4 inches, but occasionally up to 6 inches.

Distribution: The longnose dace is widespread in North America, occurring from the Pacific to the Atlantic coasts across southern Canada and the northern United States, with a southern extension of the range south to Texas and into Mexico on both slopes of the Rocky Mountains. In Wyoming, it is native to and common in all but the Green and Little Snake river drainages. It is now present in Hams Fork Creek in the Green River drainage where it was presumably introduced by bait fishermen.



Natural history: The longnose dace, as its specific name implies, is eminently a riffle fish. It is most conspicuous in riffles with rubble or gravel substrate. Its ecologic niche is similar to that of the sculpins and the sturgeon chub. All of these species may be collected easily and predictably by holding an aquatic net immediately downstream from a medium sized rock in a riffle, rolling the rock and withdrawing the net quickly. Often more than one longnose dace will be captured in a single attempt. Although it prefers riffles, the longnose dace is sometimes found in lakes, usually along a rocky shoreline. Spawning behavior of this minnow in the Rocky Mountain area has not been studied in detail. It is believed to deposit the eggs in sand and gravel. Males in breeding colors are seen throughout the summer months. Food of the longnose dace is primarily aquatic insects but includes some algae. Simpson (1941) analyzed the stomach contents of 37 adults of this species from four different localities in Wyoming. They contained 98% by volume of insect remains, traces of algae and about 2% debris, sand and gravel.

Relation to man: This species is an important bait minnow and forage fish.

Nomenclature: Two subspecies of the longnose dace were recognized by Simon (1951). These were *R. cataractae ocella* from the upper Missouri River drainage (except the North Platte River drainage) and the Snake and Bear river drainages west of the Divide and *R. cataractae dulcis* for the population of this species from the upper North Platte system. Those subspecies are no longer generally recognized.

Literature references: *Argyreus dulcis*. Girard 1856:185 (Sweet Water, a tributary stream of Nebraska or Platte River); Girard 1858:243-244 (Sweetwater, tributary of the Platte River, Nebraska). *Rhinichthys dulcis*. Jordan 1891b:48 (Gardiner River, Yellowstone National Park); Evermann 1892:42-43 (junction, Firehole and Gibbon rivers, Yellowstone National Park, Snake River, President's Camp, Wyoming). *Rhinichthys cataractae*. Evermann and Cox 1896:408-409 (Tongue, Powder and North Platte river drainages in Wyoming); Simon 1951:74 (Missouri River, Columbia River and Bonneville Basin drainages).

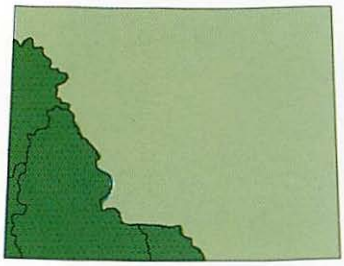
Distinguished from:

the speckled dace by the broad connection (frenum) between its upper lip and snout;

the other minnows by its elongate snout and the presence of radii in all fields of its scales.

Speckled dace *Rhinichthys osculus*

(*Rhinichthys*-- snout fish, from the elongate snout characteristic of the genus; *osculus*-- small mouth)



Description: Body elongate, fusiform; fins rounded; caudal fin moderately forked; head short; eye small; mouth small and subterminal, a small rounded barbel usually present; premaxillae usually protractile with a groove separating the upper lip and the snout; scales with radii in all fields; scales in the lateral line 54-67; dorsal rays usually 8; anal rays usually 7; pharyngeal teeth 1,4-4,1 or 2,4-4,2. Breeding males with small tubercles on body and fins. Color dusky, black or brown above, with a dark lateral stripe that may be indistinct; lateral and dorsal surface usually blotched or speckled. Adult size up to 5 inches, usually 3-4 inches.

Distribution: The speckled dace is native and widespread west of the Continental Divide; it ranges north into Canada in extreme southwestern British Columbia. In Wyoming, it is common in the Green, Bear and Snake river drainages.

Natural history: This species lives in both lakes and streams. In Wyoming, it is most common in streams but is not so conspicuously associated with riffles as is the longnose dace. In Arizona, John (1964) found that, when there are two periods of high water, one resulting from spring runoff and one from heavy summer rains, this minnow spawns twice during the summer. The spawning "nests" he described consisted of areas in the stream where swarms of males worked over the stones with their mouths; this and the turbulence created by their swimming created sites free of plants and silt. Females move into the nest and deposit eggs beneath rocks while attended by several males. Free-drifting eggs which failed to adhere were consumed by males. Fertilized eggs moved to the laboratory hatched in 6 days at 18-19 degrees C. In the inlet of Kelly Warm Springs in Teton County, swarms of speckled dace are evident and probably spawn throughout much of the year because of the warmer water. The speckled dace is omnivorous. A population of this species in Lake Tahoe, studied by Baker (1967), was most abundant along the rocky shoreline, feeding upon bottom organisms including snails, aquatic insects and some plankton. Stomach analysis made by Simpson (1941) showed that speckled dace in the Bear River were omnivorous with some preference for vegetable matter. Algae made up some 21.15% by volume of the stomach contents of 14 specimens; insects made up only 12.63%. Stomachs of speckled dace collected from the Green River, however, contained mostly insects.

Relation to man: The speckled dace is an important bait minnow in Jackson Hole and Star Valley in Wyoming, and, like the longnose dace, it is often an important forage fish. The Kendall Warm Springs dace (see below) is listed as an endangered subspecies under the Endangered Species Act.

Nomenclature: The speckled dace is very widespread in the western United States, and extremely variable in its meristics. Several subspecies have been recognized; the subspecies *carringtoni*, in the Columbia River drainage, and *yarrowi* in the Green River drainage were used by Simon (1951). The Kendall Warm Springs dace, *Rhinichthys osculus thermalis*, is restricted to Kendall Warm Springs in Sublette County. The biology and status of that subspecies were investigated by Binns (1978) and more recently by Kaya et al. (1989).

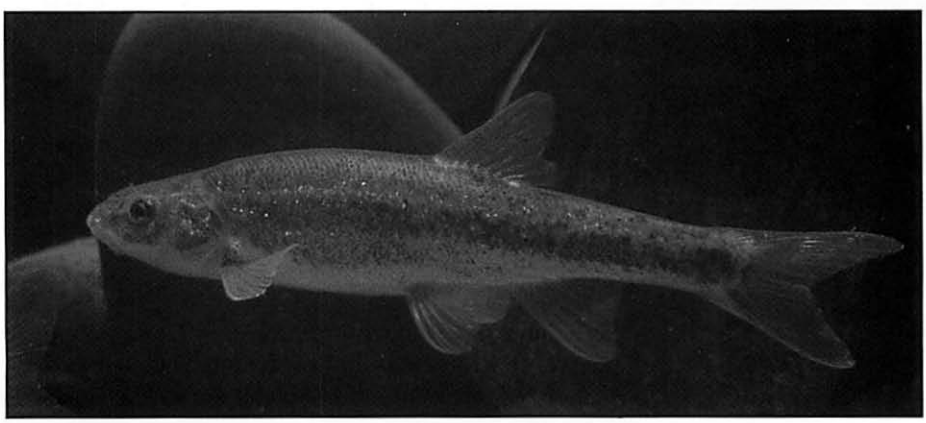
Literature references: *Ceratichthys squamilentus*. Cope 1872:442 (Henry's Fork of the Green River, Wyoming). *Agosia nubila*. Jordan 1891a:48 (Witch Creek, Yellowstone National Park). *Apocope oscula thermalis*. Hubbs and Kuhne 1937:1-21 (description, new species, Kendall Warm Spring, Wyoming). *Apocope oscula yarrowi*. Hubbs and Kuhne 1937:9 (Green River drainage, Wyoming). *Apocope oscula carringtoni*. Simon 1939:35 (Snake River and tributaries, Yellowstone National Park). *Rhinichthys oscula carringtoni*. Simon 1951:75-76 (Snake River, Bear River) *Rhinichthys oscula yarrowi*. Simon 1951:76-77 (Green River, Little Snake River). *Rhinichthys oscula thermalis*. Simon 1951:77-78 (Kendall Warm Springs). *Rhinichthys osculus thermalis*. Binns 1978: (Kendall Warm Springs).

Distinguished from:

the longnose dace by the protractile premaxillary of the speckled dace, producing a groove between the lip and snout;

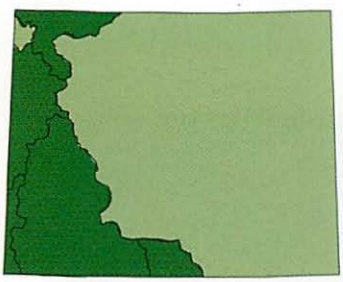
other Wyoming minnows by the presence of radii in all fields of its scale and the presence of a small barbel;

(hybrids with the redside shiner which are intermediate in character are not uncommon).



Redside shiner *Richardsonius balteatus*

(*Richardsonius*-- after Sir John Richardson; *balteatus*-- girdled)



Description: Body relatively deep and moderately compressed; caudal peduncle of average depth; caudal fin deeply forked; eye large; mouth small, oblique, without a barbel; scales in the lateral line 49-59; dorsal rays 9-11; anal ray count extremely varied, usually 11 in Wyoming specimens; pharyngeal teeth 2,5-4,2. Adults weakly tuberculate during spawning, males more so than females. Color dark green or bluish, sides above the lateral line with a golden sheen; belly white; breeding adults more brightly colored, males with a bright red stripe laterally, females with pink splashing; immature fish silvery with a white belly. Adult size 3-5 inches.

Distribution: The redside shiner is a predominant species in streams and lakes of the Bonneville Basin and the Columbia River drainage. In Wyoming, it is common in the Snake and Bear river drainages. It has been introduced into the Colorado River drainage and is common in the Green and Little Snake river drainages. It has also been introduced into Yellowstone Lake in Yellowstone National Park.

Natural history: This minnow seems to be equally at home in lakes or streams. It congregates in large schools; in large lakes, these schools move short distances to shoals or deeper water in response apparently to changes in water temperatures or to presence or absence of food (Johannes and Larkin 1961). Simon (1951) reported that this minnow spawns in late June and early July in Jackson Hole. Wiesel and Newman (1951) observed spawning in early April in a spring in western Montana. In British Columbia, Lindsey and Northcote (1963) found the redside shiner spawning in both lakes and streams from May into August. No nest is built and males do not defend a territory. Two to 5 individuals spawn together; they do not pair off as do nest-building minnows. Eggs are broadcast, adhering to vegetation or to rocks and debris. Redside shiners normally spawn in their second year of life (Weisel and Newman 1951). The diet of the redside shiner consists mainly of insects and other aquatic invertebrates but includes some algae. Simpson (1941) believed that this species is primarily a surface feeder; he also observed this shiner feeding upon newly planted grayling fry.

Relation to man: Johannes and Larkin (1961) found that, in Pinanton Lake in British Columbia, redside shiners fed on cladocerans near the surface during the

night, moving back near shore to forage primarily on algae during daylight hours. Redside shiners in Paul Lake fed upon freshwater shrimp and terrestrial insects, foraging more efficiently upon shrimp in the weedbeds than did rainbow trout. Those authors concluded that there was competition for food between the shiners and the trout in both Pinanton and Paul lakes. Crossman (1959) studied the predator-prey relationships between the redside shiner and the Kamloops trout in Paul Lake, B.C. When populations of redside shiners reached population densities as high as 5,000-100,000 per acre, they ate trout fry, competed for trout food and served as food for adult trout (Scott and Crossman 1973). These studies illustrate the need for an understanding of organisms proposed for introduction into a fishery as a forage species. The redside shiner is widely used as a bait minnow in Jackson Hole and Star Valley. As a bait and forage species, it is one of the most important nongame fish in Wyoming.

Nomenclature: A number of different subspecies of the redside shiner have been recognized, based mostly upon variations in the number of anal rays in different geographic races. In this edition, we follow Scott and Crossman (1973) and do not recognize the subspecies *hydrophlox* used in earlier editions of *Wyoming Fishes*.

Literature references: *Leuciscus hydrophlox*. Jordan 1891b:438 (Heart Lake, Witch Creek, Yellowstone National Park); Evermann 1892:44 (Snake River, President's Camp; small creek at the head of Jackson Lake). *Richardsonius balteatus hydrophlox*. Simon 1951: 81-82 (Snake and Bear river drainages, Green River drainage, where introduced).

Distinguished from:

other minnows by the larger number of anal rays, the absence of a barbel and the red color of the sides;

the golden shiner by the golden's unscaled keel on the venter;

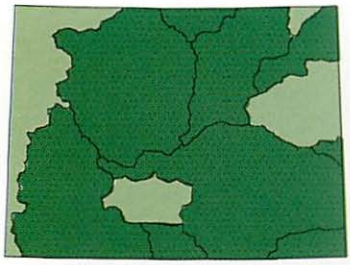
the emerald shiner, by the emerald's larger scales;

hybrids with the speckled dace and/or leatherside chub (not common) by the hybrids' intermediate morphology.

courtesy of the Colorado Division of Wildlife

Creek chub *Semotilus atromaculatus*

(*Semotilus*-- banner spot, in reference to the black spot in the dorsal fin; *atromaculatus*-- black-spotted)



Description: Body robust in larger fish; fins rounded; head large; mouth large; barbel present, flap-like, situated above and in front of the angle of the jaw, vestigial or absent on one or both sides in some populations; scales in the lateral line 58-74; dorsal rays 8; anal rays 8; pharyngeal teeth usually 2,5-4,2. Color dusky above, a lateral black stripe in young fish becomes dusky in older individuals; a wedge-shaped spot usually present at the base of the caudal fin; a distinct black spot present in the base of the anterior dorsal fin rays, this spot not evident in immature fish. Breeding males splashed with red or salmon pink with purple iridescence and developing conspicuous tubercles on the head, pectoral fins and on the caudal peduncle and caudal fin. Adult size up to 12 inches; usually not exceeding 8 inches in Wyoming.

Distribution: The creek chub ranges from the Rocky Mountains east to the Atlantic Coast, and from southern Canada to Louisiana. In Wyoming, it is a predominant fish in creeks and small rivers in the North Platte and South Platte drainages, and it occurs also in the Big Horn, Niobrara, Belle Fourche and Tongue rivers and in Clear Creek. It has been introduced into the Little Snake River drainage and into Willow Creek near Pinedale in the Green River drainage.

Natural history: The species' preferred habitat is pools in clear, gravel-bottomed creeks. The creek chub is one of the few Wyoming minnows to live on the montane zone; it ranges to at least 9,000 feet in the Medicine Bow Mountains in Albany and Carbon counties where it occurs with the brook trout in some montane streams. It is a hardy species, tolerating dewatering and siltation better than some of the other clear-water, gravel-nesting minnows such as the stoneroller, hornyhead chub and common shiner. Elaborate spawning behavior including the construction of a large gravel nest by the male was described by Reighard (1908) for this species in Michigan streams. Such nests are seldom seen in Wyoming, and the breeding pattern is apparently less complex in the western parts of the chub's range. Breeding occurs in late spring and is obviously successful in stream habitats which are quite heavily silted. Breeding tubercles, conspicuous in the creek chub (hence, a common name: "horned dace"), are used in digging the gravel nest, in combat with other males over nesting sites and as an aid in clasping the female during

spawning. The creek chub is mainly carnivorous, taking a wide variety of animals including insects, crustaceans and small fish along with some algae. When collected by electrofishing, large creek chubs often have swallowed smaller fish of their own and other species which were immobilized by electric shock. The percentage of total volume of stomach contents of 32 creek chubs analyzed by Simpson (1941) were: aquatic insects including caddis cases, 69%; terrestrial insects, 7.2%; crustaceans, 1.2%; algae, 4.5%; debris, 18.2%. Hybrids between creek chubs and common shiners are not unusual in Wyoming. They have been collected from the Laramie River in Albany County, from the lower North Platte River and from Horse and Lodgepole creeks in Goshen and Laramie counties.

Relation to man: This widespread minnow is an important forage and bait fish. It is easily caught on hook and line and is a favorite among young anglers. It is an important forage fish in the North Platte and South Platte river drainages in Wyoming. Creek chubs sometimes compete for food and space with trout but more often a population of creek chubs benefits a trout fishery.

Literature references: *Semotilus speciosus*. Girard 1856: 204 (Sweet Water, a tributary of Platte or Nebraska River); Girard 1858:283-284 (tributary of the Platte River, Nebraska). *Semotilus atromaculatus*. Evermann and Cox 1896:399-400 (Deer Creek, Glenrock; Big Goose Creek, Sheridan). *Semotilus atromaculatus atromaculatus*. Simon 1951:69-70 (North Platte, South Platte and Belle Fourche rivers and tributaries; introduced into the Little Snake River).

Distinguished from:

the pearl dace by the chub's larger size, the black spot at the base of the dace's anterior dorsal fin rays, and the absence of mottling in the creek chub;

the lake chub by the creek chub's flap-like barbel;

from the hornyhead chub by the creek chub's smaller scales;

from hybrids with the common shiner by the hybrids' intermediate morphology.

other minnows formerly found in Wyoming

Two minnows known or believed to have had viable populations in Wyoming in the past are the Colorado squawfish, *Ptychocheilus lucius*, and the bonytail, *Gila elegans*.

The Colorado squawfish is a large minnow living in the Colorado River drainage in Colorado, Utah and Arizona. This fish is known to have lived in the Green River below the city of Green River in Wyoming before 1963 when Flaming Gorge Reservoir was constructed in that area. This species was believed to be extirpated and was not included among the native fish listed in the 1970 edition of *Wyoming Fishes* (Baxter and Simon 1970). In about 1972, this species had become so rare throughout its range that it was classified a federal endangered species by the U.S. Fish and Wildlife Service. In recent years, studies of this fish have revealed that a substantial population of Colorado squawfish resides in the river systems on the west side of the Continental Divide in Colorado, Utah and Arizona. Nevertheless, the population is considered fragile, and the endangered status has been retained. Efforts to stabilize the population of this species in the Colorado River drainage have included rearing the young in hatcheries and intensive studies on its biology.

The Colorado squawfish is a large elongated minnow with a long, dorsally flattened head and a very large mouth. Dorsal and anal fins have 9 rays; scales are small,

80 to 95 in the lateral series. Pharyngeal teeth 2,5-4,2. Color olive with a pale belly. Young fish have a dark blotch at the base of the caudal fin.

The Colorado squawfish is an inhabitant of large, deep rivers where it lives in eddies and pools rather than in the fast water. Food of young fish is mainly invertebrate animals, but fish are the preferred food of adult squawfish.

This large minnow spawns in the summer after water temperatures rise to 65 degrees F, or warmer, spawning over gravel in deep water.

In August, 1990, a single 27-inch female Colorado squawfish was captured alive in the Little Snake River in Carbon County, Wyoming. That fish was captured by gill net by Dr. W.L. Minckley, Arizona State University, and released unharmed after it was photographed. Subsequent surveys of the section of river where this fish was captured, made by personnel of the Wyoming Game and Fish Department and the U.S. Fish and Wildlife Service, failed to reveal any specimens. A viable population of the Colorado squawfish does not appear to be present in the Little Snake River in Wyoming.

The bonytail, *Gila elegans*, has not been found in Wyoming since the construction of Flaming Gorge Reservoir. It presumably lived in the Green River in Sweetwater County before construction of Flaming Gorge Reservoir.

Family Catostomidae

Suckers

flannelmouth sucker courtesy of the Colorado Division of Wildlife

Suckers are bottom-dwelling, freshwater fishes, closely related to the minnows. Most suckers are characterized by an inferior mouth which enables them to feed from the substrate, sorting selected food items from the mud or sand with their fleshy lips.

Fishes in this family have soft fin rays, cycloid scales, and pelvic fins situated well back on the abdomen. They lack teeth on their jaws and possess the Weberian apparatus.

Major distinctions of suckers from minnows are the predominantly inferior mouth and the comblike nature of the pharyngeal teeth of the suckers (see figures and keys on pages 27 and 34).

From the New World (as contrasted with such Old World minnows as the carp, grass carp, and goldfish) minnows, suckers differ by the more posterior location of the anal fin. The distance from the front of the anal fin to the base of the caudal fin of suckers is contained about three times in their standard length. Among the minnows found in Wyoming, only the common carp, the goldfish, and the grass carp (all introduced from Eurasia) have the anal fin situated so far back on the body.

The suckers are principally found in North America where 12 genera and about 60 species are known. Two species are found in eastern Asia: one is a unique genus and species found in China; the other is the longnose sucker (see pages 124-127) which occurs in northeastern Siberia as well as in North America.

Suckers are poor to fair food fish. They were important food for native Americans, and some species are still used for food to some extent in the United States and Canada. They are important forage for game fishes and are frequently used as bait.

Suckers spawn mostly in streams but can reproduce in lakes. They thrive in seepage lakes and small reservoirs where few trout can reproduce. When such habitats are managed as trout fisheries, competition of suckers with trout has sometimes led to a need for chemical elimination of suckers. Generally, however, young suckers make a positive contribution to the food chain of game fish.

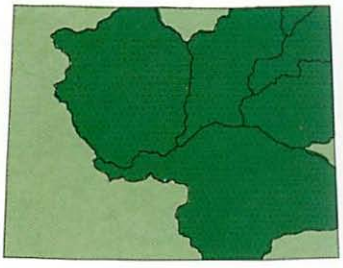
River carpsucker *Carpiodes carpio*

Carpoides-- carp-like; *carpio*-- low Latin for "carp"

Description: Body compressed laterally; head moderate; eye moderate; mouth inferior; lower lip with a median, nipple-like expansion; scales in the lateral series about 35; dorsal rays 23-27. Males are tuberculate in the spawning season. Color tawny to greenish above, silvery laterally and white below. Size of adults in Wyoming usually less than 20 inches and weighing less than 2 pounds; Brown (1971) noted that the largest river carpsucker reported for Montana was 25 inches long and weighed 10.2 pounds.

Distribution: The river carpsucker ranges from Montana to Pennsylvania south to Tennessee and southwest to Texas. In Wyoming, this sucker occurs in the Big Horn, Powder, Little Powder, Belle Fourche and North Platte river drainages. There are no records of this species from the Niobrara or South Platte river drainages in Wyoming.

Natural history: This sucker lives in larger rivers in both clear and turbid waters, less commonly in rubble-



bottomed streams and with some preference for turbid waters. In Wyoming, the river carpsucker is usually associated with the flathead chub and the plains minnow, less commonly with the white sucker. It lives in quiet water, often at the mouths of tributary streams. This carpsucker also occurs in reservoirs, where it may replace the white sucker. It is common in Keyhole and Boysen reservoirs. Spawning occurs from April to June (Harlan and Speaker 1951; Deacon 1961); eggs are broadcast over the bottom and left unattended. The food includes algae, some higher vegetation, and some small invertebrates (Buchholz 1957).

Relation to man: The river carpsucker probably serves as forage for game fishes in some reservoirs. It is of little importance as a food or bait fish in Wyoming.

Literature references: *Carpiodes carpio carpio*. Simon 1951:53 (Big Horn, North Platte, Belle Fourche, and Little Missouri river drainages); Personius and Eddy 1955:41 (Little Missouri River).

Distinguished from:

the quillback (with some difficulty) by its blunt snout and by the lower lip which is usually about the level of the anterior nostril. The distance from the tip of the snout to the anterior nostril is usually less than the diameter of the eye.

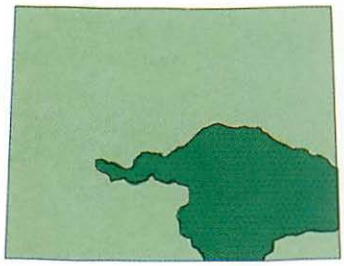
Quillback *Carpiodes cyprinus*

Carpoides-- carp-like; *cyprinus*-- generic name for the carp

Description: Body compressed laterally; head moderate; eye moderate to large; snout longer, distance from the anterior nostril to the tip of the snout greater than the diameter of the eye; no nipple-like expansion of the lower lip; scales in lateral series 37-40; dorsal rays 26-28; males tuberculate during the breeding season. Color brown or greenish above; sides silvery, belly white. Adult size up to 16 inches; weight to several pounds.

Distribution: The quillback, a carpsucker, ranges from Manitoba and the Lake States south to Florida and from the Rocky Mountains east to the Atlantic Coast. In Wyoming, it occurs together with the river carpsucker in the lower North Platte River, in some lakes near Torrington, and in the lower Laramie River.

Natural history: The plains form of the quillback differs from that of the Midwest and Atlantic Coast in having a lower dorsal fin and a more slender body, presumably in relation to a more extreme environment (Trautman 1957). More studies of this ecotype are needed. Breeding and food habits of the plains form of the quillback



have not been studied in detail.

Relation to man: The quillback is occasionally used as food but is not highly favored due to its boniness. Becker (1983) states that, of the carpsuckers in Wisconsin, the quillback is most frequently caught by anglers, and that its flesh is tasty, but admits that this species is not much used for food.

Nomenclature: The race of quillback occurring in the Missouri River drainage was formerly considered to differ from the eastern form of the quillback and was named *Carpiodes forbesi*. Simon (1951) used that name for carpsuckers from the lower North Platte River in Wyoming. After Trautman noted differences in the body form of eastern and western quillbacks, attributing them to ecological factors, Bailey and Allum (1962) placed *Carpiodes forbesi* in synonymy with *C. cyprinus*.

Literature references: *Carpiodes forbesi*. Simon 1951:52 (Ken French Reservoir, Goshen County, North Platte River).

Distinguished from:

the river carpsucker by its longer snout, the tip of which is usually well ahead of the anterior nostril;

from the carp by the absence of barbels and the absence of a serrate spine in the dorsal and anal fins.

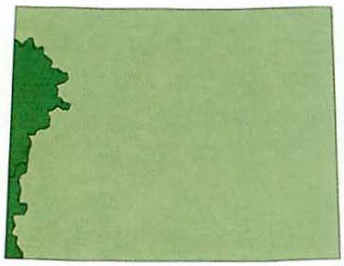
(In the North Platte drainage, the river carpsucker and the quillback probably hybridize, but the species are so similar in morphology that hybrids are very difficult to recognize.)

Utah sucker *Catostomus ardens*

Catostomus-- inferior mouth; *ardens*-- burning, in reference to the bright red coloration of breeding males

Description: Body elongate; head short; mouth inferior with relatively weak lips; lips without lateral notches; scales in the lateral series 60-70; dorsal rays 11-13; anal rays 7. Color bronze or coppery, white ventrally; breeding males with a bright red stripe. Adult weight up to 12 pounds, Wyoming's largest sucker.

Distribution: The Utah sucker is native to the Bonneville Basin and the Snake River drainage above Shoshone Falls. In Wyoming, this sucker is found in the Snake and Bear river drainages.



Natural history: This species lives in both lakes and streams. It is abundant in Jackson, Two Ocean, and Emma Matilda lakes in Teton County and is the most abundant sucker in the upper Snake River and in the Bear River in Uinta County. In Yellowstone National Park, it occurs in Witch Creek where water temperatures may exceed 80 degrees F (Simon 1951). Simon (1951) described spawning behavior of this sucker: On June 11, 1941, rosyside (Utah) suckers were observed spawning in inlets to Jackson Lake. One female was followed for a short distance by 2 males, 1 on either side and slightly behind her. As contact was made between the bodies of the three fish, all quivered rapidly and seemed to arch their backs, spreading out the dorsal fin to its fullest extent; eggs and milt were emitted at this time. Tails of the males vibrated violently, stirring up gravel and sand from the bottom of the stream. Simon noted also that 20% of the large suckers examined by Game and Fish personnel collecting lake trout eggs from Jackson Lake in September and October 1938, had trout eggs in their stomachs. Simon commented "whether their negative value as spawn eater is offset by their positive value as a trout food is yet to be determined". Feeding habits of the Utah sucker are similar to those of the white sucker. It feeds in streams by sorting food from the bottom materials. Like the white sucker, this species is sometimes taken on hook and line. Simon reported the capture of a 12 pound, 7 ounce Utah sucker on minnow bait in 1939. Simon noted the habit of this fish feeding on flotsam from the surface film of lake waters with the body held vertically. This behavior has been

observed in the oxbow of the Snake River below Jackson Lake Dam. White suckers sometimes exhibit this same feeding behavior (personal observation).

Relation to man: Young Utah suckers are sometimes used for bait in the Jackson Hole area.

Nomenclature: Simon (1951) called this species *Catostomus fecundus*. That name was used by Cope and Yarrow (1875) for the Webug sucker, a form which was found in Utah Lake, Utah, now believed to be a hybrid between *Catostomus ardens* and the June sucker, *Chasmistes liorus* (Sigler and Miller 1963).

Literature references: *Catostomus ardens*. Jordan 1891b:47-48 (Witch Creek, Heart Lake, Yellowstone National Park); Evermann 1892:42 (Snake River at Presidents Camp). *Catostomus fecundus*. Simon 1951:56-57 (Snake River Basin; Bonneville Basin).

Distinguished from:

the white sucker by the coarse pigmentation of the interradial membranes of its dorsal fin (see figures on page 35);

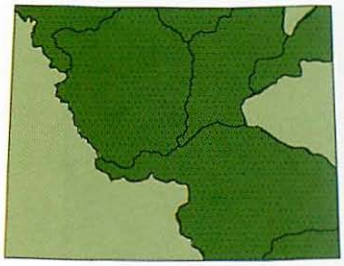
the mountain and bluehead sucker by the absence of a lateral notch in the lips.

Longnose sucker *Catostomus catostomus*

Description: Body slender; head moderate, flat; snout long; eye moderate; mouth inferior; lips fleshy, with a median ventral notch but no lateral notches; scales in lateral series 95-120; dorsal rays 9-12; anal rays 7. Color gray to black above, white or yellow below; a red lateral stripe often apparent in breeding males; young fish mottled. Adult length up to 24 inches.

Catostomus-- inferior mouth

Distribution: The longnose sucker occurs in both



North America and Asia. In North America, it ranges from above the Arctic Circle south to Colorado, east across the northern states to New England. In Wyoming, this species is native in Yellowstone Park in the Yellowstone River below the falls and in the Gardner River; it has been introduced into Yellowstone Lake. It is common in the Big Horn River drainage, in Clear Creek, Lake DeSmet, and in the Powder River above the mouth of Salt Creek. In the Black Hills, it is present

in Redwater and Sand creeks. It is common throughout the North Platte and South Platte river drainages. In South Dakota, Bailey and Allum (1962) found an isolated population of this species in the upper Belle Fourche River drainage.

Natural history: The longnose sucker prefers cooler water. It is the most common sucker in montane and subalpine lakes in the Medicine Bow Mountains where the white sucker is rare. It is not found in the turbid waters of the larger rivers in the northeastern counties. Spawning resembles that of the white sucker, but is initiated at lower water temperatures. Geen et al. (1966) found that, in inlets to Sixteen-Mile Lake in British Columbia, the spawning migration was initiated when water temperatures reached 41 degrees F; the white sucker migrated when the water had warmed to 50 degrees F. Two to 4 males escort a female when spawning, the males "apparently either clasping the female with their pelvic fins or vibrating against her with the anal fin." These same investigators reported that eggs of the longnose sucker hatched in 8 days at 59 degrees F and in 11 days at 50 degrees F. In the Medicine Bow Mountains, the longnose sucker spawns in Telephone Creek, inlet to Towner Lake, in June and July, and spawning aggregations in shallows of Towner Lake itself have been observed. The study in British Columbia showed that both this species and the white sucker are long-lived. A few adult fish marked while spawning in 1957 returned as many as 5 successive years to spawn. Simon (1951) reported that the food of the longnose sucker is almost entirely plant material. Brown and Graham (1954) found that stomachs of this species from streams tributary to Yellowstone Lake contained about two-thirds vegetable material and that suckers from the lake proper had fed upon crustacea and midges. Hepworth (1959) reported about one-fourth of the stomach contents of longnose suckers from Towner Lake was animal, including midges, caddis, cladocera and snails; stomach contents also included algae, Elodea, and detritus. When available, trout eggs may be

eaten by longnose suckers (personal observation).

Relation to man: Rawson and Elsey (1948) reported that reduction in longnose suckers in Pyramid Lake in Alberta did not substantially increase the survival of rainbow trout planted as fry. In lakes in the Medicine Bow Mountains, sucker populations are sometimes very dense, and competition for space and food with brook trout seems likely. Johnson (1982) found that, in Upper Sunshine Reservoir in Park County, longnose suckers compete to some extent for food and space with cutthroat trout. Some lakes in the Big Horn Mountains have been treated with rotenone to eliminate longnose suckers.

Nomenclature: Two subspecies of the longnose sucker, *catostomus* and *griseus* were recognized by Simon (1951) and other authors. These races have not been found to be consistently distinct in different geographic areas.

Literature references: *Catostomus (Acomis) griseus*. Girard 1856:136 (Sweet Water fork of Platte River). *Acomis griseus*. Girard 1858:222 (Sweetwater Fork of Platte River, Nebraska). *Catostomus griseus*. Jordan 1891b:46-47 (Yellowstone and Gardiner rivers below the falls, Yellowstone National Park); Evermann and Cox 1896:391 (North Platte River, Douglas). *Catostomus catostomus*. Evermann and Cox 1896:391 (North Platte River, Deer Creek, Glenrock; Clear Creek, Clermont [sic]; Powder River, Arvada; Big Goose Creek, Sheridan; south fork of Tongue River, Sheridan). Simon 1939:30 (Yellowstone River below the falls, Gardiner River, Slough Creek, Yellowstone Lake, and Pelican Creek, Yellowstone National Park). *Catostomus catostomus catostomus*. Simon 1951:57 (Yellowstone and Shoshone rivers and their tributaries; Class Lake, Snowy Range: Laramie River; Lake DeSmet). *Catostomus catostomus griseus*. Hubbs et al. 1943:14-19:58-60 (hybridization: Laramie River, Sweetwater River); Simon 1951:58 (Platte and upper Missouri river drainages).

Distinguished from:

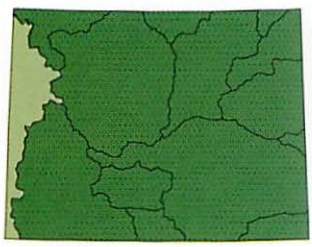
the white sucker by its longer snout, its lateral stripe and smaller scales, mottling on fingerling longnose suckers, and the lack of three lateral dark spots seen in fingerling white suckers;

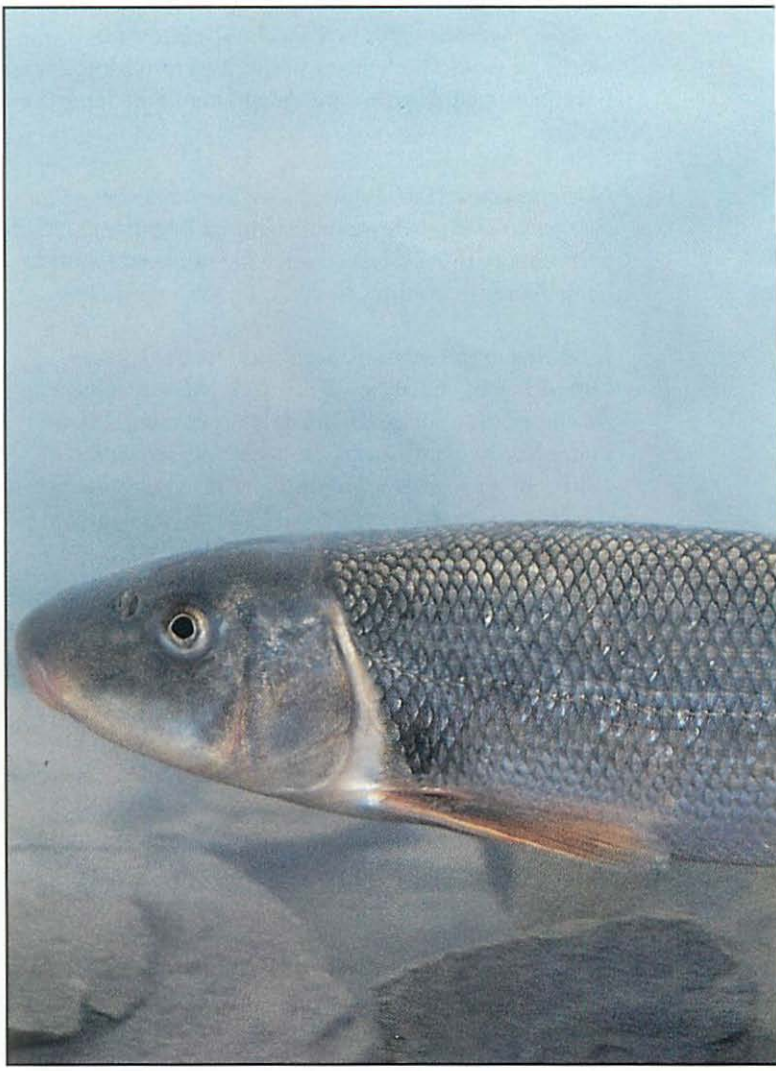
from the mountain sucker by the absence of the lateral notch on its lips.

White sucker *Catostomus commersoni*

Catostomus-- inferior mouth; *commersoni*-- after Dr. Philbert Commerson

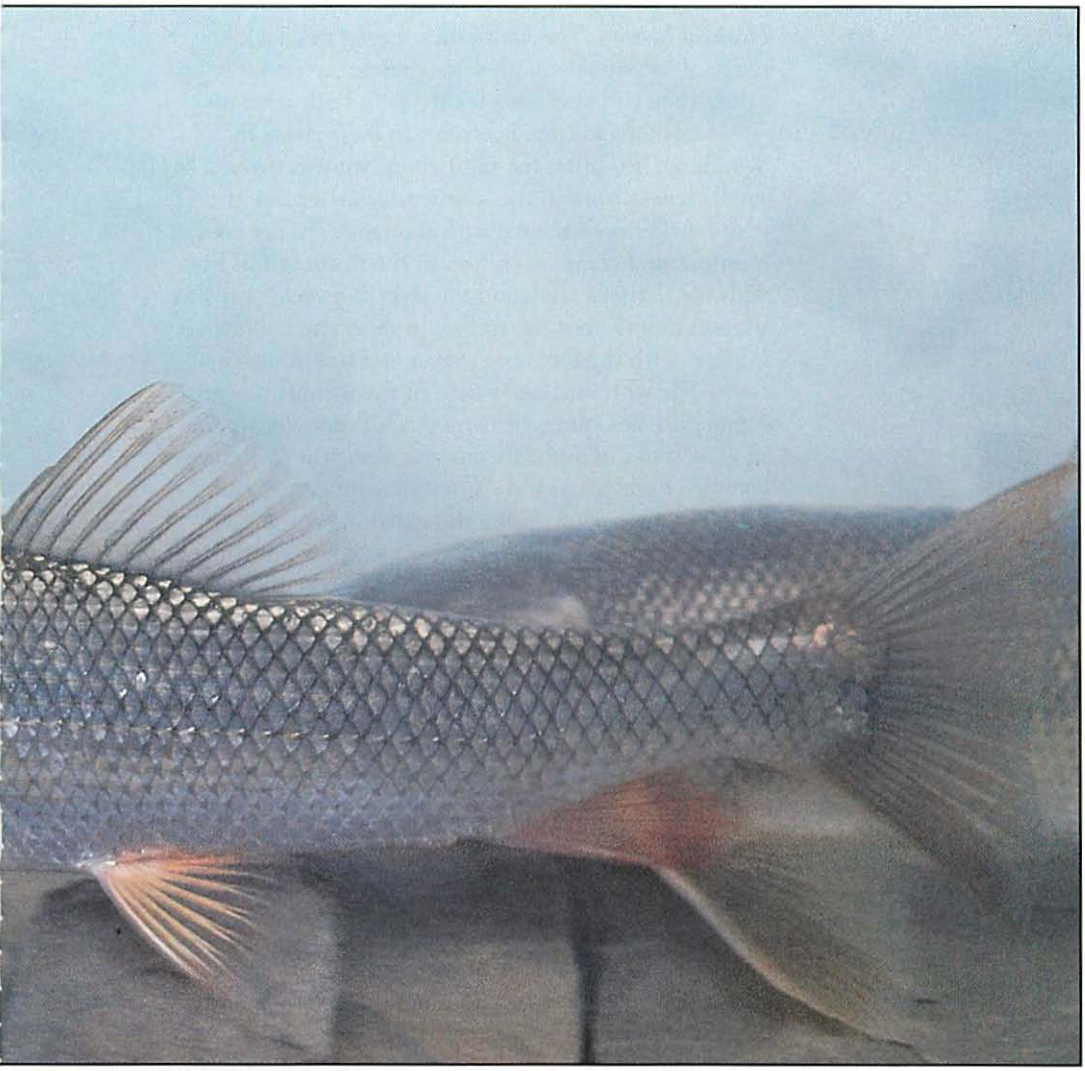
Description: Body elongate and fusiform; anal fin elongate; head moderate; mouth inferior; lips papillose but narrower than the lips of the longnose and flannelmouth suckers; lips without a lateral notch; scales in the lateral series 65-75, crowded anteriorly; dorsal rays 11-13; anal rays 7. Breeding males with large tubercles on the anal and paired fins, smaller tubercles on the dorsal surface. Color dusky to black above, shading to white below. Breeding males are coppery or





bronzy colored; during the spawning act, the males may become very black dorsally; this color phase is evident only in spawning congregations. Young fish up to about 4 inches in length have 3 quite conspicuous darker spots on the side. Adult weight rarely over 2 pounds in Wyoming.

Distribution: The white sucker is widespread in North America, from the Rocky Mountains east to the



Atlantic Coast and from the Arctic Circle south to northern Georgia, Alabama and Louisiana. In Wyoming, it occurred in 63 of 107 collections from habitats east of the Continental Divide in the survey made in the 1960s. It is less common in the turbid streams of the northeastern counties. This species has been inadvertently introduced into streams west of the Continental Divide and occurs in both the Green and Little Snake river drainages.

Natural history: The white sucker tolerates a wide range of habitats but with some preference for clear rather than turbid waters. It thrives in both lakes and streams but avoids rapid current. In large rivers in Wyoming, it is often the most abundant fish species. In small clear streams in the southeastern counties, the white sucker is associated with the creek chub, brassy minnow, and common shiner. In the northeast, it lives with the flathead chub and the river carpsucker only in streams that are not too turbid. In montane habitats, it is found with the longnose sucker and the trout populations. The white sucker spawns in the spring and early summer in Wyoming. Spawning adults congregate in shallow water in both streams and along the shoreline of lakes over gravel or sand. When spawning, males are densely tuberculate; during the spawning act, males become very black dorsally and white below. In the spawning act, there is no organized construction of a nest; the activities of adult fish over gravel beds create depressions where the fertilized eggs are deposited. The adhesive eggs are glued to the substrate and probably partially covered by this same activity. Females join a group of active males, one or a few at a time, and a single female usually pairs with 2 males, 1 on either side and with the pectoral fins spread beneath the female. The nuptial tubercles of the males assist in holding the three fish together as the eggs and milt are released (Reighard 1920).

The white sucker displays a wide range in its choice of food. It feeds primarily at the bottom of sand- and gravel-bottomed streams, dimpling the substrate with depressions created as it sorts the bottom material for food. Simpson (1941) noted that animal food, including

insects and crustacea, makes up a major part of the diet. In 23 stomachs of lake-dwelling white suckers examined, only 4.3% by volume was algae. From stream dwellers, only 0.05% was algae. He noted that the white sucker may feed upon the eggs of other fish. Simon (1951) reported that 5 white suckers taken from Pathfinder Reservoir had fed only on small crustaceans. Schools of adult white suckers sometimes feed on floating organic materials at the surface of lakes. This has been observed in Lake Hattie Reservoir. The same behavior, by Utah suckers, has been observed in oxbow ponds of the Snake River below Jackson Lake Dam.

Relation to man: The white sucker is an important forage fish and is often used as bait. In some northern states, the white sucker is often used for food. Its flesh is considered good although bony and not as firm as that of game fishes. It is sometimes smoked or pickled. Many of the large reservoirs east of the Continental Divide have dense populations of white suckers, and its massive spring spawning migrations into inflowing streams make this fish susceptible to trapping or seining. Among the suckers of Wyoming, the white sucker has the greatest potential as a food fish. Becker (1983) had high praise for the white sucker, stating that this species "is potentially the most valuable food and sport fish in Wisconsin." The white sucker sometimes overpopulates a fishery to the detriment of game fish populations.

Literature references: *Catostomus commersonii*. Evermann and Cox 1896:392-394 (Deer Creek, Glenrock; North Platte River, Glenrock and Douglas; Beaver Creek, Newcastle; Clear Creek, Clermont [sic]; Powder River, Arvada; south fork of Tongue River, Sheridan; Big Goose Creek, Sheridan). *Catostomus commersonii sucklii*. Hubbs et al.1943:14-19 (hybridization, Laramie River, Albany County); Simon 1951:54-55 (Missouri River drainage) *Catostomus commersoni commersoni*. Personius and Eddy 1955:41-42 (Little Missouri River).

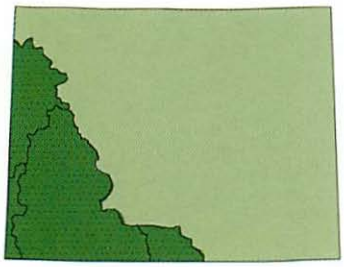
Distinguished from:

the longnose sucker by its larger scales and longer snout (fingerling white suckers can be recognized by their three dark lateral spots);

the Utah sucker by its lack of coarse pigmentation in the interradial membranes of the dorsal fin rays (see figures on page 35).

Bluehead sucker *Catostomus discobolus*

Catostomus-- inferior mouth; *discobolus*-- disc-thrower, probably in reference to the disc-like nature of the mouth



Description: Body elongate; caudal peduncle narrow; head short; eye moderate; mouth large; upper lip expanded with lateral notches and cartilaginous biting edges on the jaws inside the lips; lateral line scales 90-115; dorsal rays 9-12; anal rays 7. Adult color dusky gray or greenish; head blue above; body shading to bright yellow or white ventrally. Young fish dusky above and white below. Adult length up to 18 inches or more, the largest of the suckers belonging to the subgenus *Pantosteus*.

Distribution: The bluehead sucker occurs in the Colorado and Green river basins, the Bonneville Basin, and in the Snake River above the Great Falls. In Wyoming, this species is found in the Little Snake, Green, Bear and Snake river drainages. It is relatively rare in the state in comparison with the mountain and other suckers.

Natural history: The bluehead sucker usually occurs in the main current of streams. It was common in the Green River near Big Piney at the time of the chemical treatment in 1963 and was collected in the 1960 survey from the Bear River, Savery Creek, tributary to the Little Snake, and the Smith Fork of the Bear River near Cokeville. In Jackson Hole, it is found in the Snake River and in Fish Creek. It is found in large numbers in pools in Muddy Creek, tributary to the Little Snake River in Carbon County. The streamlined body form and narrow caudal penduncle indicate that this fish is adapted to living in strong currents of larger rivers. Spawning has been observed in Ditch Creek, tributary to the Snake River in Teton County in June (Jon Erickson, personal communication). Food is mostly algae, but includes small bottom-dwelling invertebrates. Simon (1951) reported his observation of bluehead suckers inverting their bodies to feed on algae on the underside of submerged boulders in the shallows of Lower Green River Lake.

Nomenclature: The bluehead sucker was originally named *Catostomus discobolus* by Cope (1872). That

species name was assigned to the flannelmouth sucker (Hubbs et al. 1943), and Simon (1951) used it for the flannelmouth sucker. The name *Pantosteus delphinus* assigned by Jordan (1891b) was used for the bluehead until Smith (1966) clarified the taxonomy, returning Cope's original name to this species when he reduced *Pantosteus* to a subgenus of Catostomus and relegated *Pantosteus virescens* to synonymy with *discobolus*.

Literature references: *Catostomus discobolus* Cope 1872:435 (original description: "Two specimens, one certainly, the other probably from the Green River, Wyoming"). *Pantosteus delphinus delphinus*. Hubbs et al. 1943: Plate V (Green River at Green River, Wyoming). *Pantosteus delphinus*. Simon 1951:60-61 (Colorado River drainage, including the Little Snake River). *Pantosteus virescens*. Sigler and Miller 1963:103 (Bear River at Evanston, Wyoming). Smith (1966):96 (*Pantosteus* = *Catostomus*; *delphinus* = *discobolus*; synonymy, zoogeography, evolution).

Distinguished from:

the mountain sucker by its larger size, by its narrower caudal peduncle, by the blue head of the adult fish, and by the pigmentation of the interradial membranes of its caudal fin;

other Wyoming suckers by the lateral notches in its lips.

photo courtesy of the Colorado Division of Wildlife

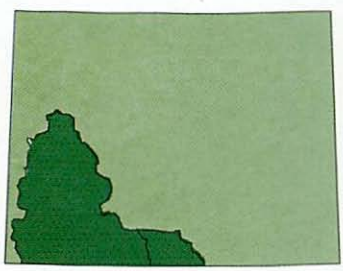
Flannelmouth sucker *Catostomus latipinnis*

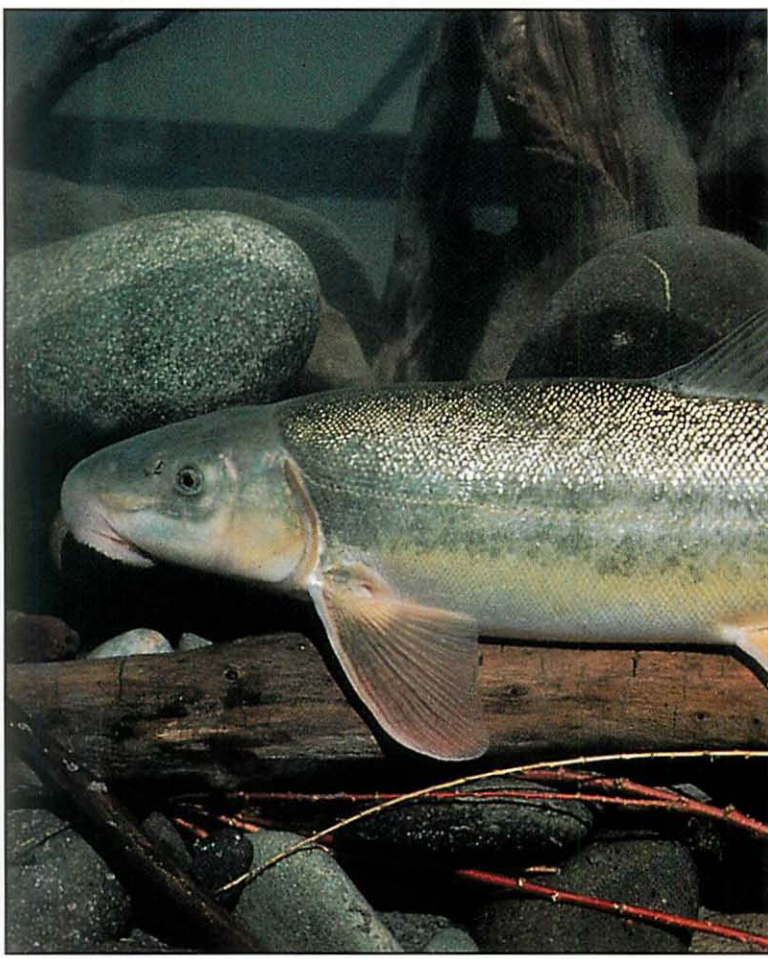
Catostomus-- inferior mouthed; *latipinnis*-- broad fin in reference to the large dorsal fin

Description: Body slender; caudal peduncle very narrow; dorsal fin large and sickle-shaped; caudal fin quite deeply forked; head short; eye moderate; lips thick; 5-8 rows of papillae in the upper lip; scales small, 98-105 in the lateral line; dorsal rays 11-13; anal rays 7. Color dusky above; dorsal and lateral pigmentation sharply demarked from the white belly; large adults become very bright yellow with red fins and the thin margin of the operculum yellow. Size to 22 inches or more.

Distribution: The flannelmouth sucker is native to the Colorado River drainage basin. In Wyoming, this species occurs in the Green and Little Snake river drainages.

Natural history: The preferred habitat of this fish is large rivers, but it is found in smaller streams and occasionally in lakes. It is common in Muddy Creek in





Carbon County and is abundant in Burnt Lake near Pinedale and in Flaming Gorge Reservoir. Its ecology in lakes has not been studied in detail. Sigler and Miller (1963) stated that this species is unknown from natural lakes in Utah. Spawning habits have not been described in detail. Like other suckers of this genus, it ascends streams in the spring to spawn. The flannelmouth sucker is mainly herbivorous; however, it has been accused of eating trout eggs (Simon 1951).

Nomenclature: Simon (1951) used the trinomial *Catostomus latipinnis discobolus* for the flannelmouth sucker. Subspecies of this fish are not recognized today, and, as Smith (1966) noted, *discobolus* is the name given to the bluehead sucker by Cope (1872).

Literature references: *Catostomus latipinnis discobolus*. Simon 1951:58 (Green River and Little Snake River).

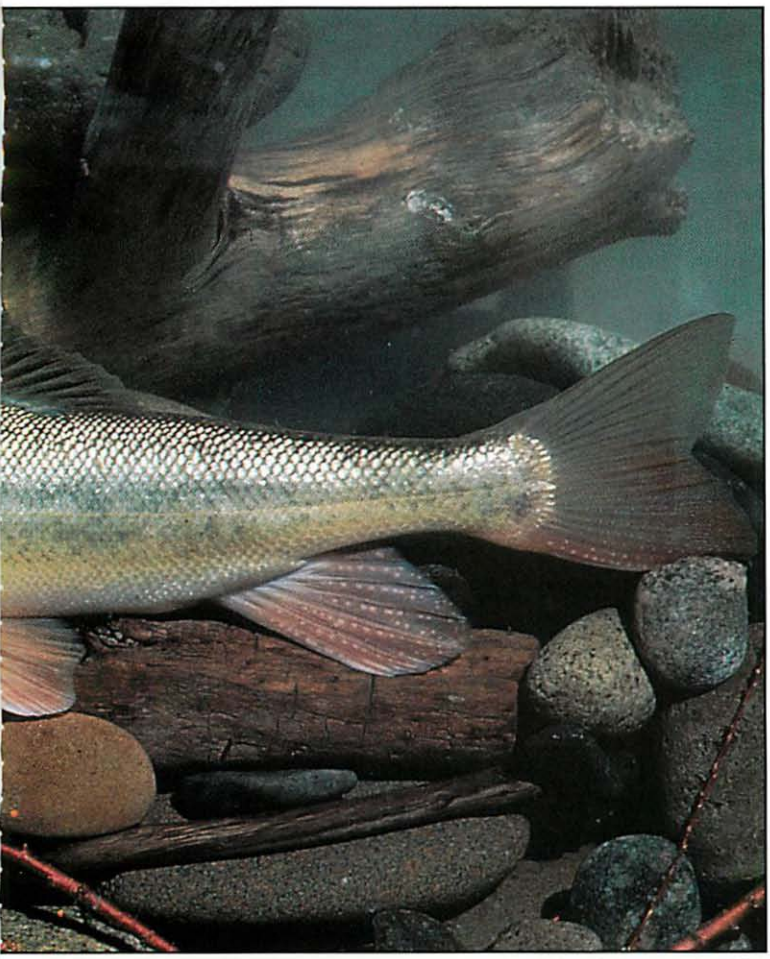


photo courtesy of the Colorado Division of Wildlife

Distinguished from:

other suckers by the lack of a lateral notch in its lips, by its narrow caudal peduncle, and by its large, sickle-shaped dorsal fin (large adults are easily recognized by their yellow color).

(Hybrids with the white sucker commonly occur in drainages west of the Continental Divide where the white sucker has been introduced. Hybrids are coppery colored and superficially resemble the Utah sucker.)

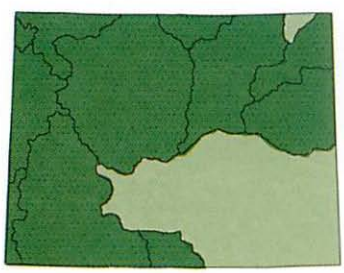
Mountain sucker *Catostomus platyrhynchus*

Catostomus-- inferior mouth; *platyrhynchus*-- flat snout

Description: Body quite slender, rounded; fins rounded; caudal peduncle relatively deep; head short; eye moderate; mouth with lateral notches and cartilaginous biting edges; scales in the lateral line usually 75-92; dorsal rays 8-13, usually 10; anal rays 7. Breeding males tuberculate. Color dusky above shading to yellow or red laterally; breeding males with a vivid red lateral band; breeding females gray or yellow laterally. Both sexes in life have a series of dark dorso-lateral blotches which are conspicuous in schooling fish. Size up to about 8 inches, rarely over 6 inches in Wyoming.

Distribution: The mountain sucker ranges from California to western South Dakota and Nebraska and from southern Alberta and Saskatchewan to southern Utah. In Wyoming, this species is common in all drainages west of the Continental Divide and, east of the Divide, in the drainages of the northern and northeastern counties. It is absent from the Niobrara and South Platte river drainages and extremely rare, probably extirpated, in the North Platte River drainage today. Simon collected it from Pickett Lake, North Platte River drainage, in 1938, and it was collected from the Sweetwater River in the 1930s. It ranges to an elevation of nearly 10,000 feet in the Wind River Mountains.

Natural history: This sucker lives in a wide variety of habitats, including larger rivers, creeks at lower elevations, and montane lakes and streams. Spawning takes place in the late spring and early summer. Simon observed the mountain sucker spawning in Jackson Hole on June 25. Smith (1966) observed spawning near Salt Lake City, Utah, in late May. In 1967, males of this species in brilliant breeding colors were observed escorting females along the shoreline of an unnamed alpine lake near North Fork Lake in the Wind River Mountains on August 4, but no spawning was observed. Some of the females were half again as large as the escorting males and were drab-colored in contrast with the bright red males (personal observation). Hauser (1969) reported that both male and female mountain suckers develop a reddish orange stripe along the lateral line when spawning. He found that some females became sexually mature by age 3, males by age 2, and recorded egg numbers ranging from 990 to 3,710. Food of the mountain sucker consists of algae and some invertebrate animals. Algae are scraped from the rocks by means of the cartilaginous biting edges of the jaws.



Simpson (1941) reported on the stomach contents of 14 mountain suckers from the Bear and the Sweetwater rivers. These contained about 21% animal material and only 13% plant material. But the percentage occurrence was 100% for plant material and 66% for animal material. Animal remains included midge larvae and some caddis.

Relation to man: The mountain sucker is widespread in the mountains, small in size, and feeds on algae, so it is potentially an important link in the food chain of trout. Simon (1938) recommended that the mountain sucker be introduced to the Snowy Range in the Medicine Bow Mountains as food for trout, but this was apparently never attempted.

Nomenclature: Populations of mountain suckers on the east side of the Continental Divide were named *Pantosteus jordani* by Evermann (1892), and that name was used by Simon (1951). Miller (1958) relegated *jordani* to synonymy with *platyrhynchus*. Smith (1966) reduced *Pantosteus* to a subgenus of *Catostomus*.

Literature references: *Pantosteus jordani*. Evermann and Cox 1896:389-390 (Beaver Creek, Newcastle; Powder River, Arvada; Clear Creek, Clermont [sic]; south fork Tongue River, Sheridan; Big Goose Creek, Sheridan); Hubbs et al. 1943:58 (hybridization, Sweetwater River); Simon 1951:61-62 (Upper Missouri and Columbia River watersheds). *Pantosteus platyrhynchus*. Simon 1951:159-60 (Snake River and Bear River drainages). *Catostomus (Pantosteus) platyrhynchus*. Smith 1966:58-72 (all Wyoming drainages except the Belle Fourche, Little Missouri, Niobrara, and South Platte river drainages).

Distinguished from:

the bluehead sucker by its deeper caudal peduncle and the absence of pigmentation in the interradial membranes of its caudal fin;

other Wyoming suckers by the lateral notch on its lips.

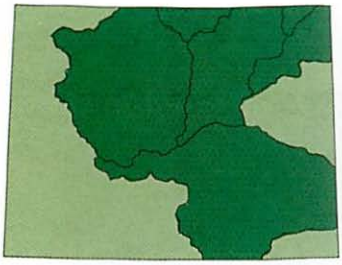
Shorthead redhorse *Moxostoma macrolepidotum*

Moxostoma--sucking mouth; *macrolepidotum*--large scales

Description: Body elongate, moderately robust; head short; eye large; lips thick and plicate; scales in the lateral series 41-48; dorsal rays 13; anal rays 7. Both sexes finely tuberculate when breeding. Color greenish or bronzy above, golden or silvery laterally, yellow or white below; body speckled from pigmentation of base of dorsal scales; dorsal fin orange or red; paired and caudal fins usually bright red, shading to purple. Size of adults as much as 20 inches and several pounds in weight.

Distribution: The shorthead redhorse ranges from Saskatchewan and Montana east to the Atlantic Coast and south to Oklahoma. In Wyoming, the shorthead redhorse is found east of the Continental Divide at lower elevations in most drainages. There are no records for this species in the Cheyenne, Niobrara, and South Platte river drainages.

Natural history: The preferred habitat is medium-sized clear streams and some lakes. It does not thrive in small creeks. In Wyoming, this sucker is found at lower elevations, principally in habitats with intermediate temperatures and lower turbidities. Meyer (1962) studied the biology of this sucker in Iowa. In the Des Moines River, the northern redhorse sucker spawned in late April in water temperatures of 52 degrees F. Both



sexes became tuberculate when spawning. Males preceded the females to the spawning area and the stay of the female on the spawning grounds was brief. The species matured at 3 years of age. Some 15,000 to 30,000 eggs were produced per female. Food consisted of aquatic insects, including midges, mayflies and caddis flies (Meyer 1962).

Distinguished from:

all other Wyoming suckers by its plicate lips and bright red fins.

Relation to man: The shorthead redhorse is not so widely used for human consumption as is the white sucker. Brown (1971) commented that the flesh is "fair, particularly if fish are harvested in the spring when waters are cold."

Nomenclature: This redhorse was formerly called *Moxostoma aureolum* (Simon 1951). That name was replaced with *Moxostoma macrolepidotum* by Hubbs and Lagler (1958). More recently, the common name was changed from "northern" to shorthead redhorse.

Literature references: *Moxostoma aureolum*. Evermann and Cox 1896:394-395 (North Platte, Douglas and Casper; Deer Creek, Glenrock; Clear Creek, Clermont[sic]); Simon 1951:62-63 (Big Horn, North Platte, Tongue and Belle Fourche rivers and their tributaries; Lake DeSmet, Guernsey reservoirs).

other suckers formerly found in Wyoming

Two species of suckers that were found in Wyoming but have apparently been extirpated or become extinct are the Snake River sucker, *Chasmistes muriei*, and the razorback sucker, *Xyrauchen texanus*.

A single specimen of the Snake River sucker was found, dead, in the Snake River below Jackson Lake Dam, by Dr. Olaus Murie in 1927. The specimen was sent to Dr. Carl Hubbs then Curator of Fishes at the University of Michigan Museum of Zoology who tentatively identified it as a June sucker, *Chasmistes liorus*, a species native to Utah Lake, Utah (Miller 1965). Miller and Smith (1981) named the species *Chasmistes muriei*, described from the single known specimen.

Suckers of the genus *Chasmistes* are relatively large fish with an almost terminal mouth. They evolved in pluvial lakes in the Great Basin and Klamath Lake basins where different species are known to have lived in Pyramid Lake, Nevada, Klamath Lake, Oregon, and Utah Lake, Utah. All but the cui-ui sucker from Pyramid Lake have either become extinct or are believed to be endangered.

The Snake River sucker found by Dr. Murie probably had lived in Jackson Lake. Collections of fish from that lake have failed to reveal the presence of the Snake River sucker there today.

The razorback sucker, *Xyrauchen texanus*, is a large sucker, uniquely characterized by a pronounced sharp-ridged hump in adult fish just behind the head. Its bizarre hump is an adaptation to living in the torrential waters of the Colorado and Green rivers.

Today the razorback sucker is found in the Colorado River drainage in Arizona, Colorado and Utah, where it is listed as "endangered" under the Endangered Species Act. Prior to 1963, the razorback sucker was found in the Green River below the city of Green River in Sweetwater County. It has not been collected from the Green River in Wyoming since construction of Flaming Gorge Reservoir.

Family Ictaluridae

Bullhead catfishes

Catfishes take their name from the conspicuous whisker-like barbels on their heads. Formerly in the order Cypriniformes, they are now classified in the order Siluriformes. This order is a companion to the order of minnows and, like the minnows, is characterized by possession of the Weberian apparatus. The order of catfishes contains many families, most of which are found in fresh waters of South America, Africa and Southeast Asia.

The four species of catfishes found in Wyoming today are contained in a single family, the bullhead catfishes, which family occurs only in freshwaters of North and Central America.

Catfishes differ from minnows and suckers in lacking scales (some have bony plates), in having teeth in the jaws, and in the presence usually of 2 to 4 pairs of barbels on the head. Catfishes have an adipose fin. There is often a bony spine in the dorsal and pectoral fins. When such spines are associated with venom glands in the skin, a puncture wound from a fin spine can be very painful.

Bullhead catfishes are carnivorous; many are scavengers, feeding primarily on the bottom where they use their barbels together with taste buds on the body surface to locate food.

Catfishes normally deposit their eggs in some sort of nest. One or both parents of most bullhead catfishes guard the nest and newly hatched young.

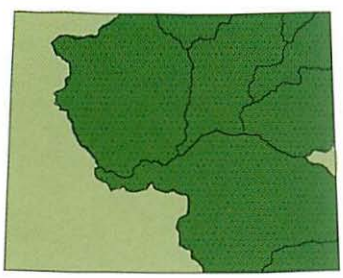
Catfishes are important both as game and food fishes. Catfish farming has become an important industry in the United States in recent years.

Black bullhead *Ameiurus melas*

Ameiurus-- caudal fin not notched; *melas*-- black

Description: Body stout; caudal fin only slightly notched; head large; eye small; mouth large; body scaleless; dorsal and pectoral fins with a bony spine and 7 rays; pectoral fin with a spine; anal rays 17-21; adipose fin present, free from the body posteriorly. Color above black, green, or yellow but not mottled; ventral surface and sides yellow or gray-green. Membranes of the anal fin jet black; young fish jet black. Adult weight up to 2 pounds or more; usually less than one-half pound in Wyoming.

Distribution: The black bullhead ranges from New York west to the Rocky Mountains and from Manitoba south to Tennessee. It has been introduced in the southern and western United States. In Wyoming, this species is found at lower elevations, mostly in the north and northeastern counties, east of the Continental Divide. Whether or not the black bullhead is native to Wyoming is questionable. Simon (1951) indicated that it is native to the North Platte River and some northeastern drainages, but it was not collected by Evermann and Cox (1896) in habitats they surveyed in central and northeastern Wyoming before the turn of the century.



Natural history: The black bullhead prefers small muddy lakes but is often found in pools in rivers and smaller streams. The relatively cool waters of Wyoming are marginal habitat for this species, and it seldom exceeds 10 inches in length. The black bullhead usually lays its eggs in a nest or depression; sometimes eggs are attached to aquatic plants. The nest is guarded by an adult fish, either male or female, and they continue to escort the fry after the eggs hatch. After escorting by an adult is discontinued, young bullheads often remain in compact schools for some time. In Joe Johnson Reservoir in Platte County, such schools of young black bullheads were observed to remain intact over their first winter of life. Black bullheads are said to eat almost anything that is digestible, including carrion, but their diet consists primarily of aquatic invertebrates and some small fish.

Relation to man: The bullhead is quite a good food fish

and is favored by anglers as a fish that is easily caught in a leisurely manner—with a cane pole. Bullheads are extremely hardy and tenacious of life. They are frequently planted into farm ponds but may overpopulate a pond and become stunted. In Wyoming, bullheads sometimes provide a source of recreational fishing in warm and turbid waters that are unsuitable for other fish. Care should be exercised in handling a bullhead. The fin spines are associated with venom glands, and a puncture by a spine is temporarily very painful, but the effects of the venom are not life-threatening.

Nomenclature: Simon (1951) used Ameiuridae for the catfish family and *Ameiurus melas melas* for the black bullhead. Bailey (1956), following the recommendation of Taylor (1954) adopted the name Ictaluridae for the family and included the bullheads in the genus *Ictalurus*. Recent revisions have returned the bullheads to the genus *Ameiurus* (Bailey and Robins 1988).

Literature references: *Ameiurus melas melas*. Simon 1951:93 (probably native, some drainages); Personius and Eddy 1955:42 (Little Missouri River).

Distinguished from:

brown bullheads (whose presence in Wyoming is only provisional) by the weak serrations in its pectoral spine and by the black interradial membranes in its anal fin;

yellow bullheads (reported in southeastern Montana) by its lack of white or yellowish chin barbels;

flathead catfish (provisional in Wyoming) by its lack of a protruding jaw and by the absence of serrations on the anterior edge of its pectoral fin spine;

other Wyoming catfishes by its relatively square caudal fin and the fact that its adipose fin is not attached along its entire length.

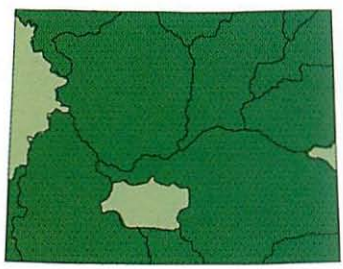
Channel catfish *Ictalurus punctatus*

Ictalurus-- fish-cat; *punctatus*-- spotted

Description: Body slender, streamlined in young fish; caudal fin deeply forked; head moderate; eye moderate; mouth large; lateral barbels long, extending beyond the gill opening; body scaleless; dorsal and pectoral fins with a spine; soft dorsal rays 16; anal rays 25-30; adipose fin large, not attached along its entire length. Color blue-gray above, fading to white on the belly; young fish with a number of small round black spots scattered over the body; these fade to dusky blotches in older fish and disappear entirely in adults. Weight to 55 pounds in some areas.

Distribution: The channel catfish ranges from the prairie provinces of Canada and the state of Montana east through the Lake States, south to Florida and northern Mexico. Introduced into the western United States. In Wyoming, the channel catfish is native to the rivers of the Missouri River drainage. It occurs today in several of the drainages east of the Continental Divide at lower elevations and has been introduced into the Little Snake and Green river drainages west of the Divide.

Natural history: This important game fish prefers larger rivers and tolerates turbid habitats. When the channel catfish is living in streams, adults rest in pools and under submerged logs or rocks in the daytime, moving into shallow water and the current at night to feed. Young catfish inhabit shallow riffles and turbulent areas near sand bars (Davis 1959). This species may spawn in either lakes or streams. Eggs are laid in dark places that are protected from intrusion. Under natural conditions, this may be in a burrow or beneath a submerged boulder. Channel catfish will spawn in submerged cream cans, wooden boxes painted black on the inside, or specially made earthenware crocks if no other cover is available. Males select breeding sites and clean them of extraneous debris by fanning with the fins. Mating pairs are formed at the time of nest selection, but the female does not participate in the cleaning process. According to Brown (1942), after the debris is cleaned from the nest (in this case a submerged keg), a mucous secretion is liberated by the male on the lower inner surface of the nest site. The female is then "lured" or driven into the keg and spawning consummated. The male sometimes then eats the eggs—17% of the time in Brown's observations. Females apparently spawn but once a year and with only one male. The channel catfish is omnivorous as an adult, feeding on a wide



variety of items including algae, plants, terrestrial insects, dead fish, and garbage. In streams, larger fish are quite predacious.

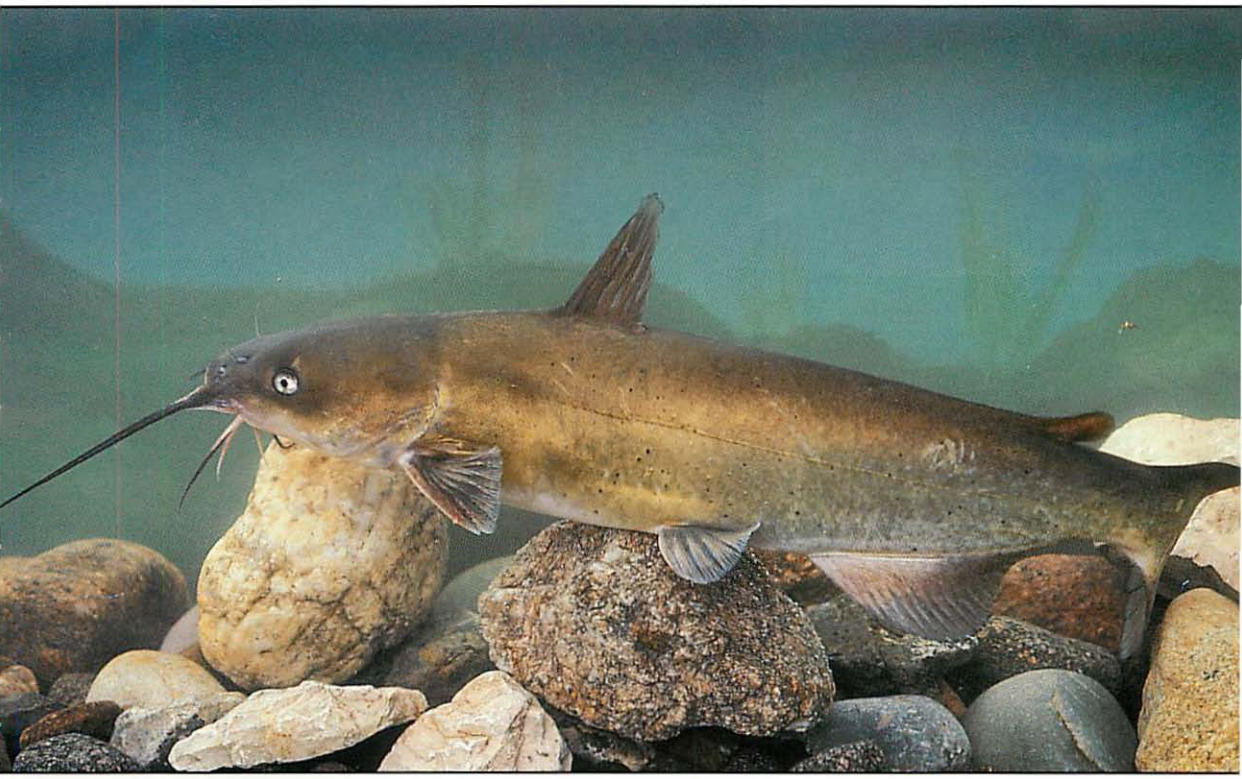
Relation to man: The channel catfish is managed as a game fish in lakes throughout the United States and is widely propagated commercially. It is highly regarded as a food fish. In northeastern Wyoming, the channel catfish is an important game fish in the lower Powder River, in Keyhole Reservoir, in the lower Belle Fourche River. In southern Wyoming, channel catfish are present in Grayrocks Reservoir, in the lower North Platte River drainage, in the Little Snake River in Carbon County, and in the lower Green River. Channel catfish for planting in Wyoming are obtained from federal hatcheries and from hatcheries of neighboring states through trades of trout eggs for catfish.

Literature references: *Ictalurus punctatus*. Evermann and Cox 1896:386 (Clear Creek at Clermont [sic]); Simon 1951:92-93 (North Platte, Belle Fourche, Little Powder, and Little Missouri rivers; introduced into the Green River); Personius and Eddy 1955:42 (Little Missouri River).

Distinguished from:

other Wyoming catfishes by its deeply forked caudal fin.

(The blue catfish also has a deeply forked caudal fin but is not known from Wyoming habitats.)



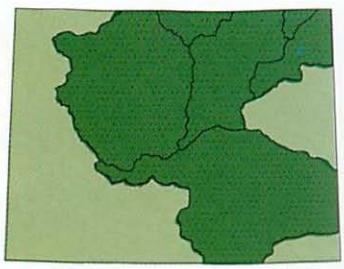
Stonecat
Noturus flavus

Noturus-- back-tail; *flavus*-- yellow

Description: Body elongate; adipose fin low and adnate; caudal fin rounded; head strongly flattened dorsoventrally; eye small; dorsal with a spine and 6 rays; anal rays 15-19; pectoral fin with a spine. Color yellow, green or brown, shading to yellow or white on the belly; dorsal fin with a dark base; dorsal and caudal fins with a pale border. Adult size up to 12 inches in length; rarely over 8 inches in Wyoming.

Distribution: This little catfish ranges from the Rocky Mountains east to New York State and south to Alabama and Oklahoma. In Wyoming, it occurs in the North Platte, Belle Fourche, Powder, Tongue, and Big Horn river drainages. Bailey and Allum collected it from the Cheyenne River drainage in South Dakota, but it was not collected from this drainage in Wyoming by the survey made in the 1960s.

Natural history: The stonecat lives in the current and likes rubble under which it can hide, but it may be found in slower water. This species nests beneath the same rubble that is its preferred dwelling place. Adults guard the nest and probably escort the newly hatched



young. Dobie et al. (1948) wrote: "The eggs are laid in depressions under boards and rocks during June and July. The nest is watched by the adult. The young remain in the nest for some time after hatching." Those same authors noted that, in southern Minnesota, the stonecat is believed to subsist mainly on aquatic insect larvae and earthworms (Dobie et al. 1948). It is semi-predacious, sometimes feeding on other bottom-dwelling fishes.

Distinguished from:

other catfishes by its adnate adipose fin.

Relation to man: The stonecat is too small to be of great value as a food or sport fish, but it is easily caught, and sometimes favored by young fishermen. The poison glands of this fish are well developed, and the venom apparatus is more elaborate than in the bullhead or channel catfish. The sting from one of the spines is painful but not dangerous, barring secondary infection.

Literature references: *Noturus flavus*. Evermann and Cox 1896:388 (Platte River, Douglas; Beaver Creek, near Newcastle; Powder River, Arvada; Big Goose Creek, Sheridan); Simon 1951:94 (lower elevations in most drainages in Wyoming).

Family Esocidae

Pikes, pickerels

This family contains the pikes and pickerels. Pikes are predacious fishes with a large mouth, many large teeth, and an elongate snout resembling the beak of a duck. The elongate body with the dorsal fin situated far back on the body and opposite the anal fin accommodates rapid acceleration associated with an ambushing mode of predation.

Pikes are found only in the northern hemisphere in North America and Eurasia. They inhabit lakes and large rivers with an abundance of vegetation.

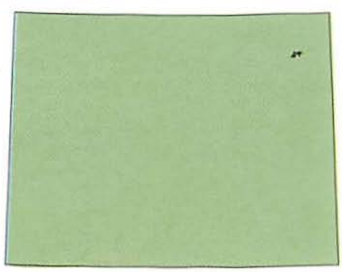
The "walleyed pike" is not a true pike, but belongs to the perch family.

Northern pike *Esox lucius*

Esox-- an old name of the pike; *lucius*-- pike

Description: Body elongate; large dorsal and anal fins situated behind the pelvics, caudal fin moderately forked; head elongate; mouth upturned and beaklike with teeth on the jaws, vomer, palatines, and branchial bones; teeth a mixture of patches of small, cardiform teeth and large "canines"; cheeks scaled; scales in the lateral line 105-148; gill rakers reduced to sharp denticles; pyloric caeca absent. Color olive to pale green with pale variegations or spots. Belly white; rays of the fins yellow or orange with black blotches. Adult size up to 40 pounds or more; mature fish in Wyoming average several pounds; females larger than males.

Distribution: The northern pike is widely distributed in northern North America and Eurasia. It tolerates low water temperatures and ranges north into the Yukon and Northwest territories in Canada; it is also found in Alaska. This species was introduced, or strayed, into a sand pit in the flood plain of the North Platte River near Torrington sometime in the 1960s. A 12.5 pound fish was caught there in the spring of 1966. Sometime prior to 1970, northern pike were illegally introduced into Keyhole Reservoir and have been established there. Stocking of northern pike by the Wyoming Game and Fish Department was initiated in 1973. To date, Keyhole Reservoir is the only Wyoming water where northern pike populations have been established.



Natural history: The northern pike lives in waters that range from moderately warm to cool. It inhabits weedy lakes, ponds, backwaters, and large sluggish rivers. Some details of the natural history of the northern pike are provided by Scott and Crossman (1973): Northern pike spawn in the spring shortly after ice-out. In their native range, spawning normally takes place in shallow waters along the shore of large lakes or in backwaters of rivers during high water. The eggs are very adhesive and adhere to submerged vegetation after they are fertilized. Newly hatched northern pike fry feed mostly on zooplankton. They soon add small invertebrates and then small fish to their diet. Adults feed principally on fish but will eat other vertebrates including frogs, crayfish, and ducklings. Growth rate of the northern

pike is extremely variable with a decrease in growth rate and an increase in longevity northward in the range. Females grow more rapidly than males. In Keyhole Reservoir, female northern pike grew to as much as 23 pounds in 4 years after they were first introduced.

Relation to man: In Keyhole Reservoir, the northern pike is an important game fish, and its introduction has reduced the numbers of carp and carpsuckers in the fishery. Spottail shiners and gizzard shad have been introduced into that reservoir to provide additional forage for the pike. Like the lake trout and other large, predatory fishes, northern pike need a substantial forage fish population to thrive. In different areas of North America, this fish may be considered a valuable commercial species, a very important sport fish, or a competitor with more favored game fish. Overpopulation and stunting of northern pike in some Rocky Mountain habitats have interfered with management of salmonid fisheries.

Distinguished from:

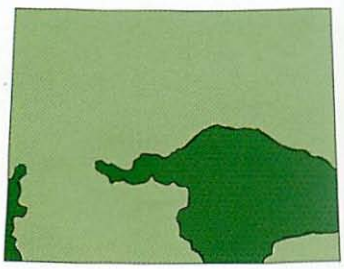
"tiger muskies" by its coloration-- in the northern pike, the markings are light on a darker background; the tiger musky has dark markings on a lighter background;

all other Wyoming fishes by its duck-like beak and general body shape.

Tiger musky

The tiger musky is a hybrid between the northern pike and the muskellunge. Tiger muskies were introduced into Grayrocks Reservoir in 1983, and the hybrid has now been introduced into some other lakes in the state. The tiger musky looks like the other pikes in general body form and is ognized by the duck-like beak. In coloration, it differs from the northern pike by having dark vertical bars on a lighter background, the characteristic that gives this hybrid its name.

The use of this hybrid serves several purposes.

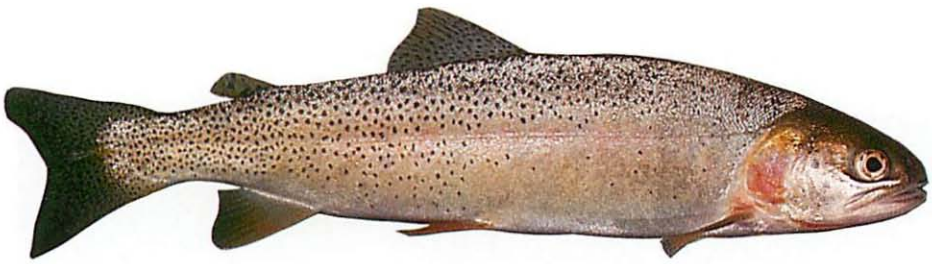


Showing hybrid vigor, it grows rapidly and is aggressive, therefore susceptible to angling. It is a piscivore that requires relatively dense populations of forage fishes in order to thrive but also can regulate population numbers of nongame fish in the habitat. In Wyoming, this hybrid provides a unique fishing experience; tiger muskies in Grayrocks have attained weights of nearly 30 pounds. Males of the hybrid are sterile, so reproduction is curtailed, and population densities in a fishery can be controlled by the stocking rate.

photo courtesy of the Nebraska Game and Parks Commission

Family Salmonidae

Trouts, salmons, whitefishes and graylings



The family Salmonidae contains the whitefishes, salmons, trouts, chars and graylings. Until the 1960s, these fish were separated into three different families: Salmonidae (salmons and trouts), Coregonidae (whitefishes and ciscoes) and Thymallidae (graylings). An examination of the skeletal characters of these fishes led to the incorporation of the three families into the Family Salmonidae with three subfamilies: Salmoninae, trouts and salmons; Coregoninae, whitefishes; and Thymallinae, graylings (Norden 1960).

Salmonids are characterized by the presence of an adipose fin and a pelvic appendage. Three upturned caudal vertebrae form the base of the caudal fin. The skeleton usually retains large amounts of cartilage. Pyloric caeca are present, usually numerous. Oviducts are vestigial; eggs of all salmonids are shed into the body cavity and released via abdominal pores. Most salmonids are cold water fishes of the Northern Hemisphere, fresh water and/or anadromous.

Whitefishes and ciscoes (Coregoninae) are often plankton feeders. They are usually fresh-water dwellers; the upper and lower jaw and vomer bone are mostly toothless; their eggs are relatively small; the dorsal fin has 10 to 15 rays; the body coloration of adult fish lacks distinct spots.

Graylings (Thymallinae) are fresh-water dwellers with small teeth on jaws and vomer, relatively small eggs, dorsal fins with 17 to 25 rays, bodies with distinct black spotting.

Trouts and salmons (Salmoninae) are fresh water and anadromous fishes with large teeth of varying size on the jaws and vomer. Their eggs are relatively large; their dorsal fins have 8 to 12 rays.

Pacific salmons and trouts endemic to the Pacific Coast of North America, now all considered in genus *Oncorhynchus*, are anadromous and fresh water fishes. Teeth are present along the entire length of the vomer in the roof of the mouth. The body coloration includes distinct black spotting.

Chars (genus *Salvelinus*) have the vomer toothed only at its anterior end. The characteristic body coloration lacks black spotting and usually includes white spots.

Under natural conditions, salmonids migrate upstream or from lakes into inflowing streams to spawn over beds of gravel in running water. A "nest" or redd is prepared by the female; the eggs are fertilized externally by an attendant male or males and then buried as additional nests are prepared.

Among Wyoming salmonids, the rainbow trout, cutthroat trout, the golden trout and the grayling spawn in the spring. Brook trout, brown trout, lake trout, kokanee salmon and the mountain whitefish spawn in the fall. Traditional labels of spring or fall spawning are, however, inadequate in describing salmonid spawning in Wyoming. Different elevations (and hence water temperature regimes), stream types, fish strains and fish culture practices all influence the timing and periodicity of spawning.

Salmonids are easy to propagate artificially. Their eggs are large and non-adhesive and normally laid in cold, running water. Such eggs are relatively easy to hatch in troughs or incubators. Salmonids lack oviducts; eggs are released into the body cavity and then to the outside during the spawning act. Thus eggs are easily stripped from ripe females for fertilization by sperm stripped from the male. These features of reproduction make salmonid fishes well suited for artificial propagation.

a note on taxonomy

A decision has recently been made to place the western trouts in the genus *Oncorhynchus* (Robins et al. 1991). Arguments pertinent to this matter have been summarized by Smith and Stearley (1989).

Pacific trouts (rainbow, cutthroat, golden trout and other western species not found in Wyoming) were formerly included in the genus *Salmo* with the Atlantic salmon and the brown trout. Pacific salmons (genus *Oncorhynchus*) were separated from *Salmo*, mainly on the basis of the presence of a "kype" in male Pacific salmons, the number of anal rays (14 or more) in *most* Pacific salmons and the fact that the Pacific salmons die after spawning. However, variants of *O. masou*, one of the Pacific salmons found only in Asia, has fewer than 14 anal rays; some Pacific "trout" die after spawning, and some races of a Pacific salmon (again, *O. masou*) do not.

Some students of salmonid taxonomy proposed moving the Pacific trouts from the Atlantic *Salmo* and the Pacific *Oncorhynchus* into a separate genus and recognizing genus *Parasalmo* (Vladykov 1963; Behnke 1979). Similarities in cranial osteology of the Pacific trouts and the Pacific salmons had been noted by Regan (1914). These were illustrated by Vladykov (1963) and in the Smith and Stearley article (1988). Smith and

Stearley (1988) explained that *Parasalmo* is not a valid name and stated that recognition of a third genus (the most appropriate name *Rhabdofario*, the name given to a fossil salmonid by Cope (1870) would not be consistent with the present understanding of the evolution of Pacific salmonids. They explained that the evolution of the salmonids is characterized by: 1) enormous diversity in anatomy, coloration, and breeding habits, 2) two sister lineages, western Eurasian (= Atlantic, = *Salmo*) and eastern Eurasian (= Pacific, = *Oncorhynchus*). This provides a stable classification of use not just to taxonomists and evolutionists but to ecologists and fisheries managers as well.

The genus *Oncorhynchus* represents a relatively recent evolutionary trend; it gave rise, in the Pacific region, to salmonids which are both land-locked and anadromous, which are strongly migratory when anadromous, which have spring spawners as well as fall spawners, which may have the capacity to migrate to marine waters very early in the life cycle and which may die after spawning. "Pacific trouts are a middle part of a trend that is continued by their close relatives, the Pacific salmons" (Smith and Stearley (1988)).

Another quite consistent feature of the lineage: the basic color pattern in *Oncorhynchus* is a large number of black spots against a red or silvery background.

The Names of Fishes Committee of the American Fisheries Society has included the Pacific trouts in the genus *Oncorhynchus* (Robins et al. 1991).

In addition to the change in the generic name, the specific name of the rainbow trout was changed to an older name, *mykiss*, in recognition of the fact that the well-known coastal rainbow trout and the Kamchatkan trout, a trout endemic to the Kamchatkan peninsula in Siberia, are the same species, and the name *mykiss* has taxonomic priority.

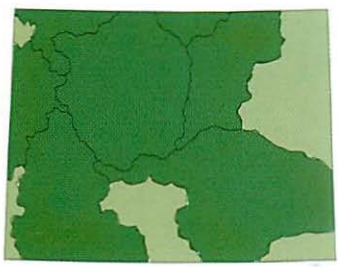
Accordingly, the following name changes have been made:

formerly:	becomes:
Cutthroat trout, *Salmo clarki*	*Oncorhynchus clarki*
Rainbow trout, *Salmo gairdneri*	*Oncorhynchus mykiss*
Golden trout, *Salmo aguabonita*	*Oncorhynchus aguabonita*

Scientific names of the brook trout, lake trout and Pacific salmons remain unchanged as do the common names of all the salmonids.

Golden trout *Oncorhynchus aguabonita*

(*Oncorhynchus*-- hooked snout; *aguabonita*-- pretty water, from Aguabonita Falls in Volcano Creek, tributary to the Kern River in California)



Description: Body slender, somewhat compressed; head short, conical; mouth large, terminal; teeth on the jaws, vomer, palatines and tongue; basibranchial teeth absent; gill rakers 17-21; scales in the lateral series 150-210; pyloric caeca 20-40; vertebrae 58-61. Color green or olive above with a bright red lateral band, bright yellow to brilliant red on the lower sides and belly. Large, round black spots, concentrated mostly on the dorsal fin, caudal peduncle and caudal fin. Parr marks are evident in 2- and 3-year-old fish in some populations. Paired fins with white borders. Adult length usually less than 12 inches, but much larger golden trout have been caught from lakes in the Wind River Mountains. Some of these large fish may be rainbow x golden trout hybrids.

Distribution: The golden trout is native to the South Fork of the Kern River in south-central California. It has been artificially distributed widely from that area and has been established in several of the western states including Wyoming.

Natural history: The golden trout has the reputation of being an alpine trout, thriving at high elevations (Simon 1946 and 1951; Sigler and Miller 1963; Brown 1971; Simpson and Wallace 1978). Most introductions in western states have been into alpine lakes, usually in remote areas. The golden trout spawns in late spring or early summer depending on elevation and water conditions. In high mountain lakes, the golden trout may migrate to either inlet or outlet streams to spawn. It sometimes spawns in a lake if gravel beds are available, but the success of such spawning is not known (Simpson and Wallace 1978). Feeding habits of golden trout in Wyoming habitats has not been studied in detail. Other authors have indicated that the food includes a variety of aquatic insects (Brown 1971). The bright red, oily flesh of golden trout from alpine lakes indicates that zooplankton is important in their diet. A study of the golden trout in the Upper Kern River Basin by Schreck (1969) revealed some misconceptions regarding this species. He noted that the golden trout attains quite large sizes in its native habitat, that Evermann reported a specimen 27.5 inches long weighing 5.5 pounds, and that 6- to 8-inch golden trout planted in Moraine Lake, California, in 1908 weighed 11 to12 pounds in 1916. Schreck also pointed out that, although the golden trout is reputed to be adapted to

alpine waters (above 10,000 feet), "the native ranges in Golden Trout Creek and the South Fork of the Kern are well below this elevation" (Schreck 1969).

Relation to man: The golden trout is esteemed primarily for its rarity and beauty rather than its gaminess or its qualities as a food fish. In Wyoming, a population of golden trout in Surprise Lake in Sublette County is used as a source of eggs, and golden trout are propagated in the Wyoming Game and Fish Department hatchery system. It has been planted in many montane and alpine lakes in the state, managed principally as a rare and beautiful species.

Nomenclature: Nomenclature of the rainbow trout complex, of which the golden trout is one, is discussed below in the species account of the rainbow trout. As noted in that section, Behnke (1992) treats the California golden trout as a subspecies of the rainbow; *O. mykiss aquabonita*, including it in the grouping he designates Sacramento Basin redband trouts.

Literature references: *Salmo aguabonita*. Simon 1951:39 (introduced into Wyoming).

Distinguished from:

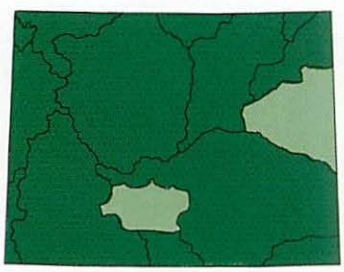
the cutthroat trout by its absence of basibranchial teeth and the white borders on its paired fins;

the rainbow trout by its much smaller scales and restriction of spotting to the posterior part of its body.

Cutthroat trout *Oncorhynchus clarki* spp.

Description: The cutthroat trout is represented in Wyoming by five subspecies, more subspecies of cutthroat trout than occur in any other state. A sixth subspecies, the greenback cutthroat trout, was once found in southeastern Wyoming. These subspecies are discussed separately in the following account of subspecies. See also Tables 1 and 2, pages 202-203. The cutthroat trout takes its common name from the slash of red or orange usually visible on each side of the lower jaw. This "cutthroat mark" is seen, although not so conspicuously, in the rainbow trout.

Distribution: The cutthroat trout is native to coastal waters from southern Alaska to northern California and inland from Canada south to New Mexico. This species is found mostly in drainages west of the Continental Divide but has extended its range to east of the Divide in Canada and south to New Mexico. The cutthroat trout is the only trout native to Wyoming. One or another of the subspecies was found in all the river drainages west of the Continental Divide, and in the Madison, Yellowstone, Big Horn, Tongue and South Platte river drainages east of the Divide. The cutthroat trout is not endemic in the North Platte River drainage (Hayden 1871). Details of color patterns, distribution and natural history of individual subspecies are provided in an account of subspecies below.



Nomenclature: Behnke (1988) reviewed the relationships and existing classification of the cutthroat trouts. He speculated that the cutthroat trouts diverged from the rainbow and its allied forms/species by the begin-

ning of the Pleistocene epoch, about 2 million years ago, and the major subspecies (see below) had differentiated by mid-Pleistocene, about 1 million years ago. He recognized 14 subspecies of cutthroats. Four "major" subspecies, of relatively early origin were noted, as follows. The coastal cutthroat, O. *clarki clarki*, has a diploid number of 68 chromosomes; the westslope cutthroat, O. *clarki lewisi*, has 66 chromosomes; the Yellowstone cutthroat, O. *clarki bouvieri*, has 64 chromosomes and the Lahontan, O. *clarki henshawi*, 64 chromosomes. The 10 "minor" subspecies were derived from the Lahontan (4) and the Yellowstone (6) cutthroats. The extant Snake River, Bonneville, Colorado River and greenback cutthroat trouts, described below, were derived from the Yellowstone variety, isolated by interbasin transfers and differentiated, probably during the second half of the Pleistocene epoch. The subspecies of cutthroat found in Wyoming are treated separately, below. Some subspecies, such as the Snake River cutthroat which is the predominant species in the upper Snake River, and some unique varieties found in closed basins in Oregon and Nevada have never been assigned a subspecific name (Behnke 1979). Different subspecies were propagated and distributed rather indiscriminately in earlier years. For this reason, genetically pure populations of certain subspecies are rare, occurring in only portions of their original range. Behnke's recent monograph of the native trouts of Western North America (Behnke 1992) expands considerably on his 1979 publication, but his analysis of the evolutionary and zoogeographic history of the cutthroat trouts, outlined above, is not changed.

Distinguished from:

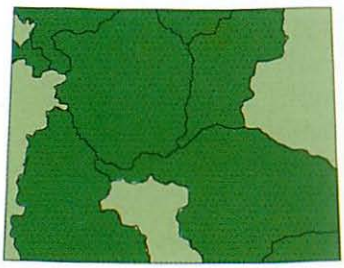
rainbow and golden trouts by its basibranchial teeth and the color of its fin (fins of cutthroat trout are uniformly colored; rainbow and golden trout pelvic and pectoral fins have white borders and may have a white or cream tip on dorsal fins--especially in young fish);

other trouts by its "cutthroat" marks;

(hybridization among trouts in western North America is common; hybrids are usually intermediate between their parents in color pattern, scale size, and number or presence of basibranchial teeth).

Yellowstone cutthroat trout *Oncorhynchus clarki bouvieri*

(*Oncorhynchus*-- hooked snout; *clarki*-- after Captain William Clark of the Lewis and Clark expedition; *bouvieri*-- after Bouvier)



Description: Body elongate; head short; snout blunt; mouth large and terminal; basibranchial teeth variable, 5-15; gill rakers typically 19-20; scales in lateral series 150-200 (typically 165-180); pyloric caeca typically 35-43; vertebrae 60-63 (meristics from Behnke 1992).

Color yellowish brown, silvery or brassy. Spots medium in size, conspicuous, rounded, often concentrated in the caudal peduncle. Paired fins uniformly brown or purplish. Adult length averaging 12-15 inches.

Distribution: The Yellowstone cutthroat is native to the Yellowstone River drainage downstream to the Tongue River, including the Big Horn and Clarks Fork river drainages in Wyoming. It is also found west of the Continental Divide in the Snake River drainage below Palisades Reservoir in Idaho and, in Wyoming, in Pacific Creek and other tributaries of the Snake River that enter above the entry of the Gros Ventre River. It has been introduced to waters east of the Continental Divide as well.

Natural history: In its natural state, the Yellowstone cutthroat trout lived in lakes, larger rivers and small tributary streams. In Yellowstone Lake, this subspecies migrates to spawn in inflowing streams; migrations begin in May, peak in early June and continue through July. Fry emerge from the gravels in late summer and early fall. Some fry move downstream into the lake immediately, others remain in the stream and enter the lake as fingerlings the following year (Ball and Cope 1961). Fish in the spawning runs ranged from ages 3 to 7 with fish in the age groups 4 and 5 making up the bulk of the runs (Bulkely 1961). Age-growth data for Yellowstone cutthroat trout from Yellowstone Lake obtained by Bulkely in 1949-1959 showed lengths in inches for ages 1 through 5 respectively to be 1.8, 4.7, 8.3, 11.4, and 12.9. Benson (1961) found that zooplankton and freshwater shrimp were predominant in the diet; next in importance was a variety of midge larvae. Some other insects, a few molluscs and very few trout were also found in the stomachs. With the initiation in Yellowstone Park of catch-and-release fishing in many fisheries since 1973 (Varley and Schullery 1983), growth rates and maximum sizes of trout in both the lake and river fisheries have probably changed considerably from those measured in the early 1960s.

Relation to man: The Yellowstone cutthroat was the native trout of Yellowstone Lake. It was used in

artificial propagation at a federal fish hatchery operated in Yellowstone National Park from about 1905 until 1955 (Behnke 1979). During that period, eggs and fry of this subspecies were widely distributed throughout the western United States. The Yellowstone cutthroat is widespread in Wyoming today. It is the common cutthroat throughout the Wind-Big Horn River drainage in northwestern Wyoming and is common in lakes of the Wind Mountains. This is the trout that was abundant in the Tongue River and Big Goose Creek in early Wyoming history. When the cavalry troops under General Crook were camped on Big Goose Creek in July, 1876, they were reported to have caught, by hook and line, some 15,000 trout (Larson 1965).

Distinguished from:

rainbow trout by its basibranchial teeth, lack of white borders on its paired fins and smaller scales;

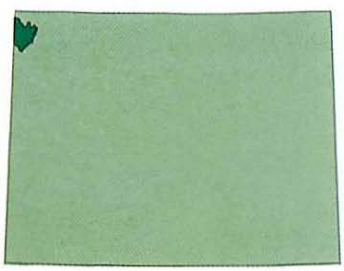
other subspecies of cutthroats by its large black spots concentrated in the caudal peduncle and its relatively drab colors.

Nomenclature: Since the turn of the century, *lewisi* has been used as the subspecific name for the Yellowstone cutthroat. Behnke (1979) concluded that the name *Salar lewisi* (later *Salmo*) given by Girard (1856) to specimens of cutthroat trout from the Madison River near Great Falls, Montana, is correctly applicable to the west slope cutthroat and assigned the subspecific name *bouvieri* to the Yellowstone cutthroat. It should also be noted that the name "*mykiss*," now assigned to the rainbow trout, was applied by some ichthyologists, (Jordan 1981b); (Evermann and Cox 1896) to cutthroat trouts, when the Kamchatkan trout was considered to be a cutthroat trout.

Literature references: *Salmo bouvieri.* Jordan and Evermann (1902) Waha Lake, Idaho. *Salmo mykiss.* Jordan 1891a 50-53 (Yellowstone Lake, Heart Lake, Yellowstone National Park. *Salmo mykiss lewisi.* Jordan 1891b:15 (Riddle Lake, Wyoming). Evermann and Cox, 1896:413-416 (Tongue River, Big Goose Creek). *Salmo clarki lewisi.* Simon 1951:35 (Missouri and Columbia systems, Wyoming).

West slope cutthroat trout *Oncorhynchus clarki lewisi*

(*Oncorhynchus*-- hooked snout; *clarki*-- after Captain William Clark of the Lewis and Clark expedition; *lewisi*-- after Meriwether Lewis of the Lewis and Clark expedition)



Description: Body slender; basibranchial teeth typically 4-8; gill rakers (anterior) 17-19; scales in lateral series 150-200 or more; pyloric caeca 25-50; vertebrae 59-63; (meristics from Marnell et al. 1987). Color "generally silver with yellowish tints–has genetic basis to express bright yellow, orange and red colors to a greater extent than found in coastal cutthroat trout or Yellowstone cutthroat trout" (Behnke 1979). Spotting of smaller, more diffuse spots, but not as small as spots of the Snake River cutthroat. Average length of mature fish 12-15 inches.

Distribution: The west slope cutthroat trout is endemic to the Clark Fork River drainage in western Montana and Idaho and, east of the Continental Divide, in the Madison River drainage in Montana and Yellowstone National Park. Marnell et al. (1987) stated that Glacier National Park in Montana "appears to represent the largest geographic province containing indigenous populations of lacustrine-adapted *S. c. lewisi* surviving today". Varley and Schullery (1983) stated that, in Yellowstone National Park, the westslope cutthroat "is now found only in the headwater areas of Grayling and Cougar Creeks" (tributary to the Gibbon River).

Natural history: In Montana and Idaho, the west slope cutthroat may be a big river fish, moving downstream, sometimes for considerable distances, to a larger stream to spawn, or a lake species such as the cutthroat trouts of the lakes of Glacier National Park studied by Marnell et al. (1987) which migrate into inflowing streams to spawn. A third ecotype is populations restricted to small headwater streams and spawning locally. The isolated populations in Grayling and Cougar creeks in Yellowstone Park probably are restricted to headwater drainages. Liknes (1984) reported that in Montana, both migratory and resident adults spawn in May and June. Migratory adults spend little time in the tributaries. In the Flathead Basin in Montana, this species attained sexual maturity at age 4, but elsewhere they may mature at age 3 (Brown 1971). Many populations in Montana spawn only in alternate years (Liknes 1984). Spawning behavior of the west slope cutthroat in

Yellowstone National Park has not been studied. In Montana, westslope cutthroat trout are considered to be invertebrate feeders and not highly predacious (Liknes 1984).

Nomenclature: See discussion of nomenclature of the Yellowstone cutthroat trout (above).

Literature references: *Salmo clarki lewisi*. Behnke 1979:60 (Madison River, Yellowstone National Park). Varley and Schullery 1983:44 (Grayling and Cougar creeks, Yellowstone National Park).

Distinguished from:

rainbow trout by its basibranchial teeth and the absence of white borders on its pectoral, pelvic and anal fins;

other Wyoming cutthroats by the medium size of its spots, general coloration and home drainage.

photo by William H. Mullins

Snake River cutthroat trout *Oncorhynchus clarki* ssp.

(*Oncorhynchus*-- hooked snout; *clarki*-- after William Clark of the Lewis and Clark expedition)

Description: Body elongate and streamlined; head short and conical; mouth large, terminal and well toothed; basibranchial teeth 4-30 (means 12-18); scales in lateral series,153-176; pyloric caeca 39-46; vertebrae 60-65; (meristics from Behnke 1992). Color silvery yellowish brown, spotting profuse and of very fine spots, these covering most of the body except the white belly, somewhat concentrated in the caudal peduncle. Average size 12-15 inches, but older individuals may grow to 20 or more inches.

Distribution: The native distribution of the Snake River cutthroat is the upper Snake River above Palisades Reservoir. Behnke (personal communication) notes that, in the Gros Ventre River drainage, some tributaries have typical *bouvieri* type spotting; cutthroat trout in most tributaries and the main stem have fine spotting. Early photographs of fish taken from Jackson Lake indicate that both large- and small-spotted cutthroat trout were found in that lake before planting from hatchery sources was initiated. The Yellowstone cutthroat is found in Idaho, in the Snake River and some of its tributaries (Behnke 1979, 1992). The Snake River cutthroat was apparently native mainly in the Snake River drainage from Jackson Lake downstream to the mouth of the Hoback River.

Natural history: The native habitat of this subspecies is the Snake River proper. Nevertheless, when planted in other habitats, this variety thrives in lakes and reservoirs as well as large rivers. Foster (1978) studied the food and feeding habits of this subspecies in the Snake River in Teton County, Wyoming. The diet of fish less than 11 inches in length was mainly aquatic insects. Fish, primarily sculpins, made up the highest percentage of volume of stomach contents of trout over 11 inches in length. Insects, annelids, snails and small rodents were secondary foods of the larger fish. In summer months, stoneflies and mayflies were the most important aquatic insects in the diet; in September and October, caddisfly larvae were a major food for larger trout, suggesting more bottom feeding at that time. Hayden (1968) reported on the spawning behavior and growth histories of the Snake River cutthroat in three tributaries of the Snake River in Teton County. Spawning runs into Fish Creek began in late March and spawning continued until June. In Blue Crane and Bar BC creeks, spawning continued into July. Hayden

suggested that genetic differences between local populations rather than temperature may have been responsible for the difference in spawning period. Peak emergence of fry occurred about 50 days after the peak of spawning. Downstream migration of fingerling and yearling trout from tributaries to the Snake River peaked in the period January-March. Average lengths, calculated from scale analysis, of Snake River cutthroat trout from Blue Crane Creek were from age 1 to 4 respectively, 5.20, 10.24, 14.01 and 17.27 inches (Hayden 1968).

Distinguished from:

rainbow trout by its basibranchial teeth and the absence of a white margin on its paired fins;

other Wyoming cutthroats by its very fine spotting.

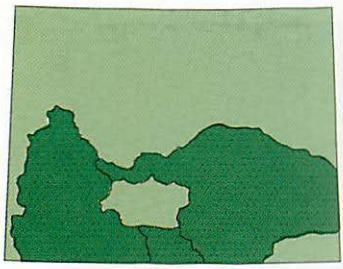
Relation to man: In recent years, the Snake River cutthroat has been introduced into many lakes and streams in Wyoming. As a game fish, this fine-spotted cutthroat is a good dry-fly fish; it prefers medium-sized and larger streams with good overhead cover. Behnke (1979) cited data obtained by the Idaho Department of Fish and Game which showed that, in Palisade Reservoir in 1975, cutthroat trout (primarily the Snake River variety) made up 84% of the trout caught by anglers while, in gill net samples, cutthroat trout made up only 28% of the fish caught. Brown trout were the other major trout species present. The Wyoming Game and Fish Department recognizes the high catchability of cutthroat trout and uses it in management planning.

Nomenclature: Ichthyologists have not yet assigned a subspecific name to the Snake River cutthroat trout.

Literature references: *Salmo clarki* ssp. Behnke 1979:75 (Snake River from Jackson Lake downstream to Palisades Reservoir).

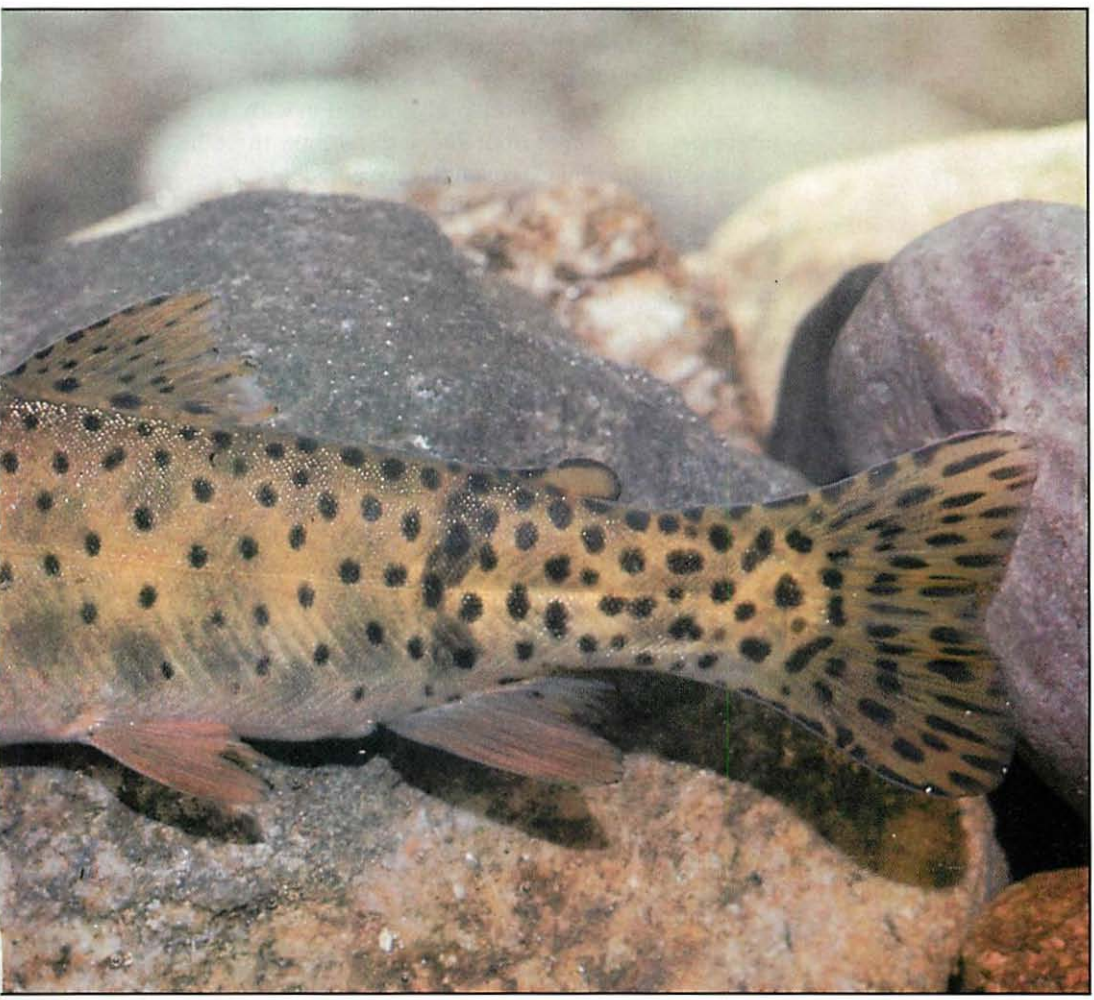
Colorado River cutthroat trout *Oncorhynchus clarki pleuriticus*

(*Oncorhynchus*-- hooked snout; *clarki*-- after William Clark of the Lewis and Clark expedition; *pleuriticus*-- of the side, in reference to the bright colors of the sides)



Description: Body elongate and somewhat compressed; head short, conical; mouth large and terminal, with teeth on jaws, vomer, palatines, tongue and hyoid; basibranchial teeth few (1-6); scales in lateral series 170-205, mean, 190; pyloric caeca 30-40; vertebrae 60-63. Color dark brownish dorsally, bright yellow, orange or red laterally and ventrally, the most colorful Wyoming cutthroat trout; spots large and distributed uniformly on the body and caudal fin, somewhat concentrated in the caudal peduncle. Fish from the Little Snake River drainage have large spots which tend to be rectangular in the caudal peduncle, and the adipose fin usually has a black border. Colorado River cutthroats from the upper Green River and Blacks Fork River have smaller spots (Binns 1977). Adult length, in smaller streams where this subspecies is found today, usually less than 10 inches.

Distribution: Colorado River cutthroat trout were the only trout native to the Green and Little Snake river drainages in Wyoming. The historic range of this subspecies was the clear-water tributaries of the Colorado River drainage, including the Green River, in Wyoming, Colorado, Utah, and probably in New Mexico and Arizona (Behnke 1992). Original numbers and distributions of Colorado River cutthroat trout were reduced through hybridization and competition with non-native trout and habitat alterations associated with the activities of man. Habitat alterations included livestock grazing, irrigation, timbering and oil exploration activities (Binns 1977). Increased road access has also led to increased fishing pressure. Colorado River cutthroat trout are more vulnerable than other trout to fishing pressure. This subspecies now occupies only a fraction of its historic range. Behnke (1979) stated that



pure populations of Colorado River cutthroat trout are virtually gone, though slightly hybridized populations (that resemble O.c. *pleuriticus)* can still be found in many areas. These populations occupy less than 1% of the subspecies' original range (Behnke 1979). While representatives of O.c. *pleuriticus* exist in Wyoming, Utah and Colorado, populations in Wyoming are key to survival and restoration of this subspecies (Wyoming Game and Fish Department Comprehensive Management and Enhancement Plan for Colorado River Cutthroat Trout in Wyoming, January 1987). Populations of this subspecies, each with slightly different morphological and color characteristics, are found in the Green River enclave consisting of headwater streams entering the Green River from the west between LaBarge and Daniel in Sublette County. In the Black's Fork enclave, including several small headwater tributaries of Black's Fork in Uinta County and in small headwater streams of the Little Snake River enclave, populations which have been identified vary with respect to their genetic purity. Hybridization with other subspecies of cutthroat trout and with rainbow trout has occurred to differing extents in native populations. Binns (1977) suggested that the turbidity of the Green River in and above the town of Green River probably limited the Colorado cutthroat's distribution in the river proper and that it was probably principally a fish of smaller tributaries.

Natural history: The original habitat of the Colorado River cutthroat trout, according to Binns (1977), "probably featured cold, clear water, a relatively steep gradient and a rubble-boulder substrate." Some of the healthiest and most genetically "pure" populations of this subspecies are now found in small streams tributary to the Little Snake River in Carbon County, Wyoming above 7,000 feet. Quinlan (1980) and Jespersen (1981) studied those populations. Population estimates made in the period from 1978 to 1981 indicated an average standing crop density of 46 pounds per acre in the several streams of the North Fork of the Little Snake River (Jespersen 1981). Maximum total lengths attained by fish in these populations was about 8 inches. Spawning was initiated early in the spring runoff and continued until about July 5. Eggs hatched by mid-August, and the fry swam up about August 25 (Quinlan (1980)). Aquatic and terrestrial invertebrates comprise the majority of items in the diet of Colorado River cut-

throat trout populations in small headwater streams in Wyoming.

Relation to man: The Colorado River cutthroat trout is recognized separately in the state's fisheries management. A brood stock of the Colorado River cutthroat trout from the Green River enclave has been established at the Daniel Hatchery. Attempts to develop a separate brood stock for the Little Snake River enclave are underway in an effort to preserve the genetic integrity and differences between the populations in these two enclaves. Recent habitat degradation from water developments, oil and gas development and timbering have coupled with increased human populations and road access to further threaten Colorado River cutthroat trout populations. Efforts were initiated in the 1970s by the Game and Fish Department, Forest Service and Bureau of Land Management to maintain Colorado River cutthroat trout, yet threats to populations and habitat continue. Significant positive steps are now needed to prevent O.c. *pleuriticus* from reaching threatened status. A management plan has been developed to describe the current status of this subspecies in Wyoming, set measurable objectives for its habitat and population management, identify actions needed to reach the objectives and establish specific criteria for monitoring the success of the program and future status of the Colorado River cutthroat trout. Intensified management efforts are underway to attempt restoration of this subspecies. The Colorado River cutthroat trout in its native habitat, especially in the Green River proper, grew to a respectable, even large, size. Behnke (1979) mentions unverified reports of cutthroats from the Colorado River basin weighing 20 pounds or more.

Distinguished from:

rainbow trout by the uniform color of its paired fins and its basibranchial teeth;

other cutthroat subspecies by its bright colors, its large spots (which tend to be rectangular in the caudal peduncle) and its relatively small scales;

(Colorado River cutthroat trout from the Little Snake River headwaters are very similar in color pattern to the greenback cutthroat).

Nomenclature: This subspecies was first described by Cope (1872) (as *Salmo pleuriticus*). Scale counts and description of spotting and coloration were provided by Jordan (1891a).

Literature references: *Salmo pleuriticus*. Cope 1872:471 (headwaters of the Green and Platte rivers); Jordan 1891a:14 (scale counts, description of color pattern); *Salmo clarki pleuriticus* Binns 1977:39 (headwater tributaries to Green, Blacks Fork and Little Snake rivers).

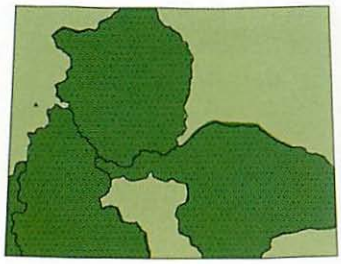
Bonneville cutthroat trout *Oncorhynchus clarki utah*

(Oncorhynchus-- hooked snout; *clarki--* after William Clark of the Lewis and Clark expedition; *utah--* from Utah)

Description: Body elongate and somewhat compressed: head short, conical; mouth large, terminal; basibranchial teeth 3-20 (mean 9.6); gill rakers 16-21; scales in lateral series 140-180, mean 150-170; pyloric caeca mean 35, Bear River drainage populations with a high average value of over 40 (Behnke 1992); vertebrae 62-63. Color yellowish brown, rather dull, lacking bright reds; Spots large, uniformly distributed. Adipose fin sometimes with a black border. Length of adults up to 20 inches or more.

Distribution: Bonneville cutthroat trout were historically endemic to a wide range of habitats within the Bonneville basin. Desiccation of Lake Bonneville in postglacial time resulted in isolation of drainages containing this subspecies. Impacts of human development including habitat modification, introduction of non-native species and fishing led to the decline of *O. clarki utah*. The Bonneville cutthroat trout is native to Wyoming in the Thomas Fork and Smith Fork drainages of the Bear River system. It is also native to some drainages in Utah and Nevada. This subspecies had been considered extinct until relatively pure populations were found in recent years in western Wyoming, Utah and the Snake Valley in Nevada.

Natural history: Binns (1981) documented the distribution, purity and ecologic status of this subspe-



cies. Much of its habitat in Wyoming has been degraded by grazing and land abuse.

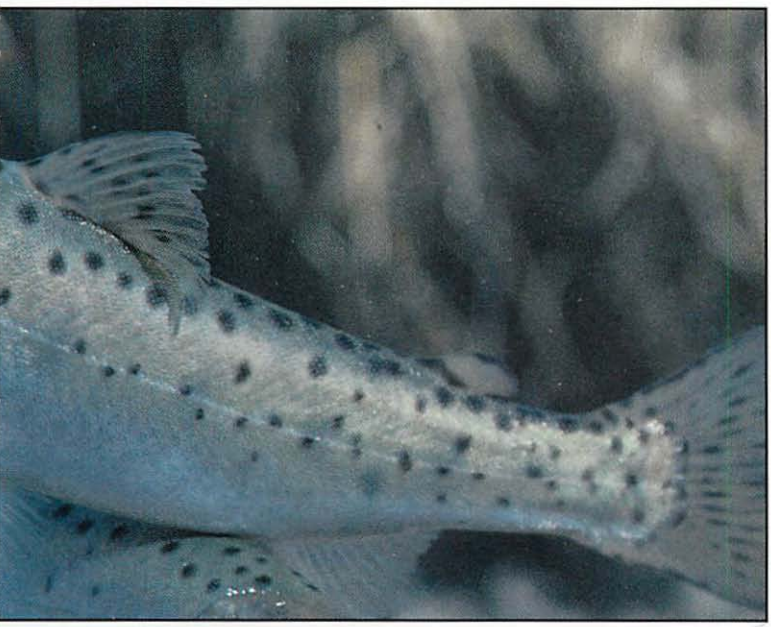
Relation to man: The Bonneville cutthroat trout is not as easily caught by anglers as other cutthroat varieties. It also resists hybridization with non-native trout (Behnke 1992). These traits, coupled with their ability to survive in degraded habitats, give this subspecies *O. clarki utah* certain management potentials not shared by some other cutthroats. As with the Colorado River cutthroat trout, relict populations of the Bonneville cutthroat exhibit different degrees of genetic purity. Six stream populations, three from the Thomas Fork drainage and three from the Smith Fork drainage, were considered to be of relatively high genetic purity by Binns in 1981. A lake population in Lake Alice is also considered relatively pure (Binns 1981). A brood stock was since established at the Daniel Hatchery. That brood stock was established in an attempt to upgrade the genetic purity of Bonneville cutthroat trout populations in the Bear River drainage.

Literature references: *Salmo clarki utah*. Behnke 1979:103 (Thomas Fork and Smiths Fork drainages of the Bear River system in southwestern Wyoming); Binns 1981:16 (Thomas Fork and Smiths Fork drainages, Lincoln County).

Distinguished from:

the rainbow trout by its basibranchial teeth and the absence of white margins on its ventral fins;

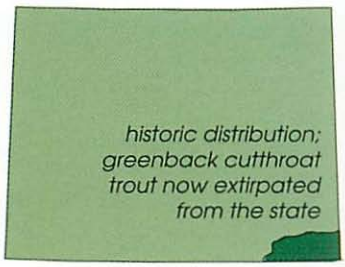
other cutthroat trout subspecies by its duller colors, and the uniform distribution of its spots.



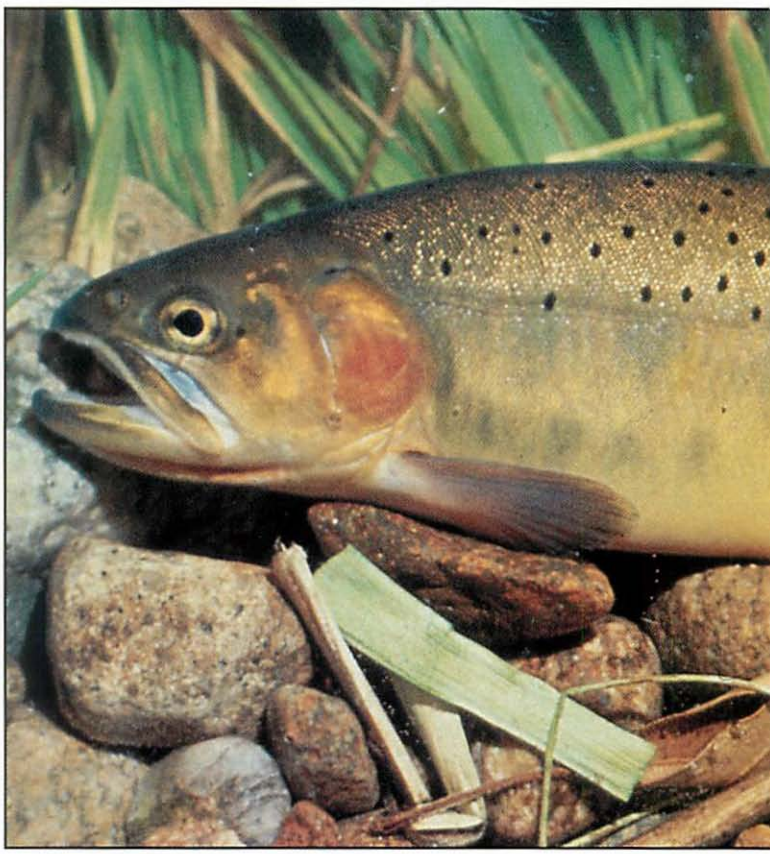
Greenback cutthroat trout *Oncorhynchus clarki stomias*

The greenback cutthroat trout is native to the headwaters of the South Platte and Arkansas river drainages. Historic range lies almost entirely in Colorado, except for a few South Platte River tributaries in Wyoming (Behnke 1992). In the 1800s, this species was found in Dale Creek, now Albany County, and probably in Lonetree Creek now Albany and Laramie counties. In his report to the Secretary of the Interior for 1878, territorial governor John W. Hoyt wrote (Beard 1933 p. 300):

The streams everywhere abound in fish of choice varieties, including the speckled trout. It is said that this most gamy and most palatable of all the finny tribe has never been found in the North Platte or any of its affluents; but it abounds in Wyoming tributaries of the South Platte and in hundreds of other streams, especially those which have their



historic distribution; greenback cutthroat trout now extirpated from the state



sources in the Laramie, Wind River, Uinta and Big Horn Mountains.

Reference to trout in the South Platte River drainage could have been only to the greenback cutthroat trout. Reference to "speckled" trout in other parts of the state refer to other varieties of cutthroat trout. In coloration, spotting and genetic character, the greenback is very similar to the Colorado River cutthroat.

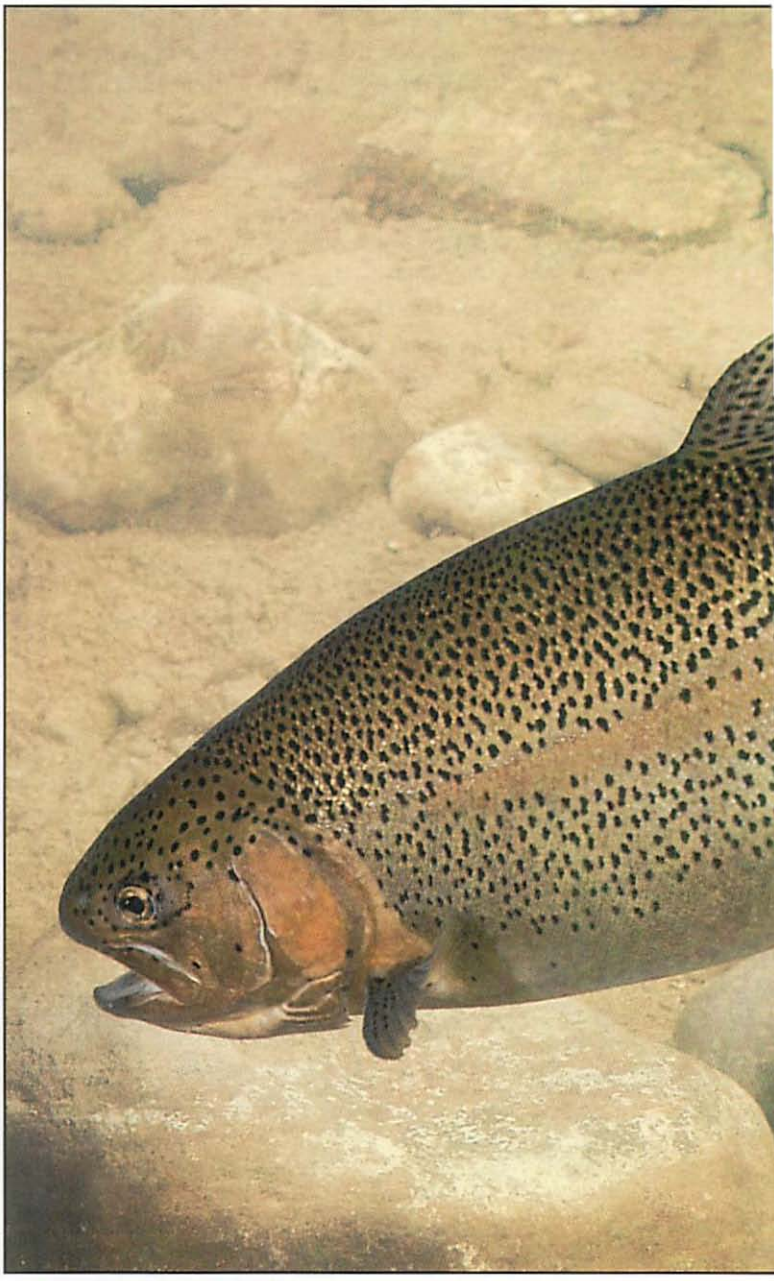
Unfortunately, populations of greenback cutthroat trout no longer exist in Wyoming. The greenback cutthroat trout is listed as a threatened species under the Endangered Species Act. Successful restoration efforts have been made in Rocky Mountain National Park, Colorado (Behnke 1992; Dwyer and Rosenlund 1988; Stuber et al. 1988).

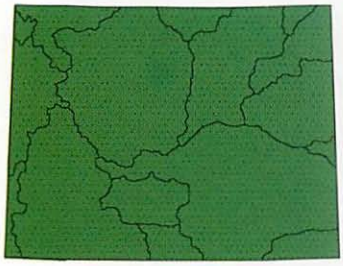
photo courtesy of the Colorado Division of Wildlife

Rainbow trout *Oncorhynchus mykiss*

(*Oncorhynchus*-- hooked snout; *mykiss*-- a native Kamchatkan name)

Description: Body elongate, somewhat compressed; head short, snout blunt and rounded; mouth large, terminal; teeth in the jaws, on the vomer, palatines and tongue, absent from the hyoid (basibranchials); caudal fin slightly forked; gill rakers 16-22; scales in the lateral series 120-140; pyloric caeca 40-70 (55); vertebrae 61-65; dorsal color dark green to blue-green, sides silvery with a distinct bright red or pink lateral stripe. Head,





body and fins densely spotted with small, irregular black spots. Adipose fin with a distinct black border in fingerlings which breaks down into spots in older fish. Pelvic and anal fins may have a white border. In some populations, the dorsal and anal fins with a white, cream or amber tip. Size varies with habitat. In small streams, average adult size 10 to 12 inches; in large rivers and lakes, to trophy size.

Distribution: The rainbow trout is native to the coastal streams of North America from Alaska to Baja California and Mexico and in the Far East, particularly in waters of the Kamchatkan peninsula. Since before the turn of the century, this species has been introduced as a game fish into cool and cold water habitats around the world.

Natural history: The rainbow trout is generally considered a stream-dweller with a preference for fast water. Nevertheless, this species is highly diversified in habitat tolerance and thrives in lakes. The sea-run rainbow, known as the steelhead, migrates to freshwater rivers to spawn. Unlike the salmons, the steelhead rainbow does not die upon spawning only once and returns to the ocean, perhaps to spawn another year. Rainbow trout normally spawn between February and May. Except for the steelhead, rainbow trout normally do not move long distances to spawn; they usually move from lakes into inlet streams and from larger rivers into smaller tributary streams. The spawning pattern is generally similar to that of other stream-dwelling trouts.

Food of the rainbow trout includes insects, other invertebrates and smaller fish, depending upon availability in a particular habitat. In lakes and tailwaters, the freshwater shrimp, also called a scud, is a favorite food of the rainbow trout. In feeding, the rainbow trout ingests considerable amounts of algae. Rainbow trout sometimes prey on small fish and fish eggs. Many carp fingerlings were noted in stomachs of rainbow trout taken from Seminoe Reservoir in the winter of 1965. Eggs of lake trout have been found in stomachs of rainbow trout collected from lakes where lake trout spawn.

Relation to man: The rainbow trout is a popular game fish, and its qualities as a food fish are excellent. These features, its suitability for artificial propagation and its adaptability to a variety of habitats make it an extremely important species in sport fishery management and in commercial propagation in the United States. Wyoming's state hatchery system uses several different "strains" of rainbow in their planting program. These include strains which are generally more piscivorous than the standard rainbow. Such strains are used in reservoirs with dense non-game fish populations. Experimentation with several strains has occurred and

continues in efforts to tailor rainbow trout strain characteristics to the various stream and reservoir habitat types and fisheries management needs in Wyoming.

Nomenclature: Scientific names which have been assigned to the rainbow trout by different students of western trouts include *Salmo gairdneri*, *Salmo shasta* and *Salmo irideus*. *Salmo gairdneri* has been the generally accepted name since about 1940. Vladykov (1963) noted that *Salmo mykiss* and *Salmo gairdneri* are apparently synonymous. Robins et al. (1991) have now adopted *mykiss* as the specific name of the rainbow trout. Behnke (1979) has outlined consistent differences between populations of coastal rainbow trout and populations living inland in the river drainages of western North America and recommended recognition of different subspecies. These would include the Columbia River rainbow, O. *mykiss gairdneri* and the golden trout, O.*m. aquabonita*.The inland subspecies, formerly called redband trouts, are generally characterized by smaller scales and fewer pyloric caeca. Their coloration includes rather bright reds and oranges. Their parr marks are elongate elliptical with supplementary rows of smaller marks. White or yellow tips on the dorsal, pelvic and anal fins may be seen in adult fish. The spotting on body and fins is usually of larger and more discrete spots as opposed to diffuse. Only vestigial basibranchial teeth are evident. In contrast, the coastal rainbow, which Behnke recommends be designated O. *mykiss irideus*, has larger scales; higher caecal counts; silvery coloration with many small, diffuse spots and rounded parr marks. White tips on the fins are seen only in young fish, and the coastal rainbow lacks basibranchial teeth. In addition to the golden trout, some of the strains of rainbow used in artificial propagation in Wyoming today represent the inland subspecies recognized by Behnke. The Gerrard rainbow (formerly called Kamloops), which had its origin in the Fraser River system of British Columbia, is a representative of the small-scaled subspecies.

Distinguished from:

the cutthroat by its smaller, irregular spots, white borders on its paired fins and its lack of basibranchial teeth.

the kokanee by the number of rays in its anal fin: rainbow–10-12; kokanee–15-16.

(very silvery fish from turbid or ice-covered water may have a dense iridescence which hides their color and spot pattern. It may be difficult to distinguish rainbow, cutthroat and even brown trout by color or spotting in such situations).

Literature references:

Salmo gairdneri irideus. Simon 1939:21 (introduced to Yellowstone Park); Simon 1951:41-42 (introduced to Wyoming, widespread).

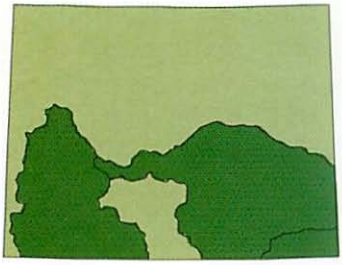
Kokanee *Oncorhynchus nerka*

(*Oncorhynchus*-- hooked snout; *nerka*-- an Indian name)

Description: Body elongate, slightly compressed laterally. Dorsal fin rays 11-16; caudal fin moderately forked; anal rays usually 13-15. Mouth terminal and large with teeth on the jaws, vomer, palatines and tongue; no teeth on the basibranchials; branchiostegals 11-15; gill rakers on the first arch 28-44, long, slender and slightly serrate, closely set; pyloric caeca 60-115; scales in lateral series 124-144. Color green or bluegreen above, silvery on the sides and belly, with fine black spotting dorsally. Both sexes usually turn red during spawning, the males brighter than females. Among spawning adults, females are somewhat smaller than males. Scott and Crossman (1973) note that "kokanee as large as 21 inches are not uncommon," and that kokanee as large as 8 pounds have been reported.

Distribution: The kokanee is native to coastal waters in both Asia (including Japan) and North America, principally in British Columbia. Today, kokanee are managed in a number of lakes and reservoirs in Wyoming, including Flaming Gorge, Boulder Lake, Fremont Lake, New Fork Lake, Lake Hattie, Granite Reservoir and Crystal Reservoir.

Natural history: The kokanee is a smaller, land-locked variety of the sockeye salmon. The major difference from the sockeye is in size; the sea-run sockeye salmon may weigh up to 15 pounds. The kokanee spawns in the



fall. Some mature kokanee migrate from Flaming Gorge Reservoir up the Green River and some of its tributaries to spawn. Other mature kokanee spawn along the rocky shorelines of Flaming Gorge at depths up to 65 feet or more. Egg numbers and size vary between different populations. Like the sea-run sockeye salmon, the kokanee eats zooplankton, using its long, closely set, gill rakers to strain macroplankton from the open water. Although it is mainly a pelagic, zooplankton feeder, it does eat some bottom organisms. It apparently never feeds on small fish except when small fry are present in the open water.

Distinguished from:

the "Pacific trouts" (rainbow, cutthroat and golden) by its larger number of anal fin rays, gill rakers and pyloric caeca.

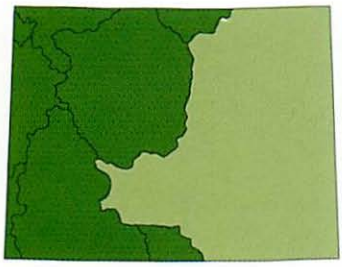
Relation to man: The kokanee has been widely introduced in North America and managed as a game fish, a commercial species and even as a forage fish for such large predators as the lake trout. A major factor in management of the kokanee is that, like most Pacific salmons, it spawns once and dies. Kokanee provide important fisheries in Flaming Gorge Reservoir, in some of the lakes in the Green River drainage and in southeastern Wyoming.

Nomenclature: The subspecies *kennerleyi*, used by Simon (1951), is no longer recognized.

Literature references: *Oncorhynchus nerka kennerlyi.* Simon 1951:43 (introduced into Wyoming).

Mountain whitefish *Prosopium williamsoni*

(*Prosopium*-- a mask (a broad preorbital bone in the skull); *williamsoni*-- in honor of Lt. Williamson of the U.S. Pacific Railway surveys)



Description: Body rounded and elongate; adipose fin large; caudal fin deeply forked; mouth small; teeth absent in adults; scales large, 73-90 in the lateral series; dorsal and anal rays 11-13; pyloric caeca 50-140. Color grayish blue or greenish above; sides silvery; belly white; adipose fin heavily pigmented; adults unspotted; young of the year with parr marks and large, uniformly distributed, round, black spots dorsally. Average adult size 10-12 inches. Weight up to several pounds, average about 1 pound.

Distribution: The mountain whitefish ranges from the Canadian Rockies into the United States on both sides of the Continental Divide south to Colorado and to the Lahontan Basin in Nevada. In Wyoming, it is common in all the drainages west of the Continental Divide and in the Madison, Yellowstone, Big Horn and Tongue rivers in the Missouri Basin. The mountain whitefish is not native to the North Platte River drainage.

Natural history: This species inhabits large, clear, cold rivers where it prefers deep, fast water. Sometimes it is abundant in lakes. Phelps Lake, in Teton County, has a dense population of mountain whitefish, and other montane lakes in the state support mountain whitefish. The mountain whitefish spawns in the fall, usually from September to November. At that time, nuptial tubercles appear along the lateral line in both sexes. In Phelps Lake, Hagen (1956) concluded that almost all of the spawning took place in the lake. In the Gallatin River, Montana, Brown (1952) reported that spawning took place between October 14 and October 28. He noted that the whitefish apparently does not prepare a redd or nest and believed that most spawning took place during hours of darkness. Eggs laid in the second half of October hatched in March. In streams, the mountain whitefish feeds mainly on aquatic insects on the substrate. Mountain whitefish in the Snake River were found by Pontius and Parker (1975) to feed primarily on midge and caddisfly larvae, feeding mostly either from stream drift or the substrate. But mountain whitefish sometimes feed actively at the surface in streams when stimulated by hatches of aquatic insects (Pontius and Parker 1975). In Phelps Lake, Hagen (1956) found this fish feeding mostly on plankton during the summer months. Sigler and Miller (1963) noted that the mountain whitefish may feed upon hatchery reared salmon fry in the Columbia River.

Relation to man: Mountain whitefish are caught by angling with artificial flies and bait. Stonefly nymphs on a small hook make an excellent bait for this fish and winter anglers use this technique to fish for whitefish. The flesh is white and of good quality. Nevertheless, most anglers regard the mountain whitefish as a poor sport fish and are more interested in catching trout. Since they share the same space and their feeding preferences overlap, there is evidently some competition between the mountain whitefish and trout. If this competition is detrimental, it is aggravated by the fact that whitefish populations are not exploited as heavily as trout.

Nomenclature: Jordan (1891b), separated the whitefish of the Missouri River drainage from that of the Columbia and Green river drainages (*C. williamsoni williamsoni)*, naming it *Coregonus williamsoni cismontanus*. Simon used Jordan's subspecies in the 1951 edition of *Wyoming Fishes*. More recently, Holt (1960) concluded that separation into two subspecies is not justified.

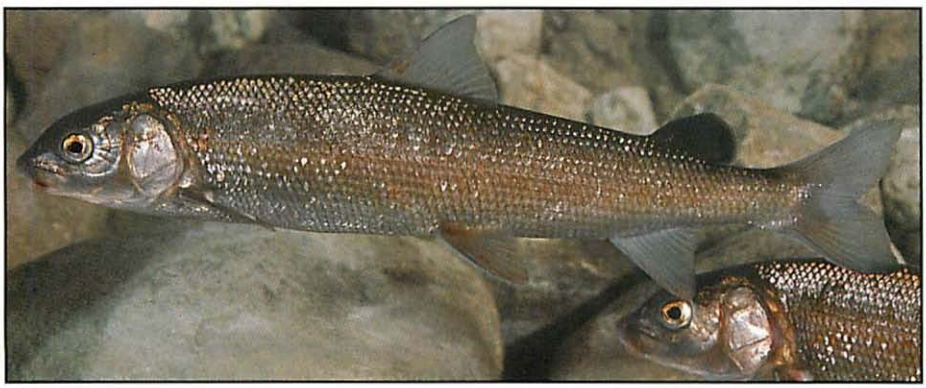
Literature references: *Coregonus williamsoni*. Evermann 1892:47 (Snake River, President's Camp, Wyoming). *Coregonus williamsoni cismontanus*. Jordan 1891b:49 (Yellowstone River below the falls; Madison River, Yellowstone National Park); Evermann and Cox 1896:413 (Tongue River and Big Goose Creek near Sheridan). *Prosopium williamsoni williamsoni*. Simon 1939:25 (Snake River and tributaries); Simon 1951:28 (Green, Bear and Snake rivers and tributaries). *Prosopium williamsoni cismontanus*. Simon 1951:29 (Yellowstone River and tributaries below the falls; Tongue River; Madison River; tributaries of the Big Horn River).

Distinguished from:

the grayling by its shorter dorsal fin 13 or fewer rays;

trouts by its small mouth, large scales (less than 100 in the lateral line) and larger adipose fin;

suckers and minnows by its adipose fin.

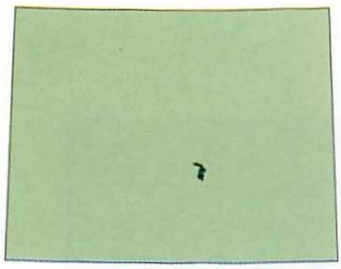


Ohrid trout
Salmo letnica

Description: Body proportions very similar to those of the brown trout; gillrakers 18-24; pyloric caeca 55 to 73; a pectoral appendage, a papilla-like structure on the base of the pectoral fin of *Salmo letnica,* has been described by Dr. Behnke (personal communication) as a feature that distinguishes it from *Salmo trutta.* Color dusky or silvery with very large black spots on the dorsal surface and on the operculum. The ocellated spots, which are normally red or maroon in older brown trout and pink in fingerling brown trout, are bright orange or yellowish orange.

The Ohrid (pronounced "Oak-rud") trout is a European trout, native to Lake Ohrid, a large, deep lake on the Yugoslavian-Albanian border. Several varieties of trout live in the lake, including "winter" and "summer" strains. Which of the varieties was introduced to America is not definitely known. The Ohrid trout is quite similar to the brown trout. A major difference is in its spawning pattern; the Ohrid trout spawns in Lake Ohrid as well as in its outlet.

While looking for a lake-spawning trout, the U.S. Fish and Wildlife Service obtained eggs of the Ohrid trout from Yugoslavia in 1965. These were hatched at a



federal hatchery in Iowa, and state hatcheries in Minnesota and Wyoming obtained eggs from the federal hatchery in Manchester, Iowa in February 1970. These were hatched at the Tensleep Hatchery, and about 1,500 fingerlings Ohrid trout were transferred to the Clark's Fork Hatchery in November when they were about 3 inches in length.

Between 1970 and 1974, Ohrid trout hatched and reared from eggs obtained from the Clark's Fork brood stock were planted into Viva Naughton Reservoir, Casper Rod and Gun Club Lake (now called Goldeneye), Lower Medicine Lodge Lake in Big Horn County and other bodies of water including Pathfinder Reservoir. The Clark's Fork brood stock deteriorated and was abandoned. Wyoming no longer maintains an Ohrid trout broodstock.

The results of plants of the Ohrid trout in Wyoming and in Tennessee, the only other state reporting any success in establishing a fishery, suggest that this trout is successful in deep, cool lakes. The Pathfinder Reservoir population is reproducing naturally. This account of the Ohrid trout is taken almost entirely from Pistono (1975).

Distinguished from:

the brown trout by its distinctive color pattern and by its "pectoral appendage";

(Ohrid and brown trout less than 12 inches in length may be difficult to distinguish).

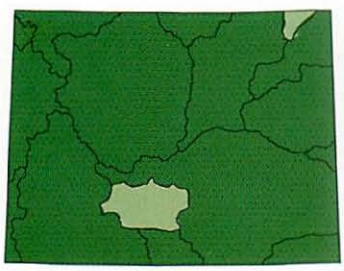
Brown trout
Salmo trutta

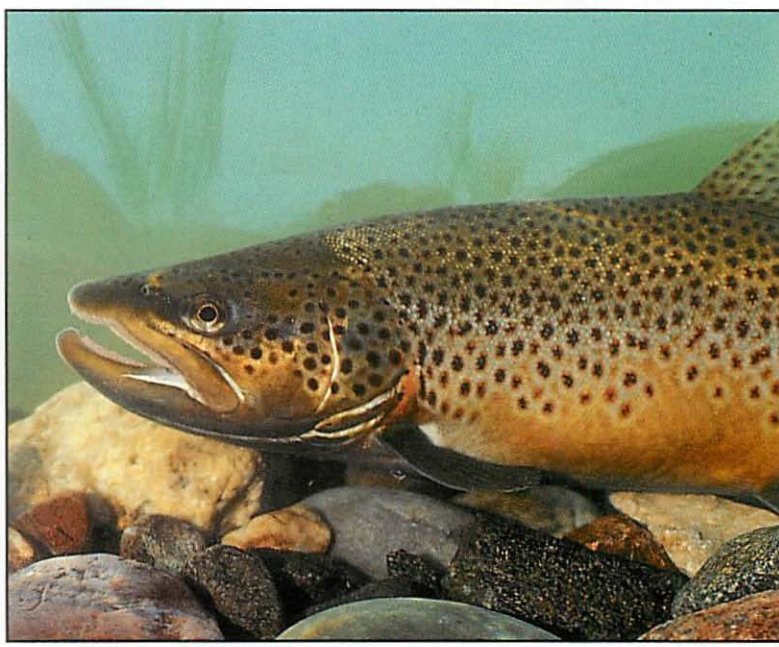
(*Salmo*-- Latin for salmon, from "salio-- to leap"; *trutta*-- low latin for "trout")

Description: Body elongate, somewhat compressed; head moderate; mouth large, terminal; teeth on the jaws, vomer, palatines and tongue, absent from the hyoid; caudal fin not forked; gill rakers 14-17; scales in the lateral series 115-140; pyloric caeca 30-60; vertebrae 56-61. Color brown or olive above; sides and belly yellow with black and red or maroon spots. Lateral spots of fingerlings pink with a blue border. Adipose fin usually with an orange or red border. Few or no spots on the caudal fin. Colors bright in fish living in clear streams, obscured by silvery iridescence deposited in the skin of brown trout living in turbid lakes or under the ice in winter. Size of adult fish usually 12 to 18 inches.

Distribution: Native to Europe and western Asia, the brown trout was introduced from Europe late in the last century and is widespread in North America and in Wyoming.

Natural history: The brown trout thrives in both lakes and streams but shows some preference for streams at lower elevations with good overhead cover. This fish is generally considered to be tolerant of slightly higher water temperatures than some other trouts. In Wyoming, the brown trout usually predominates among the trouts in foothills streams. This trout spawns in the fall, preferring fast water in streams when available. It is diversified in its feeding habits – larger individuals are



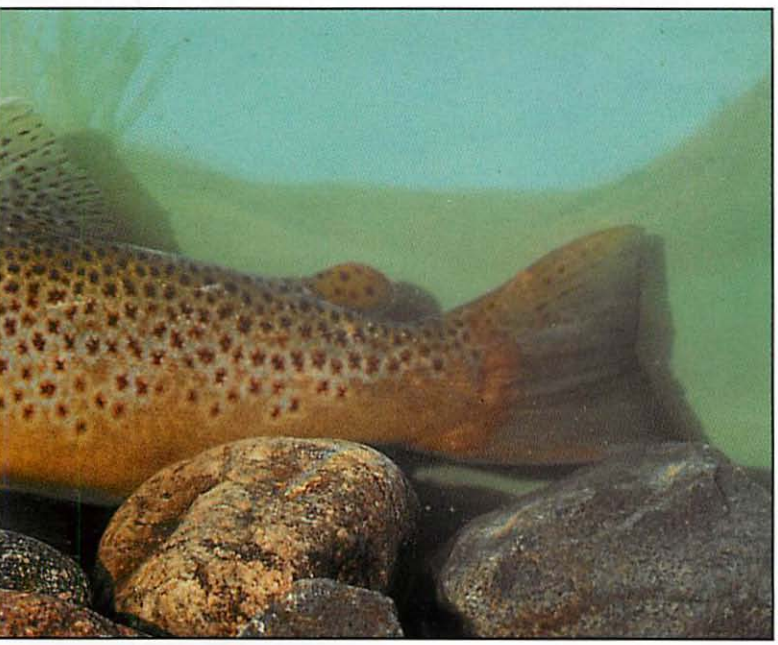


piscivores, feeding mostly in hours of twilight or darkness.

Relation to man: The brown trout is often self-sustaining and is important in wild trout management. In hatchery systems, it is not so favored as the rainbow trout; it is generally more susceptible to disease and is not so easily handled as some other trouts, being inherently "spooky." Brown trout are generally considered to be the most difficult trout to capture by angling.

Nomenclature: This species is often called either the German brown or the Loch Leven; these names are derived from the original stocks from which the brown trout was first transplanted to America in 1883. Loch Leven trout presumably came from Scotland, the German Brown or Von Behr trout from Germany. Today, several other races of brown trout are recognized in Eurasia. European brown trout have been variously imported to America and subsequently mixed during hatchery and management operations, thus the common names German Brown, Von Behr, or Loch Leven are not appropriate.

Literature references: *Salmo trutta fario* Simon 1939:18 (introduced into Yellowstone National Park); Simon 1951:33 (introduced into Wyoming).



Distinguished from:

rainbow and cutthroat trout by the large black or maroon pale-bordered spots on its body and conspicuously on the opercle, also from the lack of spotting on its caudal fin;

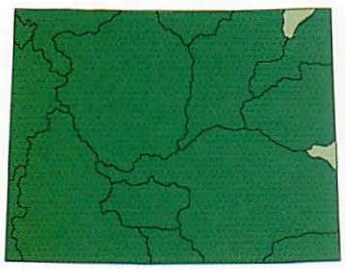
brook trout by the more conspicuous white border on the brook trout's ventral fins;

(young of both brown and brook trout have pink or red spots on their sides; fingerling brown trout differ in having distinct black spots dorsally as opposed the vermiculations seen on fingerling brook trout).

Description: Body elongate; caudal fin moderately forked; body rather stout, becoming compressed in large fish; head short with a blunt snout; mouth large, terminal, with teeth on the jaws, vomer (at anterior end only), palatines, and tongue; basibranchial teeth

Brook trout *Salvelinus fontinalis*

(*Salvelinus*-- an old name for the char; *fontinalis*-- of springs)



sometimes present; gill rakers 14-22; scales in the lateral series 197-230; pyloric caeca 23-55, average about 35; vertebrae 58-62. Color dark green above; sides lighter; belly white with splashes of bright red, more distinct in males and brilliant in males in breeding colors. Pink

spots with a blue border present on the sides. Dorsal surface with black or cream vermiculations which break up into spots on the sides and the fins. Anal, pelvic and pectoral fins and ventral edge of caudal fins with a white border, this border accentuated by being separated from the remainder of the fin by a jet black line. Size up to 10 pounds or more, average size of adults 8-14 inches.

Distribution: Brook trout are native to the eastern United States from Labrador to Georgia and westward through the Great Lakes Region to Wisconsin and extreme northeast Iowa. This species has been transplanted very widely and is abundant in small montane streams in the Rocky Mountains and on the Pacific Coast. Brook trout are widespread in Wyoming. They are found in streams and small lakes of all the major mountain ranges.

Natural history: Brook trout thrive in alpine and subalpine streams and associated beaver ponds. They are often abundant in montane lakes where inlet streams provide spawning sites. Because of tolerance to low water temperatures and its spawning success in alpine brooks, the brook trout almost always becomes the predominant (and often the only) fish species found above 10,000 feet elevation. Brook trout mature at an early age; in Wisconsin, males mature in their first year of life and females a year later (McFadden 1961). A year longer is normally required for sexual maturity of brook trout in the Rocky Mountains. Spawning occurs in the fall; ordinarily sexually mature fish migrate upstream into headwater streams to spawn, or they may spawn in the immediate vicinity. In the Pole Mountain area, brook trout were observed to spawn in a beaver pond where spring water was welling up through gravels. In some mountain lakes, brook trout may migrate into an outlet stream to spawn. This has been observed at Libby Lake in the Snowy Range Division of the Medicine Bow Mountains, Albany County. In alpine and subalpine habitats, brook trout spawning is often especially successful, probably because of the absence of predators and because it takes place in the fall when there is less flooding and silting. Large numbers of fry and fingerling brook trout are produced each year. Recruits drift downstream continuously, and small lakes and beaver ponds along the course of the stream become overpopulated. A result is intense competition for food between

young and older fish. Competition, low water temperatures and low productivity of montane and alpine waters combine to produce slow growth. In Libby Lake, a subalpine lake in the Medicine Bow Mountains in Albany County, Sinn (1962) reported that the average total length of brook trout caught by anglers in the summer of 1961 was 9.1 inches. Brook trout over 10 inches in length are rare in the small lakes and streams of the Snowy Range in the Medicine Bow Mountains. Larger fish are usually seen only where populations are sparse or where an excess of food is present. This overpopulation phenomenon is observed in the eastern United States and Canada, the native range of the brook trout, as well as in the Rocky Mountains and in cold water habitats on the Pacific Coast. Food of brook trout in montane streams includes the usual variety of aquatic invertebrates seen in the stomachs of all stream-dwelling trout, which are opportunistic feeders generally. In alpine lakes and ponds, midge larvae and pupae, fresh-water shrimp, leeches and, sometimes, snails are important in the diet of brook trout (Hepworth 1959; Sinn 1962). Large brook trout may feed on young fish, sometimes of their own species.

Relation to man: The brook trout is quite susceptible to capture by angling and is a prized food fish. These features, together with its relative abundance, make it a favorite fish for family fishing. Because of the problems of overpopulation and stunting, fisheries managers have experimented, without much success, with a number of different strategies in an attempt to increase the size of the fish harvested. These have included fertilization of lakes, closure of some lakes over a period of time, introduction of predatory forms such as the splake to brook trout habitats and introduction of strains of brook trout that become sexually mature at an older age. One strategy is to permit an increased harvest of brook trout below a certain size. In Wyoming, current regulations on many waters permit a limit of 10 brook trout, less than 8 inches in length, in addition to the standard limit of trout.

Literature references: *Salvelinus fontinalis* Evermann and Cox 1896:415 (introduced); Simon 1939:23 (introduced into Yellowstone National Park); *Salvelinus fontinalis fontinalis*; Simon 1951:44 (introduced into Wyoming).

Distinguished from:

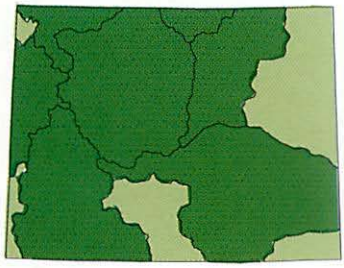
lake trout by its almost square tail and the pink, blue-haloed spots on it sides;

the splake by the difference in number of pyloric caeca;

(fingerling and young-of-the-year brook trout resemble young brown trout, but brook trout lack the distinct small black spots evident on the dorsal surface of young brown trout).

Lake trout *Salvelinus namaycush*

(*Salvelinus*-- an old name for the char; *namaycush*-- an Amerindian name for this fish, another very common name is "mackinaw")



Description: Body elongate and slender; caudal fin deeply forked; head short, eyes relatively small; mouth large, terminal, with teeth on the jaws, vomer (anterior end only), palatines, tongue and basibranchials. Gill rakers 16-26; scales in lateral series 175-230; pyloric caeca usually 120-180; vertebrae 61-69. Color gray or light green with white spots on the head, body and fins. Light spots may merge into pale vermiculations on the dorsal surfaces. Paired fins, the anal and caudal fins with traces of orange. Paired fins and anal fin with white borders. Size to trophy range; adults in larger lakes and reservoirs average 15 to 30 inches and several pounds.

Distribution: The lake trout is native to Canada and the Great Lakes from the Yukon to the Atlantic Coast south into northern Montana and into New England. It has been introduced into Wyoming. Several lakes and reservoirs have self-sustaining populations, including Jackson Lake, Fremont Lake, Buffalo Bill Reservoir, Flaming Gorge Reservoir and Beartooth Lake.

Lake trout were introduced to Wyoming in 1890 from eggs collected in the Beaver Island area of Lake Michigan. Fry were shipped by train from Michigan's Northville Federal Hatchery to the railhead in Montana, then packed into Yellowstone on horseback. The first stockings were: August 9, 1890 – Shoshone Lake, 18,000 fry; August 23, 1890– Shoshone Lake, 7,262 fry and Lewis Lake, 7,763 fry; September 2, 1890– Shoshone Lake, 4,750 fry and Lewis Lake 4,750 fry (Evermann 1892; Varley 1981).

Lake trout established quickly from these plants. By 1906, 15-pound lake trout were found in Jackson Lake. Jackson Lake and Jenny Lake were populated with lake trout via drift from Shoshone and Lewis lakes. Wyoming subsequently developed a lake trout brood stock from Jenny Lake fish.

Natural history: Lake trout are adapted to living in large, deep, cold-water lakes with rocky lake margins for spawning and with reasonably dense populations of a forage fish. They spawn in the fall, migrating to shallow waters to spawn over rock or gravel substrate. Females produce as many as 6,000 eggs. The food of adults is primarily fish, but the diet includes invertebrates and plankton at certain times of the year. Young lake trout feed upon aquatic insects and larger crustaceans such as scuds.

Relation to man: The lake trout is the largest of the trouts of Wyoming. Deep trolling accounts for most large lake trout caught by anglers. Some large lake trout are caught through the ice; they are quite susceptible to ice fishing. In the United States and Canada, valuable lake trout fisheries of the Great Lakes have been seriously depleted due to overexploitation, depredations of the sea lamprey and pollution. Lake trout populations, including those in Wyoming, are susceptible to heavy fishing pressure. Lake trout often require 15-20 years to achieve trophy size. Natural and angling mortality dictate that relatively few lake trout will survive to trophy size.

Nomenclature: Simon (1951) used the name *Cristivomer namaycush namaycush* for the lake trout; this name was in common use until the late 1950s. Since then, *Cristivomer* has been considered a subgenus of the genus *Salvelinus* (Morton and Miller 1954). Subspecies of the lake trout are no longer recognized.

Literature references: *Cristivomer namaycush namaycush*. Simon 1939:22 (introduced into Yellowstone National Park); Simon 1951:46 (introduced into Wyoming).

Distinguished from:

other trouts by its slender body form, its deeply forked caudal fin and the profusion of pale spots with no black or red spots on its body;

the splake (with some difficulty) by its more deeply forked caudal fin and its larger number of pyloric caeca.

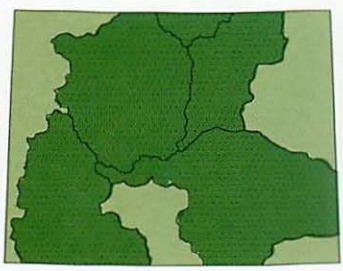
Splake

Hybrid: brook or "speckled" trout crossed with lake trout

The hybrid obtained by fertilizing the eggs of a female lake trout with the milt of a male brook trout is called a splake. The reciprocal cross, male lake trout with female brook trout, is called a brookinaw.

The splake is piscivorous like the lake trout and grows to larger sizes than brook trout. The splake is an unusual hybrid in that it is fertile, both when back-crossed with one or another of the parent species or with another splake (although the splake x splake cross is less viable).

Splake are intermediate in character between the parent species. Sexually mature male splake show the pink lateral spots and quite distinct white borders of the ventral fins. Sexually mature female splake more closely resemble, in coloration, the lake trout. A good character



for distinguishing the hybrid is the number of pyloric caeca: Brook trout average about 35 caeca; lake trout average about 150; splake are variable in caecal count and generally intermediate between the parental species.

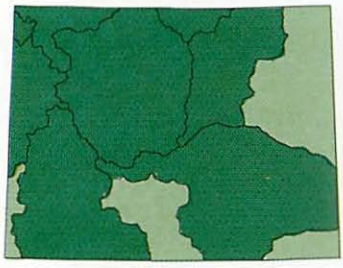
Splake are used in Wyoming's fisheries management program. In some instances, they have been planted in lakes that are overpopulated with brook trout where the splake grows to a larger size and may prey on small brook trout. In other situations, the splake has been introduced into habitats which have become overpopulated by minnows, suckers or even game species such as grayling or yellow perch.

Grayling *Thymallus arcticus*

(*Thymallus*-- ancient name referring to its thyme-like odor; *arcticus*-- of the arctic)

Description: Body elongate and trout-like; caudal fin forked; dorsal fin very long, with 18 to 21 rays; head short, conical; mouth moderate with teeth on the jaws, vomer (anterior end), palatines, and tongue (sometimes absent in older fish). Basibranchial teeth absent. Gill rakers 16-23; scales in the lateral series 82-100; pyloric caeca 14-21; vertebrae 58-62. Color gray or bluish above and iridescent with black spots mostly anterior and above the lateral line. The dorsal fin of breeding males is strikingly colored with blue or violet spots on a dark gray background and the fin with a red outer border. Length of adults 12 inches or less.

Distribution: The grayling is a cold-water salmonid occurring in the northern regions of North America and Eurasia. The native range of the species in North America is across northern Canada with southern extensions of the range into Michigan in the Middle West and into Montana and extreme northwestern Wyoming in the Rocky Mountains. In Yellowstone Park, it was originally found only in the headwaters of the Madison and Gibbon rivers. Cope (1872) reported it from the Yellowstone River, but this was likely an error, as both Jordan (1891b) and Evermann (1892) indicated that it was found only in the Madison River and its tributaries.



Natural history: Grayling generally prefer the clear waters of large rivers, creeks and mountain lakes. Scott and Crossman (1973) noted that, in Great Slave Lake, grayling caught in gill nets were taken only to a depth of 10 feet. This fish spawns in the spring, normally migrating into streams to spawn over gravel beds. Newly hatched fry are small, making artificial propagation difficult. Grayling feed mostly on insects, with a high percentage of terrestrial insects, but diets sometimes includes small fish. Both Brown (1938) and Miller (1946) found some fish in grayling stomachs, but grayling are not highly piscivorous. Grayling feed in schools and are voracious feeders. Simon (1951) commented on their habit of darting repeatedly at an artificial fly and returning to deep water without taking it.

Relation to man: As an introduced species throughout most of Wyoming, the grayling is a novelty species. A number of lakes in Wyoming have been stocked with grayling. Meadow Lake in the Pinedale area and Willow

Lake in the Big Horn Mountains support good grayling fisheries. A grayling hatchery was operated by the U.S. Fish and Wildlife Service at Grebe Lake in Yellowstone National Park between 1933 and 1954 (Kruse 1959). That lake still supports a grayling fishery.

Distinguished from:

trouts and whitefish by its very large dorsal fin.

Nomenclature: The North American grayling, called *Thymallus signifer*, was, for many years, considered distinct from the Asiatic *Thymallus arcticus*. More recently, they have been considered synonymous (Walters 1955).

Literature references: *Thymallus tricolor*. Cope 1872:469 (headwaters of Yellowstone River, Yellowstone National Park). *Thymallus signifer* var. *ontariensis*. Jordan 1891b:49-50 (Madison River, Yellowstone National Park). *Thymallus signifer* Evermann 1892:47-48 (junction of the Firehole and Gibbon rivers, Yellowstone National Park) *Thymallus signifer tricolor*. Simon 1939:26-27 (Missouri River drainage above the falls); 1951:48-50 (Yellowstone National Park; introduced to Big Horn Mountains).

Table 1. Meristics of subspecies of cutthroat trout found

common name	lateral line scales	pyloric caeca	basibranchial teeth
Yellowstone	165-180 *	35-43 *	22**
West slope	150-200 *	25-50	present
Snake River	153-176 **	39-46 *	12-18 *
Colorado River	170-205+	30-40 *	present
Bonneville	141-190**	32-64 **	3-20 ***

* "typically"

Table 2. Meristics of different western

common name	chromosomes	scales in lateral line	basibranchial teeth
Coastal cutthroat trout	68	140-180	present
Inland cutthroats trouts	64-66	150-200+	present
Golden trout	58	150-210	rare
Columbia redband trouts (Gerrard)	58	135-160	vestigial
Coastal rainbow trout	58-64	120-140	absent

in Wyoming (mainly from Behnke 1992 and Binns 1981)

vertebrae	gill rakers	spotting	background colors
61-62*	14-20*	large, rounded	yellowish brown
60-61 *	17-21*	medium, diffuse	silvery reds and yellows
61-63 *		small, diffuse	dull yellowish
60-63*	17-21*	large, rectangular	with bright reds
62-63 **	16-21 **	sparse, even	silvery

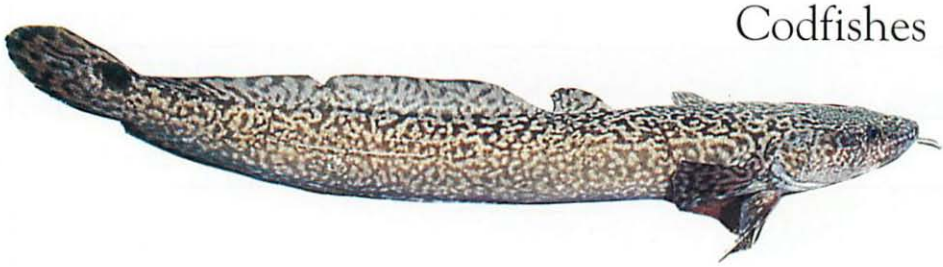
**Binns's ranges

trouts (mainly from Behnke 1992)

white borders on fins	black spots	background colors
no	small-medium, diffuse	pale, silvery
no	larger, fewer (usually)	bright, with reds
yes	large, localized	bright yellows, reds
yes	medium, diffuse	red lateral band
usually	usually smaller, diffuse	red lateral band

Family Gadidae

Codfishes



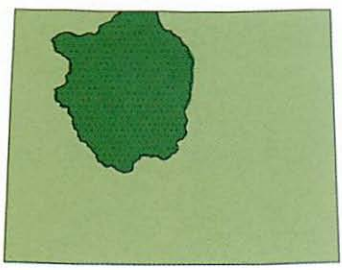
Codfishes are mostly marine fishes of great economic importance to man as food. The burbot is the only freshwater codfish. Cods, haddock, hakes, and other representatives of this family have elongate bodies. The pelvic fins are far forward on the body; the dorsal fin is either a single, elongate fin or divided into 2 or 3 dorsals. Scales are cycloid; fin rays are soft; the gas bladder lacks a duct. Most of the fishes in this family have the single median barbel under the chin. Many are predatory piscivores.

Burbot
Lota lota

Lota-- from the French, *lotte*, a European name for the burbot

Description: Body slender and elongate; dorsal fin large, double, scarcely separated from the anal and caudal fins and producing an almost continuous median fin around the posterior half of the body; pelvic fins inserted anterior to the pectorals; head short and wide, flattened dorsally; eye small; mouth large with a single median barbel; scales microscopic; dorsal rays 11-13 and 72-76; anal rays 53-68, all fin rays soft. Color green or dark olive, marbled with black dorsally and laterally; uniform pale green or yellow below. Weight of mature fish to 24 pounds or more.

Distribution: The burbot, or ling, is a northern species occurring throughout Canada and in the U.S. south to Missouri and Kansas and east to New England. In Wyoming, the burbot was native to the Big Horn and Tongue river systems. It is found in larger lakes in the Lander and Dubois area, including Boysen Reservoir and Ocean Lake. It is also found in the Big Horn River.



Natural history: The burbot is a fish of cold deep lakes and large rivers. Immature burbot show a preference for rubble substrate; larger adults remain in deep water where they prey on other fish, even those of their own species. Cahn (1936) described the spawning of the burbot in Minnesota. A number of males and females gather and form a ball of squirming bodies about 30 inches in diameter. Eggs and sperm are discharged as the bodies move over one another, usually in water less than 4 feet deep and over sand or gravel substrate. He believed that most spawning occurs at night. The burbot spawns during the winter months. In February 1939, personnel of Wyoming Game and Fish Department found burbot migrating upstream between Ring Lake and Trail Lake, a distance of one-half mile. These fish were concentrated in a large pool mid-way between the lakes and were ripe. Eggs were stripped from them and fertilized and hatched in much the same way that trout eggs are handled (Simon 1951). Subsequently, it was learned that conventional hatchery screens are unsuitable for retaining the very tiny fry of the burbot, and attempts at artificial propagation were discontinued. Adult burbot are voracious piscivores, feeding largely at night. Scott and Crossman (1973) stated that, in Canada, burbot are predatory during summer months but feed on aquatic invertebrates in winter. Miller (1970) found that, in Ocean Lake, fish made up about 98 % of the diet of larger burbot; burbot under 11

inches in length from that lake had damselflies in their stomachs. He found that burbot from Torrey Creek measuring 3 to 14 inches in length had fed on a variety of stream-dwelling invertebrates and that fish made up only a small part of their diet.

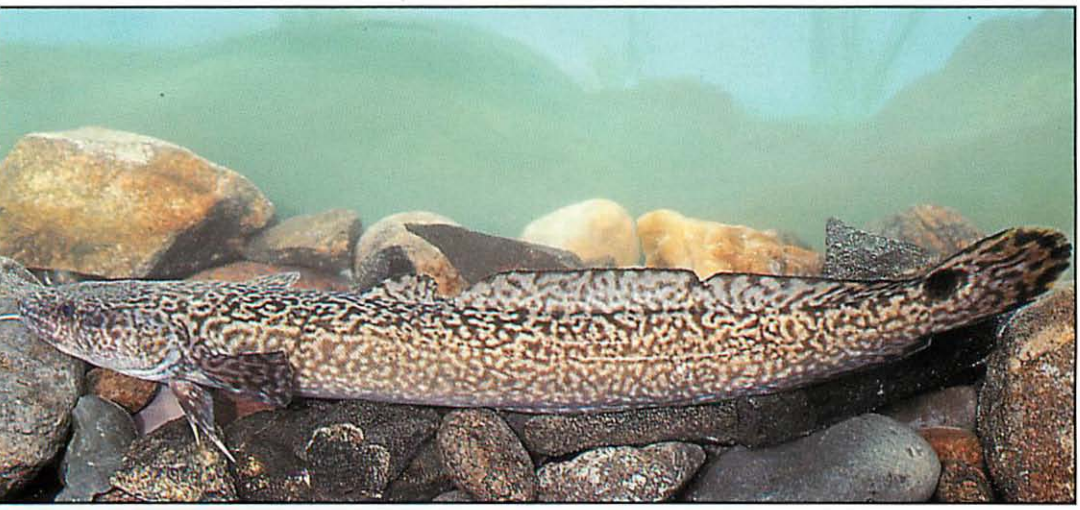
Distinguished from:

other Wyoming fishes by its eel-like body and median chin barbel.

Relation to man: The burbot is not esteemed as a food fish in the Lake States, although Becker (1983) noted references to the excellent quality of the flesh, it being "similar in taste to the more expensive lobster imported to the supermarket." He suggested the use of the predatory burbot in fisheries management to control overpopulation and stunting of prolific species (Becker 1983). In Canada, fisheries managers have considered the burbot a trash fish and detrimental to more valuable species (Scott and Crossman 1973). In Wyoming, the burbot is classified as a game fish. The flesh of burbot taken from cool lakes is excellent, and this fish was popular with winter anglers in Fremont County through the 1960s. Burbot populations in Fremont County have now decreased. Sediment pollution is blamed for declines in Wyoming's major burbot fisheries.

Nomenclature: Simon (1951) used the trinomial *Lota lota maculosa* for the burbot; the "eastern" burbot, *L.l. lacustris*, is recognized by some authors (Trautman 1981).

Literature references: *Lota lota maculosa.* Simon 1951:113-115 (Wind-Big Horn River, Tongue River).



Family Cyprinodontidae

Killifishes

Killifishes, also called topminnows, are small, often colorful fishes that usually feed at the water surface. They are easily distinguished from minnows by the presence of teeth in the jaws. Killifishes have a superior mouth; the dorsal fin is situated back at the same level as the anal fin; the caudal fin is rounded. The lateral line lacks external pores. Scales are mostly cycloid, although male killifishes have some ctenoid scales. The fin rays are soft.

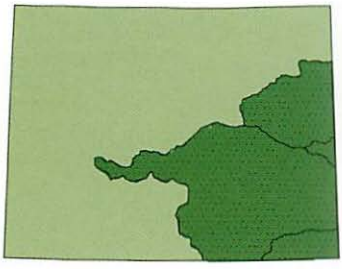
Killifishes are worldwide in distribution, mostly in tropical and subtropical regions, and primarily in fresh or brackish waters.

Plains topminnow *Fundulus sciadicus*

Fundulus-- of the bottom; *sciadicus*-- shady

Description: Body stout, slightly compressed; mouth distinctly superior; dorsal fin situated posteriorly at the same level as the anal fin; caudal fin rounded; head large, covered with scales; mouth small; eye very large; lateral line not evident externally; scales in the lateral series 33-39; dorsal fin rays 10 or 11; anal rays usually 12. Color olive green above, paler below, with a mid-dorsal dark stripe that has a distinct white segment just anterior to the dorsal fin. Ventral fins edged with red, the caudal mostly red in breeding males. Length of adults to about 3 inches.

Distribution: The plains topminnow ranges from South Dakota to Oklahoma in streams of the Plains States. In Wyoming, it is found in the North Platte and South Platte river drainages, in the Niobrara River drainage, and in headwaters of the Cheyenne River where it may have been introduced. In their survey of the fishes of



South Dakota, Bailey and Allum (1962) did not find this species in the Cheyenne River drainage.

Natural history: The characteristic habitat of this fish is shallow water in clear streams with sand or gravel substrate and considerable vegetation, where schools of this species may be seen frequenting the shallows along the edge of the stream. It thrives also in sloughs and backwaters that are choked with vegetation. In the 1950s, this topminnow was found, rarely, in Sand Creek and in the Laramie River in the Laramie Basin, but it has not been collected there in recent years. The life history of this species is virtually unknown. Pflieger (1975) notes that spawning takes place in early summer. The eggs are deposited on submerged vegetation or algae.

Literature references: *Fundulus sciadicus*. Simon 1951:96 (tributaries, North Platte and South Platte rivers).

Distinguished from:

plains killifish by absence of vertical lateral bars;

from minnows by teeth in its jaws, large scales on its head, and absence of an external lateral line.

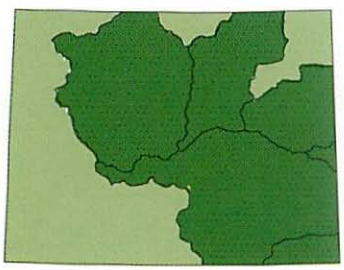
Plains killifish *Fundulus zebrinus*

Fundulus-- of the bottom; *zebrinus*-- zebra-like

Description: Body stout, somewhat compressed; mouth distinctly superior; dorsal fin situated posteriorly at about the level of the anal fin; caudal fin rounded or square; lateral line not evident externally; mouth small; eye large; scales in the lateral series 55-60; dorsal rays about 15; anal rays 13-14 with a basal sheath in the adult female. Color light brown, straw colored, or pale green fading to pale yellow or white on the belly; sides with 12-28 vertical dark bars. Breeding males more brightly colored than females, the fins bright orange. Adult length to 4 inches.

Distribution: This killifish ranges on the Great Plains from South Dakota to Oklahoma and Texas. In Wyoming, it is indigenous in the North Platte and South Platte river drainages, at elevations below 7,000 feet. Its range has been expanded by introductions; it is presently found in Twin Buttes Lake in the Laramie Basin, the Cheyenne River drainage, the Big Horn River in Big Horn County, Ocean Lake in Fremont County, and in the lower Powder River in northeastern counties. Brown (1971) reported collections of this species from streams in the Big Horn River drainage in southern Montana.

Natural history: Preferred habitat of this fish is shallow streams with sand or gravel substrate. It is tolerant of high salinities and high alkalinities. Twin Buttes Lake in Albany County once contained a high concentration of total solids, as much as 35,000 ppm. This killifish was the only fish in the lake before the water was diluted to establish a trout fishery. This fish is a predominant species in sandy, intermittent streams in the Casper area. The plains killifish is mostly carnivorous, feeding on the surface and in open water. Simon (1951) noted a habit of this species of stirring up the bottom materials by quick sideways darting movements. This behavior was observed in Casper Creek in July 1965 (personal observation). One fish positioned itself above a large pebble in the sand and, by vigorous agitation of the body, stirred up a cloud of sand. Several fish immediately downstream searched the cloud of sand, presumably feeding on food items made available. From a short distance, these activities could be mistaken for spawning behavior. Spawning behavior of the plains killifish was described by Koster (1948). In New Mexico on August 16-18, when water temperatures were near 82 degrees F, Koster observed the plains killifish over gravel in 2-4 inches of water. During spawning, the



male placed himself next to the female, and they then turned on their sides with the male on top. The sex products were released as the two fish assumed a flattened S-shape with the head and anal regions of their bodies touching the substrate. Breder and Rosen (1966) did not describe the spawning of either of the two species of killifishes found in Wyoming but mentioned instances in the genus *Fundulus* where eggs were buried, probably from the shifting of sand at the bottom. Another interesting behavior exhibited by this species is that of burying itself in the sand. This has been observed in an aquarium and was described from natural conditions by Minckley and Klaasen (1969).

Distinguished from:

plains topminnows by its vertical lateral bars;

minnows by its jaw teeth, absence of an external lateral line, and its vertical bars.

Relation to man: This hardy killifish has been used as bait. Such use accounts for the spread of the plains killifish into the Laramie Basin and into the Wind-Big Horn and Cheyenne river drainages. The plains killifish is not particularly susceptible to predation as evidenced by the fact that the introduced population in Twin Buttes Lake in Albany County is self sustaining in a lake that has been heavily planted with trout since rehabilitation.

Nomenclature: The genus *Plancterus* was relegated to synonomy with *Fundulus* by Miller (1955). The species *kansae* was relegated to *zebrinus* by Poss and Miller (1983).

Literature references: *Plancterus kansae*. Simon 1951:96-97 (North Platte and South Platte river drainages; Niobrara River). Miller 1955:11 (zoogeography, systematics, refers to Wyoming distribution, *Plancterus* = *Fundulus*).

Family Poeciliidae

Livebearers

This family is closely related to the killifish family, differing principally in bearing their young alive. The anal fin of male livebearers is elongate and modified into an intromittent organ. Like the killifishes, these fish have a superior mouth, a rounded caudal fin, and the lateral line is not evident externally.

Livebearers are predominantly tropical and subtropical fishes. Several species occur in the southern United States. The family includes such well known aquarium fishes as the guppy, swordtail, the platys, and mollies.

Exotic warmwater livebearers have been introduced into natural lakes and streams in the southern states and into warm springs in some northern states. In most instances, such introductions are illegal and irresponsible, as they are usually detrimental to the natural fisheries.

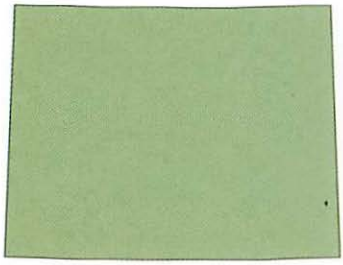
Western mosquitofish *Gambusia affinis*

Gambusia-- from *Gambusino*, a Cuban name; *affinis*-- Latin for "related"

Description: Body small and stout; mouth superior; fins rounded; lateral line not evident externally. Scales in the lateral series 27-30; first few rays of the anal fin elongate and forming a gonopodium in males. Color yellowish brown, the scales bordered by dark pigments to produce a distinctive pattern of cross-hatching. Adult length to about 3 inches; males smaller than females.

Distribution: The mosquitofish ranges from Missouri and Kansas south to Texas and the Southeast. It has been introduced in many places in the United States in an attempt at biological control of mosquitoes. In Wyoming, mosquitofish have been released in the Cheyenne and Torrington areas. A study of the fishes of lower Horse Creek in Goshen County made in the summer of 1986 revealed the presence of mosquitofish in that habitat.

Natural history: The mosquitofish feeds in schools at the surface of shallow water habitats, and mosquito larvae are susceptible to predation by this fish. In warmer climates, the mosquitofish reproduces over a period of 2 or even 3 months in the summer, and a



female may produce several broods. Mosquitofish reproduce very much like the guppy. Males pursue and court females almost continuously; sperm are transferred to the reproductive tract of the female via the gonopodium and stored alive in a special structure in the cloaca of the female. Broods up to several hundred young are born alive. Adult mosquitofish are short-lived, probably not often living beyond their second summer (Pflieger 1975).

Relation to man: Mosquitofish are an introduced species, used in an attempt to control mosquitoes. Lynch (1988) reported on the introduction and subsequent history of mosquitofish in Nebraska. He concluded that "In spite of access, mosquitofish appear capable of little dispersal in streams and rivers of eastern Nebraska." Because of a cooler climate in Wyoming, the reproductive schedule of the mosquitofish is probably much reduced; nevertheless, the use of this species for mosquito control and its relation to native fish species should be monitored.

Distinguished from:

guppies by the plain colors of the male mosquitofish;

from male swordtails by its lack of a sword-like extension of the caudal fin;

from minnows by its jaw teeth, absence of external lateral line pores, and the gonopodium of the male.

Family Cottidae

Sculpins

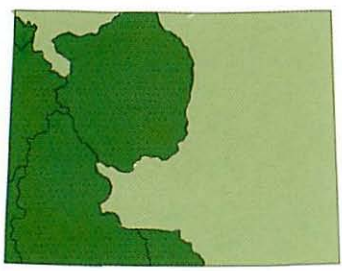
This family of fishes is included in the Order Scorpaeniformes, a group of spiny-rayed fish known as the mail-cheeked fish, so-called from the presence in the skull of a suborbital "stay," a posterior extension of the third suborbital bone. The fin spines of sculpins are weak and flexible. Their scales are absent or much reduced; vestigial scales appear often as "prickles," minute bony structures imbedded in the skin. Their flattened head and slender tapered body adapts them to living beneath rocks. Like sunfishes and catfishes, the sculpins usually lay their eggs in a nest which is guarded by one or both sexes. Freshwater sculpins are typically cold-water riffle dwellers. Most of the species in the family are marine, living along the coastline of North America and Asia. Species of the genus *Cottus* are found in fresh water. Sculpins are small fish and are important as forage and bait.

Mottled sculpin *Cottus bairdi*

Cottus-- an ancient name; *bairdi*-- after Spenser F. Baird

Description: Body slender, terete, flattened laterally and tapered toward the tail; head large, broad, and depressed dorso-ventrally; eyes dorsal; nostrils small and widely separated; mouth large; palatine teeth present; snout broad and flat; pectoral fins very large; caudal fin rounded; caudal peduncle slender; two dorsal fins, first dorsal with 7 or 8 flexible spines, second dorsal with 16-18 soft rays; anal fin with 11 to 13 rays; scales absent; body with tiny prickles in some populations; lateral line incomplete, with 23 to 29 pores; preopercle usually with 1 large spine and from 1 to 3 smaller spines. Color bluish or brownish gray above, mottled with irregular blotches of dark brown or black; ventral surface white with a bluish or yellowish cast; all fins spotted or mottled with black; ventral surfaces of head, body, and fins dusky with minute black spots; first dorsal with the upper edge tinged with orange or white in breeding males. Adult size 4 to 6 inches.

Distribution: The mottled sculpin ranges widely across the northern states from British Columbia and Washington to the Atlantic Coast. A relict population lives in the Ozarks in Arkansas and Missouri. In Wyoming, it occurs primarily west of the Continental Divide but occurs in the upper Wind River, apparently introduced via the bait bucket.



Natural history: This species inhabits clear, cold, streams with rock or gravel substrate. It lives on the bottom, hiding during daylight hours and foraging mostly at night. Bailey (1952) observed sculpins in quiet water near shore where they stirred up clouds of silt which settled and covered them. Spawning occurs between February and June. Simon and Brown (1943) observed the spawning of the mottled sculpin in spring creeks near Jackson, Wyoming, at water temperatures between 45-48 degrees F. The mottled sculpin becomes sexually mature at 2 or 3 years of age, at which time females are distinguished by the distended abdomen and the males by a conspicuous genital papilla. The nest, scooped out beneath a stone or other submerged object is apparently made by the male. In Montana, females produce an average of 203 eggs, and since Bailey (1952) found as many as 1,578 eggs in a nest, he concluded that more than one female uses a nest. The sculpin has been accused of feeding upon trout eggs, since it buries itself in gravels in the very place where these are deposited. Simon and Brown (1943) counted an average of 354

eggs per nest, and an average of 6,219 eggs in the ovaries of females ready to spawn. They observed both male and female sculpins in attendance of nests of uneyed eggs. Bailey (1952) believed that the male fish was the attendant. Food of the mottled sculpin includes aquatic insects, crustaceans, and some small fish.

Distinguished from:

Paiute sculpins by its palatine teeth and the presence of more than one preopercular spine.

Relation to man: The mottled sculpin is an important forage fish and is frequently used as bait.

Nomenclature: Simon (1951) indicated that a species, *semiscaber*, which he called the Rocky Mountain bullhead, occurred in both the Snake River and the Bear River drainages. Bailey and Bond (1963) used the name *semiscaber* for the subspecies of the mottled sculpin with prickles and indicated that it is restricted to the Bear River drainage. If this subspecies is recognized, then populations in the Snake River and other northern drainages would be considered *Cottus bairdi punctulatus* following Jordan (1891).

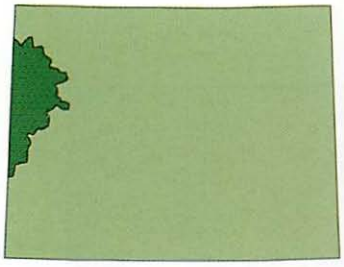
Literature references: *Potamocottus punctulatus*. Gill 1876:402-403 (original description: a single specimen—between Bridgers Pass and Fort Bridger). *Cottus bairdi punctulatus*. Jordan 1891b:53 (Madison River, Gibbon River and Canon Creek, Yellowstone National Park); Evermann 1892:51-52 (Canon Creek, Yellowstone National Park; Junction of Firehole and Gibbon rivers; Pacific Creek in Two Ocean Pass; Pacific Creek, 25 miles below the Pass; Small Creek at head of Jackson Lake; Snake River, Presidents Camp). *Cottus punctulatus*. Simon 1951:110-111 (Green, Little Snake, Madison and Gibbon rivers).

Paiute sculpin *Cottus beldingi*

Cottus-- an ancient name;
beldingi-- after L. Belding

Description: Body terete, the head depressed dorsoventrally and the body compressed laterally; head large, eyes somewhat dorsal; pectoral fin large, caudal fin rounded; palatine teeth absent or much reduced; lateral line complete; first dorsal fin with 7 or 8 flexible spines, second dorsal with about 17 soft rays; anal fin with 12 soft rays; preopercle usually with a single spine. Color brown or brownish gray above with a series of 5 to 7 dorsal saddles. These saddles merge more or less with lateral blotches or an irregular lateral dark band which continues posteriorly to produce a distinct dark wedge at the base of the caudal fin. Two quite distinct dark lines on the side of the head converge in the eye. The spinous dorsal fin has both an anterior and posterior dusky blotch; the intermediate rays are rufous in color. The rays of all the fins are regularly blotched or speckled. The top of the head is irregularly speckled with large spots. Adult size usually about 4 inches.

Distribution: The Paiute sculpin occurs in the Lahontan and Bonneville basins and the Columbia River system, including the upper Snake River. In Wyoming this sculpin is found in headwaters of the Snake River in Teton and Sublette counties. It has been collected from Shoal Creek, tributary to the Hoback



River, and from Horse Creek and Pacific Creek, tributaries to the Snake River.

Natural history: The preferred habitat of this sculpin is riffle areas of streams with somewhat higher gradient. It sometimes lives in lakes; it is the common sculpin in Lake Tahoe in Nevada-California (La Rivers 1962). It spawns in the late spring and early summer. Spawning behavior has not been described in detail. Food and feeding habits of the Paiute sculpin are probably similar to those of the mottled sculpin.

Relation to man: As with other sculpins this species is an important forage and bait species.

Nomenclature: The taxonomy of the sculpins of western North America has had a complicated history. Simon used the name *tubulatus* for this species. Bailey and Bond (1963) relegated *tubulatus* to synonymy with *beldingi*.

Literature references: *Cottus tubulatus*. Simon 1951:112-113 (Hoback River and Granite Creek, Teton County).

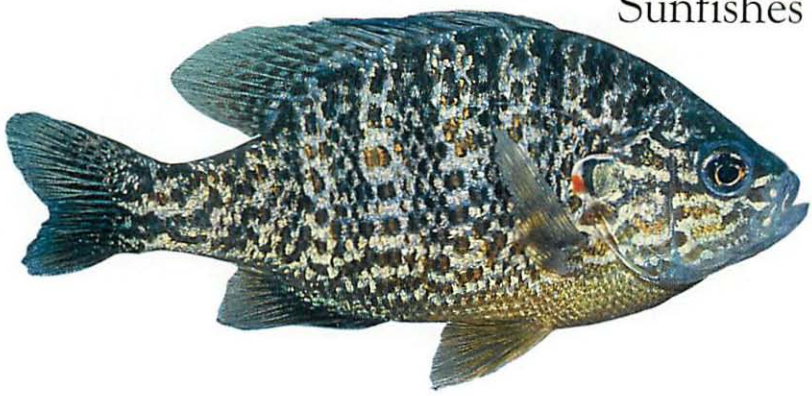
Distinguished from:

mottled sculpins by a combination of-- 1) lack of palatine teeth (usually); 2)a single preopercular spine (usually); 3)a complete lateral line (usually).

In younger specimens compared side-by-side, the skin of the Paiute sculpin is markedly smoother.

Family Centrarchidae

Sunfishes



The family Centrarchidae contains the familiar sunfishes such as the bluegill, pumpkinseed, crappies, and the black basses. These are spiny-rayed fishes with a dorsal fin made up of an anterior spiny segment and a second segment of mostly soft rays. In centrarchids, this fin is never completely separated into 2 fins as in the perches. Centrarchids are often deep bodied and strongly compressed laterally. Scales are ctenoid; the pelvic fins are situated well forward inserted at about the same level as the pectoral fins; the gas bladder is not connected to the alimentary tract by a pneumatic duct.

Sunfishes are mostly warm water carnivores. They thrive in weedy ponds and small lakes but inhabit some stream habitats. Eggs are deposited in a nest which the male prepares and guards while the eggs are hatching.

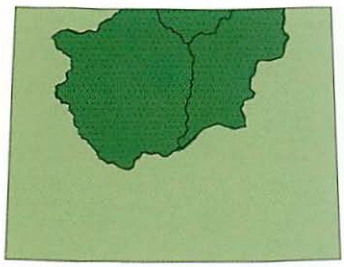
Sunfishes are important game and food fishes; they are widely used as farm-pond fish.

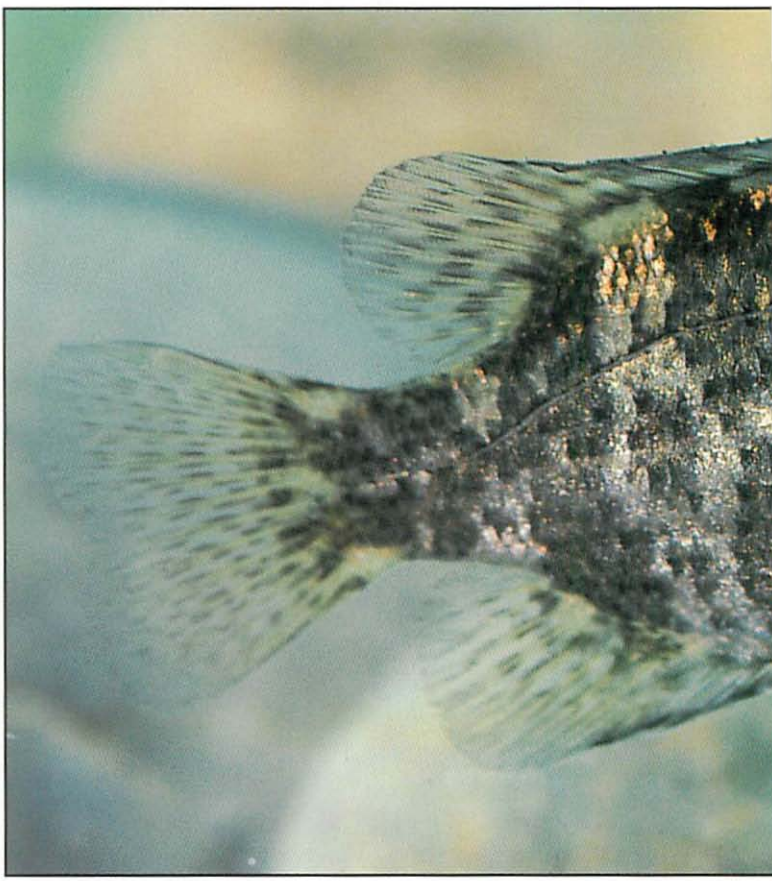
Rock bass *Ambloplites rupestris*

(*Ambloplites*-- blunt-armed; *rupestris*-- of the rocks)

Description: Body robust, moderately compressed; head, eye, and mouth large; angle of the jaw extending to below the eye; lateral line scales 40-46; dorsal fin with 11 spines and 11 or 12 soft rays; anal fin with 5 or 6 spines and 11 soft rays; no opercular flap; gill rakers slender. Color dark brown or black, mottled or spotted dorsally and laterally; breast pale brown or yellow; eye of adult fish bright orange-red. Young fish conspicuously marked with large irregular black blotches. Maximum length in Wyoming about 10 inches.

Distribution: The rock bass ranges from Manitoba east through the Lake States to New York, south and west to Oklahoma. In Wyoming this species is found in several habitats in the northern and northeastern drainages.





Natural history: This fish prefers streams with rubble substrate; it usually inhabits pools. Spawning follows the pattern of other sunfishes. Food includes aquatic invertebrates and small fish.

Relation to man: Classified as a game fish in Wyoming, the rock bass is quite sporty but seldom attains large size.

Nomenclature: Simon (1951) recognized the subspecies *rupestris*, distinguishing northern populations from those found in the Gulf States. These subspecies are no longer generally recognized.

Literature references: *Ambloplites rupestris rupestris*. Simon 1951:108 (introduced into Wyoming).

Distinguished from:

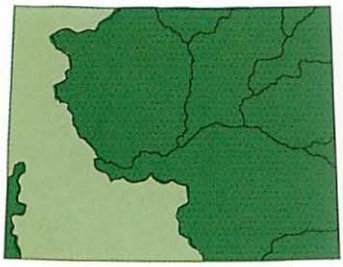
other sunfishes by the presence of more than three anal spines and by its red eye.

Green sunfish *Lepomis cyanellus*

(*Lepomis*-- scale-operculum; *cyanellus*-- bluish)

Description: Body short and deep, compressed laterally; head large; eye moderate; mouth large, tip of maxillary meeting a vertical line at about the middle of the eye; dorsal fin with 10 spines and 11 soft rays; anal fin with 3 spines and 8 to 10 soft rays; pectoral fin short and rounded; scales in the lateral line 45-50. Color mostly green above, shading to yellow or orange ventrally. Usually with a large black blotch at the base of the posterior part of the dorsal and, often, the anal fins; the dorsal, anal, and pelvic fins usually with white or creamy margins; opercular flap black with a creamy margin; typically with a distinctive row of blue or purple spots across the cheek just below the eye. Adult length to about 7 inches in Wyoming.

Distribution: The green sunfish ranges from the Lake States to the Rio Grande River along the Mexican border and from the Alleghanies west to Nebraska, Colorado, and New Mexico. In Wyoming, where it has been introduced, this species is the most widely distributed of the sunfishes and is common today in the northeastern counties of the state and in the North Platte, Niobrara, Big Horn, and Bear river systems.



Natural history: This sunfish inhabits pools in small to medium-sized streams. At lower elevations, it is often abundant in small lakes, ponds, and sloughs. Reproduction follows the pattern typical of the sunfishes. In early summer, the male constructs a nest in shallow water and, after spawning, guards the eggs and fry for some time. Mueller and Rockett (1969) observed many green sunfish nests guarded by males on July 19, 1967, and July 18, 1968, in Cook Lake, Crook County, when surface water temperatures measured 73 degrees F. The diet includes small fish and a variety of aquatic invertebrates.

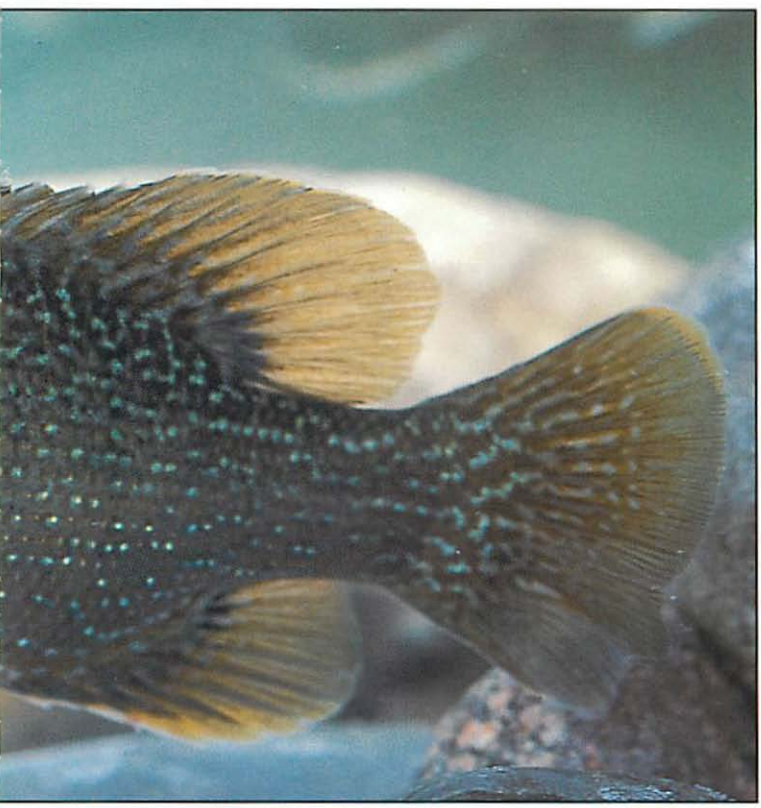
Relation to man: The green sunfish is easily taken by hook and line, but in Wyoming it is often stunted. In sloughs along the North Platte River near Guernsey, this fish (often misidentified as the bluegill) is abundant and provides some recreational fishing.

Literature references: *Lepomis cyanellus*. Simon 1951:105 (introduced into Wyoming).

Distinguished from:

other sunfishes of the genus Lepomis *by its larger mouth;*

the rock bass by having three anal spines rather than five.



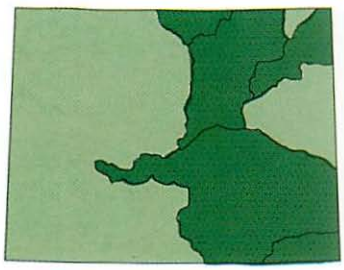
Pumpkinseed *Lepomis gibbosus*

(*Lepomis*--scale-operculum; *gibbosus*--hump-backed, shaped like a pumpkin seed)

Description: Body deep and compressed laterally; head large; eye large; mouth moderate; lateral line scales 35-40; dorsal fin with 10 spines, 11 soft rays; dorsal fin with 3 spines and 10 soft rays; pectoral fin long and pointed; opercular flap small; inferior pharyngeal teeth blunt; gill rakers short and blunt. Color greenish above shaded with blue; sides mottled black and orange; opercular flap always with a bright scarlet spot (this spot duller in females). Adult length to 8 inches in Wyoming.

Distribution: The pumpkinseed ranges from North Dakota to Quebec, south to the Carolinas and the upper Mississippi Valley. In Wyoming the introduced pumpkinseed occurs sporadically in small lakes and ponds at lower elevations in the counties east of the Continental Divide.

Natural history: The pumpkinseed prefers warmer weedy lakes and ponds, where it is often found together



with the largemouth bass, other sunfishes and the golden shiner. Spawning and feeding habits are similar to those of other sunfishes. Hybrids between the pumpkinseed and the green sunfish have been reported from the northeastern counties. In the cooler waters of Wyoming this sunfish seldom exceeds 5 inches in length.

Relation to man: The pumpkinseed is easily caught on hook and line. When it is abundant, angling for this and other sunfishes provides recreation for young and old alike. Many of us fondly remember the little sunfish with the bright red spot on its cheek as the first fish we ever caught. And that our grandfather called it a bluegill and our mother called it "bony".

Literature references: *Lepomis gibbosus*. Simon 1951:107 (introduced into Wyoming).

Distinguished from:

other Wyoming sunfishes by the red spot on its opercular flap.

(A preserved specimen in which this spot has faded may be distinguished from bluegills by its short, blunt pharyngeal teeth and blunt gill rakers;)

from green sunfish by its smaller mouth.

Bluegill
Lepomis macrochirus

(*Lepomis*-- scale-operculum; *macrochirus*-- large fin, in reference to the elongate pectoral fin)

Description: Body deep and laterally compressed; head large; eye large; mouth small; lateral line scales usually 41-45; fins high, dorsal fin with 10 spines and 10-12 soft rays; anal fin with 3 spines, 10-12 soft rays; pectoral fin long and pointed; gill rakers long and slender; pharyngeal teeth sharp. Color green above, silvery laterally; in adults, the breast burnt orange or yellow; males more brightly colored than females; young fish usually with vertical bars on the sides, these usually faint or absent in adults. Males in breeding colors with bright blue markings on the operculum and cheek; this apparently the source of the name. Length up to 11 inches, rarely over 7 inches in Wyoming.

Distribution: The range of the bluegill in the United States is from South Dakota east to the Atlantic seaboard, south to Florida and Texas. In Wyoming, where it has been introduced into lakes and farm ponds, it is most common in ponds in the northeastern counties.

Natural history: The bluegill prefers warm, weedy ponds, sloughs, and small lakes. In its native range, it occurs also in sluggish streams. Spawning behavior is similar to that of other sunfishes. The diet is mainly aquatic insects, rarely small fish.

Relation to man: The bluegill provides some recreational angling. This species is widely used as a forage fish for the largemouth bass. Bluegill populations have the potential to increase rapidly in favorable habitats and become stunted unless cropped heavily. Dense beds of vegetation in farm ponds often reduce angler success and afford protection for young bluegills from the bass. In such situations, bluegills become extremely abundant and all game species in the pond may be stunted.

Literature references: *Lepomis macrochirus macrochirus*. Simon 1951:106-107 (introduced into Wyoming).

Distinguished from:

other sunfishes by its small mouth, the presence of vertical bars on young and juvenile fish, and the yellow or burnt orange breast of adults.

(Reports of bluegills in Wyoming are often based on the misidentification of green sunfish.)

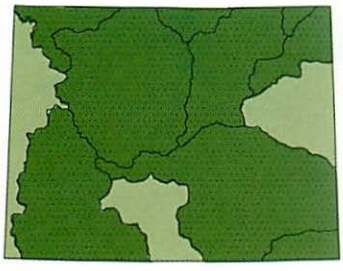
Smallmouth bass *Micropterus dolomieu*

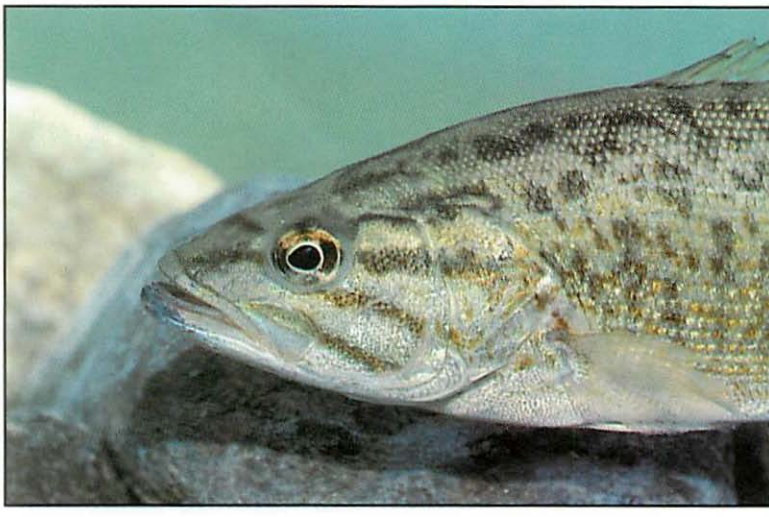
(*Micropterus*-- small fin; *dolomieu*-- after M. Dolomieu)

Description: Body elongate, moderately compressed; spiny and soft segments of dorsal fin broadly joined; head large; eye large; mouth relatively large, the posterior end of the maxillary meeting a vertical line at about the middle of the eye; dorsal spines 9 or 10; last spine of the spiny segment more than half as long as its longest spine; dorsal soft rays 12-15; usually 14; anal spines 3; anal soft rays usually 11; pelvic fins with 1 spine and 5 soft rays; lateral line scales about 70. Color greenish brown or olive, white below. Older fish usually not barred but may show mottling or bars when spawning; younger fish are mottled or barred with black, and young of the year and yearlings with bright orange or yellow on the basal part of the caudal fin and a black band in the caudal fin inside light margins. Length of mature fish usually less than 12 inches.

Distribution: The native range of the smallmouth bass is from eastern South Dakota across the Lake States to the St. Lawrence River system, south to northern Georgia and west to the Ozarks. In Wyoming, the smallmouth bass was first introduced as early as 1889 (Miller 1890) when it was introduced unsuccessfully into the Laramie River and Hutton Lake near Laramie. In the 1960s, smallmouth bass became established in ponds near Sheridan. This species has been established in a number of low- elevation lakes and reservoirs in the state and in the Laramie River downstream from Grayrocks Reservoir.

Natural history: Cool, clear rivers and large cool lakes are preferred habitat for the smallmouth bass. This species spawns in streams and in deeper lakes that have





shoal areas of rock, gravel, or sand (Hubbs and Bailey 1938). Spawning usually occurs at water temperatures of at least 60 degrees F, although Becker (1983) noted that in Wisconsin this bass has been found spawning at 53 degrees F. The male selects a site and makes a depression by fanning his caudal fin.The female is then driven or lured to the nest and the eggs are laid and fertilized. The adhesive eggs adhere to stones on the nest floor. A female may spawn several times a season in the same nest. After spawning, the male smallmouth bass guards the nest until the eggs hatch and continues to escort the young fish for a few days after hatching. The smallmouth bass is almost entirely carnivorous; the fry feed on microcrustaceans and, as they grow larger, on insects, crayfishes, and finally small fish (Hubbs and Bailey 1938).

Relation to man: The smallmouth bass has become more important in the management of Wyoming reservoir fisheries in recent years. It is common today in Keyhole Reservoir and the Belle Fourche River in the northeastern counties and in Grayrocks and Flaming Gorge reservoirs in the southern part of the state.

Nomenclature:The subspecies *dolomieui*, recognized by Simon (1951), is no longer in general use. The terminal-i of the specific name was deleted by action of the committee on names, American Fisheries Society (Bailey and Robins 1980).

Literature references: *Micropterus dolomieui dolomieui.* Simon 1951:103 (introduced into Wyoming).

Distinguished from:

the largemouth bass by the length of the last spine of the spiny dorsal which is more than half the length of the longest dorsal fin and by the shorter maxillary which extends to about the middle of the eye.

(Young smallmouths are easily distinguished from largemouth bass by their coloration.)

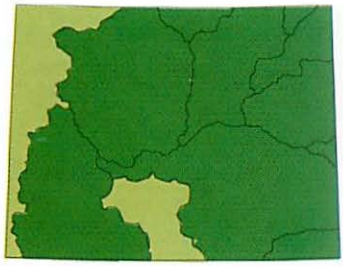
Largemouth bass *Micropterus salmoides*

(*Micropterus*-- small fin; *salmoides*-- salmon-like)

Description: Body robust, somewhat compressed; spiny and soft segments of dorsal fin almost separated; head large; eye large; mouth large, tip of maxillary meeting a vertical line behind the eye; dorsal spines usually 10; last spine of the spiny dorsal less than half the length of its longest spine; dorsal soft rays 12-13; anal spines 3; anal soft rays 11; lateral line scales 60-70; cheek scales large in 9-12 rows from the eye to the angle of the preopercle. Color usually green with a bronzy tinge and with a conspicuous dark lateral band; this band more evident in young fish. Average size of adults usually 14 inches or less; weight in its whole range to 22 pounds.

Distribution: The native range of the largemouth bass is from southern Canada through the Lake States south to Florida and northeastern Mexico. It has been introduced widely throughout the United States as a game fish. In Wyoming, it is restricted to warmer waters at lower elevations where it is present in some larger lakes and in farm ponds.

Natural history: The largemouth bass prefers larger lakes and backwaters of slow streams with summer water temperatures reaching 75 degrees F and abundant beds of vegetation. Spawning behavior is similar to that of



the smallmouth bass and other sunfishes; males fashion a nest by fanning the substrate with the fins and, after inducing a female to spawn, guard the eggs until they hatch. The male largemouth bass escorts and guards the fry and fingerlings for some time after they leave the hatching site. This large piscivore needs a good supply of forage fish. Golden shiners or bluegills are often managed with largemouth bass as forage species.

Relation to man: The largemouth bass is an important game species in warmer lakes and ponds in Wyoming. Largemouth bass for planting are obtained by the Game and Fish Department from existing Wyoming populations or from warm water hatcheries in surrounding states who trade fry, fingerling, or subadult largemouth bass for trout eggs.

Nomenclature: The genus *Huro* used by Simon (1951) was reduced to a subgenus by Bailey and Hubbs (1949), hence the largemouth bass was included in the genus *Micropterus*.

Literature references: *Huro salmoides*. Simon 1951: (introduced into Wyoming).

Distinguished from:

the smallmouth by its larger mouth, the shorter last spine of the spiny segment of its dorsal fin, and by its larger cheek scales.

(Young smallmouths are recognized by their bright colors.)

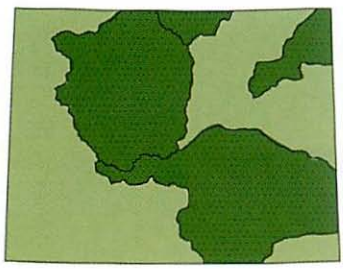
photo by Richard T. Bryant

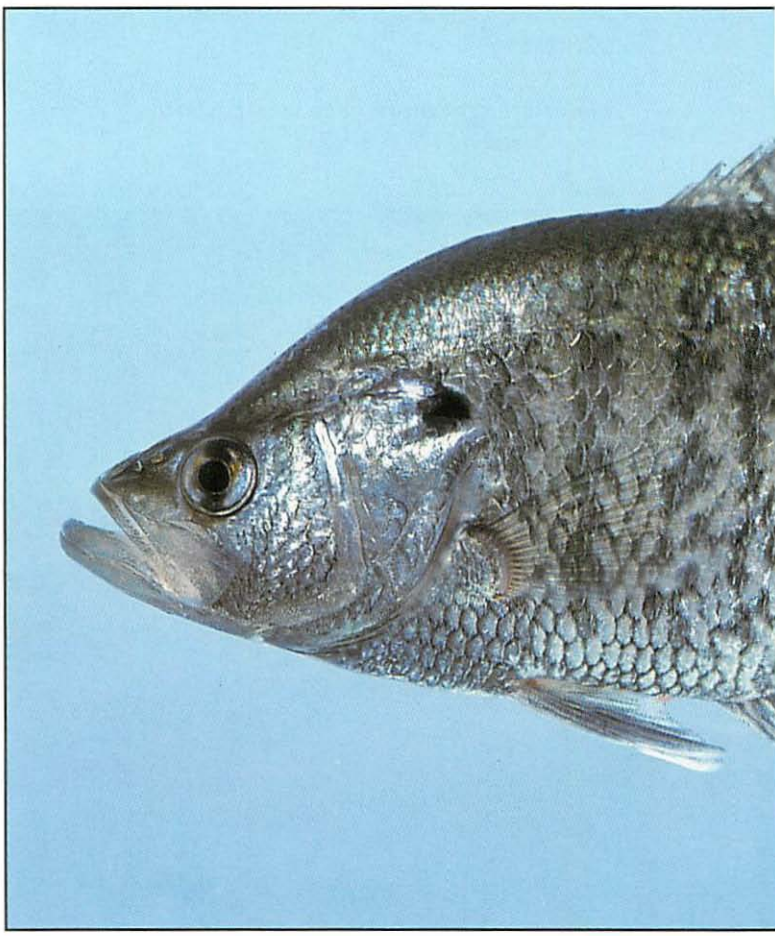
White crappie *Pomoxis annularis*

(*Pomoxis*-- sharp opercle; *annularis*-- with rings)

Description: Body deep and strongly compressed; head long but not deep; eye large; mouth large; maxillary extending to the level of the middle of the eye; no opercular flap; operculum bony to its edge and quite pointed; lateral line scales 38-45; dorsal fin with 5 or 6 spines and 13-15 soft rays, rounded, its length less than the distance from the front of the dorsal fin to the eye; anal fin rounded, with 5 or 6 spines and 17 or 18 soft rays. Color dark olive above, silvery on the sides, with about 10 quite distinct vertical bars; belly white; dorsal, anal, and caudal fins mottled. Maximum length about 18 inches in warmer climates, usually 7-8 inches in Wyoming.

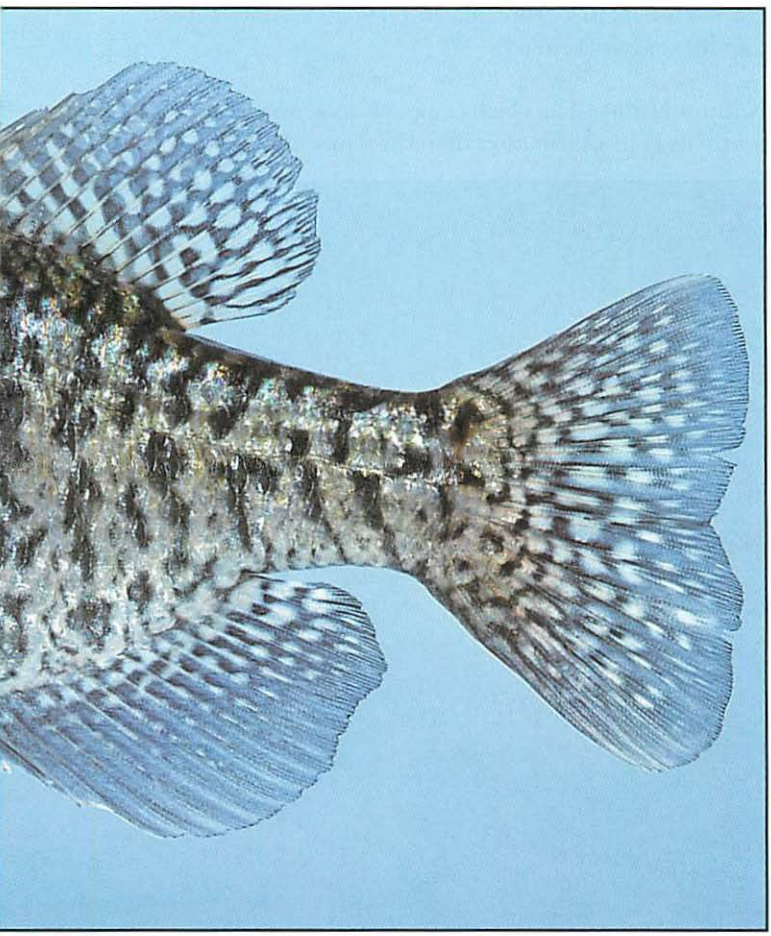
Distribution: The native range of the white crappie is from eastern South Dakota and the southern Lake States south to Texas. In Wyoming, this fish is found in the Tongue River and has been introduced into Keyhole, Grayrocks, Hawk Springs and Glendo reservoirs.





Natural history: Ecological differences between this species and the black crappie are not great. Forbes and Richardson (1920) suggested that the black crappie may prefer lakes with a "harder bottom" — as opposed, presumably, to a silty or mud bottom. Harlan and Speaker (1956) stated that the white crappie is seemingly more tolerant of turbid conditions than the black crappie. The black crappie ranges farther north (into Manitoba) than the white crappie; the white crappie ranges farther south in Texas. In Wisconsin, the white crappie is common only in the southern half of the state (Becker 1983). Spawning and food habits of the white crappie are essentially the same as for the black crappie.

Relation to man: It remains to be seen whether the white crappie may prove to be the more successful of the two crappie species in some turbid Wyoming habitats.



Distinguished from:

the black crappie by its shorter dorsal fin, and fewer soft rays. Black crappie has 15-16 rays, white: 13-15.

(The white crappie almost always shows vertical bars; adult black crappie are usually completely mottled with black.)

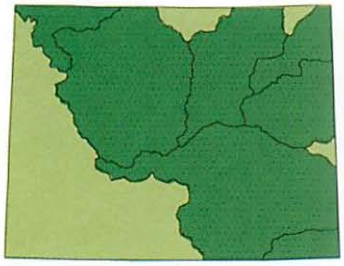
Black crappie *Pomoxis nigro-maculatus*

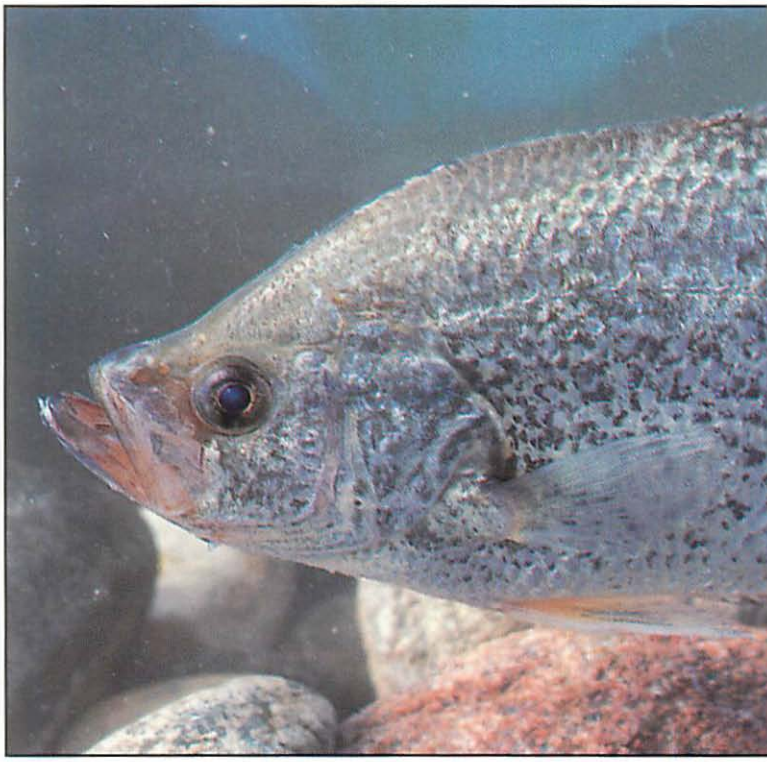
(*Pomoxis*-- sharp opercle; *nigromaculatus*-- black spotted)

Description: Body deep and strongly compressed; eye large; mouth large, maxillary extending back to the middle of the eye; no opercular flap as in *Lepomis*; operculum bony to its border and quite pointed; lateral line scales 38-44; dorsal fin rounded, its length greater than the distance from the front of the dorsal fin to the eye; dorsal spines 7 or 8; dorsal soft rays 15-16; anal fin rounded with 6 spines and 18 soft rays. Color olive or green dorsally; sides mottled black and white almost never with distinct vertical bars as in the white crappie. Maximum length of mature fish about 18 inches; weight to 4 pounds in its native range.

Distribution: The range of the black crappie is from Manitoba south to Texas and east to the Atlantic Coast; it has been widely introduced elsewhere in the United States. In Wyoming, this species is found in a number of lakes at lower elevations east of the Continental Divide. At one time there was an excellent crappie fishery in Ocean Lake in Fremont County but that fishery has declined.

Natural history: The black crappie is somewhat more northern in its distribution than the white crappie and





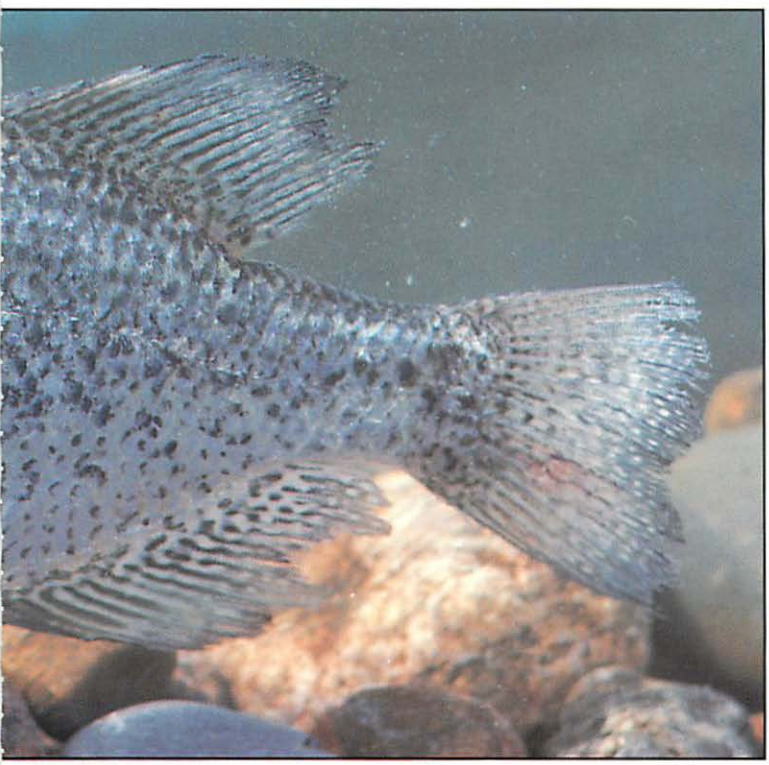
seems to prefer lakes and ponds with a substrate other than soft silt or mud. It is said to be less tolerant of turbidity than the white crappie (Becker 1983, citing Schneberger). The black crappie spawns in May or June in nests constructed in sand, gravel or vegetation, sometimes using undercut banks as a nest site. The nest and eggs are guarded by a parent fish. Food of this species includes insects, crustacea and small fish.

Distinguished from:

the white crappie by its longer dorsal fin, with 15-16 rays and the absence of vertical bars.

Relation to man: In Wyoming's relatively cool climate, the black crappie is the more important game fish of the two species of crappie. The black crappie is easy to catch on hook and line and, in lakes where it grows to a respectable size, is an excellent game fish. Crappie enthusiasts rave about the eating and sport qualities of this species, and travel long distances to fish for it. Scott and Crossman (1973) noted that commercial fisherman in Canada get a price for this fish equal to that of the walleye. Minnows and artificial flies are taken readily by the black crappie. In the Lake States, it is one of the favorites of the winter anglers.

Literature references: *Pomoxis nigromaculatus*. Simon 1951: (introduced into Wyoming).



Family Percidae

Perches

This family of fresh water fishes includes the yellow perch, sauger, walleye, and the darters.The sauger and walleye are sometimes called pikeperches, so called because of their larger size and large mouth with long canine-like teeth.They are not closely related to the pikes.

Percids are spiny-rayed fish having ctenoid scales. The pelvic fins are situated well forward on the body, inserted at about the level of and below the pectoral fins. The gas bladder is not connected to the gut. New World perches are always characterized by two completely separated dorsal fins, the first dorsal fin with spines only, the second dorsal fin with soft rays which may be preceded by 1 or more spines.

Perch are almost exclusively carnivorous; the pikeperches are predacious. Perch and pikeperches are important game species and their flesh is of excellent quality.

Darters are small, brightly colored fishes with the general features of the other perches. They are bottom dwellers in clear streams and lakes where they rest on the pectoral and anal fins, darting in pursuit of insects and other aquatic invertebrates or to escape their predators.

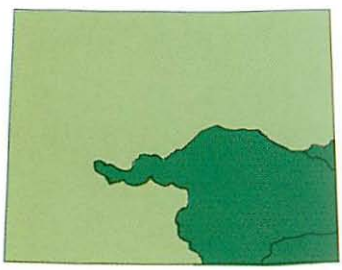
Darters are native only to North America; over 100 species are recognized (Nelson 1984).

Iowa darter *Etheostoma exile*

Etheostoma-- various-mouth; *exile*-- slim

Description: Body slender; pectoral fins large; caudal fin rounded; head moderate; eye large; mouth moderate; the premaxillae not protractile; lateral line incomplete, usually with pored scales only about two-thirds the distance from the shoulder to the base of the caudal peduncle; scales in the lateral series 54-60; cheeks scaled; first dorsal fin with about 9 spines; second dorsal fin with 9-12 soft rays; anal fin with 2 spines, 7-8 soft rays. Color brown or green with about 10 lateral dark blotches. A conspicuous black bar extends vertically below the eye. Breeding males become very brightly colored, the lateral blotches overlain with green and interspaced with red, the lower part of the caudal fin bright green, the belly red, and the breast cream-colored, the first dorsal bordered with blue or green. Adult length about 2.5 inches.

Distribution: The range of the Iowa darter is from Saskatchewan and the east slope of the Rocky Mountains east to Quebec and Ohio. In Wyoming, this darter is found in small, clear streams in the North Platte and South Platte river drainages and in the Niobrara River drainage. It ranges to over 7,000 feet elevation in the Laramie Basin where it is common in Sand Creek, in



the Laramie River, and in drainage lakes in the Basin. Since the 1960s, the Iowa darter has been largely replaced by the johnny darter in the upper North Platte River in Carbon County, and in the Rock and Medicine Bow rivers.

Natural history: The preferred habitat is clear, cool, weedy streams and along the shoreline of small lakes. The Iowa darter spawns from late April to July in Wyoming. Spawning takes place beneath undercut banks or underneath submerged objects. In spawning, the male mounts the female while the vents are held at the same level; eggs are deposited along fibrous mud banks, on the undersurfaces of submerged objects, and possibly buried in sand (Winn 1958). The food of the Iowa darter consists of small aquatic invertebrates.

Nomenclature: This species was recorded as *Poecilichthys* by Simon (1951); that name was relegated to synonomy with *Etheostoma* by Bailey (1951).

Literature references: *Poecilichthys exilis*. Simon 1951:101-102 (Muddy Creek, South Platte River drainage; North Platte River and tributaries).

Distinguished from:

johnny darters by the frenum connecting its upper lip with the roof of its snout and by its incomplete lateral line. Iowa darters are marked with dark lateral blotches; these appear as W-shaped marks on the johnny darter;

orange-throat darters by its scaled cheeks and shorter soft dorsal fin;

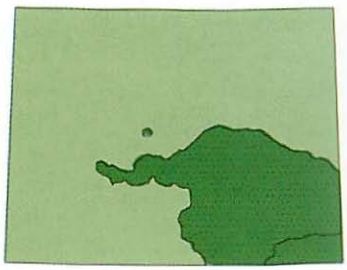
(Brightly colored male Iowa darters in breeding colors are sometimes mistakenly identified as orange-throat darters.)

Johnny darter *Etheostoma nigrum*

Etheostoma-- various-mouth; *nigrum*-- black

Description: Body slender, terete; the pectoral fins large; the caudal fin rounded; head moderate; eye large; mouth moderate; the premaxillae protractile; lateral line complete with 42-50 pored scales; first dorsal with 8-10 spines; second dorsal with 11-13 soft rays. Anal fin with 1 spine, 7-9 soft rays. Color brown or gray with dark dorsal saddles and dark lateral inscriptions which are usually W-shaped, the distinguishing feature of the johnny darter. Breeding males become very black anteriorly. Dorsal and caudal fins heavily speckled with dark pigments. Length of adults to about 3 inches.

Distribution: The johnny darter ranges from Saskatchewan and the Rocky Mountains east to Quebec, south to Virginia and Oklahoma. In Wyoming, this darter has expanded its range quite dramatically since the late 1960s. Today, it has become common in the upper North Platte River from the Wyoming-Colorado state line downstream and in the Medicine Bow and Rock rivers in Albany and Carbon counties. It



is also found in the Laramie River drainage in Albany, Goshen, and Platte counties, in Horse Creek in Goshen and Laramie counties, and in the Crow Creek and Lodgepole Creek drainages in Laramie County.

Natural history: The preferred habitat is described by Cross (1967) as small, spring-fed streams that have high gradient. Its ecology in Wyoming has not been studied. Food of this species includes bristle worms, midge larvae, and small crustacea. The breeding habits are quite similar to those of the Iowa darter. Males establish territories beneath stones and clean the underside of stones by turning upside down and fanning or brushing the stones with the pelvic fins. In the spawning act, both the male and female are inverted. The eggs deposited onto the under surface of the stone. Only the male guards the eggs and fry (Winn 1958). In Wyoming, spawning probably takes place in late May and June.

Distinguished from:

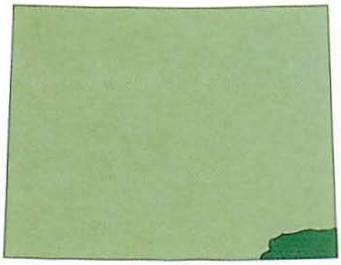
Iowa and orange-throated darters by the W-shaped marks on its sides, its protractile premaxillary and complete lateral line.

Orangethroat darter *Etheostoma spectabile*

Etheostoma-- various-mouth; *spectabile*-- conspicuous

Description: Body robust; head large; snout blunt and decurved; premaxillae not protractile; gill membranes slightly joined across the isthmus; cheek naked; opercle scaled; lateral line incomplete with about 33 pored scales; scales in the lateral series 43-48; first dorsal fin with 9 or 10 spines; second dorsal with 12-14 soft rays; anal with 2 spines and 7 soft rays. Color brown or olive with dark dorsal saddles and lateral vertical bars. Breeding males strikingly colored; the vertical bars on the side blue, the posterior body and base of the caudal fin with orange spots, and the dorsal fin bright orange or reddish orange with a blue border. Adult length to about 2.5 inches.

Distribution: The orangethroat darter ranges from western Ohio west to the Rocky Mountains and south to Oklahoma. Simon found this species in drain ditches in Nebraska just east of the Wyoming-Nebraska state line and included it provisionally in the 1946 and 1951 editions of *Wyoming Fishes*. In Wyoming, this species was found in lower Lodgepole Creek, Laramie County



in 1969 when that section of stream was treated with a piscicide to remove rough fish. Results of attempts to reintroduce the orangethroat darter into that stream from fish taken downstream in Nebraska were uncertain for many years. Orangethroat darters were collected in abundance from two of three sites on Lodgepole Creek, Wyoming, in 1993.

Natural history: This species, according to Cross (1967), occurs mostly in small streams with sand or gravel bottom and is quite tolerant of intermittency in streams. It is sometimes found along the shoreline of small lakes. Food includes diptera and caddisfly larvae as well as other larval insects (Cross 1967).

Nomenclature: Five subspecies of the orangethroat darter are recognized. The subspecies occurring in Wyoming is *E.s. pulchellum*.

Literature references: *Poecilichthys spectabilis pulchellus*. Simon 1951:102 (provisional in Wyoming).

Distinguished from:

johnny darters by the absence of W-shaped marks on its flanks and its incomplete lateral line.

Iowa darters by its longer soft dorsal fin and unscaled cheeks.

(Because of the bright colors of breeding Iowa darter males, they are sometimes misidentified as orangethroat darters.)

Yellow perch *Perca flavescens*

Perca-- an ancient name; *flavescens*-- yellow

Description: Body elongate, somewhat compressed; head long, concave above; eye moderate; mouth large and toothed, lacking large "canine" teeth; preopercle serrate; opercle pointed posteriorly; first dorsal fin with 12-14 spines; second dorsal fin with 1 or 2 spines and 12-14 soft rays; anal fin with 2 spines and usually 8 soft rays; lateral line scales 54-60. Color yellow or pale green with 6 or 7 dark vertical bands; pelvic fins orange or reddish, belly lighter. Weight to over 3 pounds.

Distribution: The yellow perch ranges from Great Slave Lake in Canada south and east to Pennsylvania and Missouri. A close relative which grows to a much larger size, *Perca fluviatilis*, occurs in Eurasia. The yellow perch has been introduced into almost every state in the United States. In Wyoming, east of the Continental Divide, the yellow perch is found in many lakes, and some streams, mainly at elevations below 7,000 feet.

Natural history: The yellow perch prefers lakes, ponds, and backwaters but is also found in large rivers. It is a strongly schooling fish. Studies of this fish in Wisconsin have shown that, in deep lakes in summer, schools of yellow perch swim in open water during daylight hours and move into shallow waters at night (Hasler 1945). In winter, yellow perch often move to the deepest part of the lake (Hasler and Bardach 1949). The yellow

perch spawns in May and June in Wyoming, moving into shallow water at that time. Eggs are contained in a strand which is uniquely folded into the ovary of the female. The eggs are fertilized in these strands, which may be as much as 6 or 7 feet in length, and may be entwined on aquatic vegetation or lie on the substrate. The yellow perch is generally carnivorous and larger fish are piscivorous.

Distinguished from:

walleyes and saugers by the vertical bars on its sides and by the presence of one or two spines at the front of its second dorsal fin.

Relation to man: The flesh of the yellow perch rates very high in eating quality. The reputation and general desirability of the yellow perch as a game fish varies with locality and with the size attained in a given fishery. Anglers, who may ignore the yellow perch during the summer months, often seek it out when fishing through the ice in winter. In multispecies fisheries, perch populations may be so dense that they are stunted and, being strict carnivores, compete with more popular game fish for food. In such cases, the yellow perch populations have been controlled by chemical treatment or by introduction of a large predator such as the walleye. Thus, while yellow perch may stunt and become less desirable to anglers in one fishery, in another they may have the angler's approval.

Literature references: *Perca flavescens*. Simon 1951:97-99 (introduced into Wyoming).

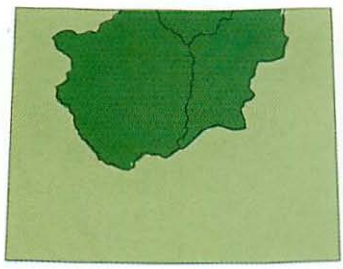
Sauger
Stizostedion canadense

Stizostedion-- prickle-breast; *canadense*-- of Canada

Description: Body elongate, head moderate; eye large, silvery; mouth large, with numerous canine teeth; head and opercles scaled; lateral line scales 83-91; dorsal fins separated; first dorsal fin with 12 or 13 spines; second dorsal fin with 17-20 soft rays; anal fin with 2 spines and 12 or 13 soft rays; pyloric caeca 5 to 9, shorter than the stomach. Color olive-gray, sides brassy or orange with dark mottling; first dorsal fin with 2 or 3 rows of rounded black spots; second dorsal with 3 series of elongate, small black spots; pectoral fins with a black basal blotch. Weight to 8 pounds.

Distribution: The sauger ranges from southern Canada east to New England, south to Arkansas and Tennessee, west to Montana and Wyoming. In Wyoming, the sauger is native to streams east of the Continental Divide; it is found today in the Wind -Big Horn River drainage and in the Tongue and Powder river drainages. It was common in the North Platte River at the turn of the century but has apparently been extirpated from that drainage.

Natural history: The sauger prefers large rivers but occurs also in reservoirs. It is quite tolerant of turbid waters. Scott and Crossman (1973) noted that in very turbid waters sauger usually replace walleye. Adult



sauger migrate into tributary streams or backwaters to spawn in shallow water over rocky or gravel bottom when water temperature reach the mid-40s. Eggs are deposited at random and left unattended until they hatch. Simon (1951) reported that a 3-pound female will produce about 50,000 eggs. This large pikeperch is piscivorous as an adult, feeding on whatever forage fishes are available. Young fish feed on aquatic insects and crustaceans.

Relation to man: The sauger is an excellent food fish and a valuable game fish in habitats with sufficient forage. Its average size in Wyoming is probably about a pound; the walleye and walleye X sauger hybrids grow more rapidly and reach a larger size.

Nomenclature: A subspecies, *boreum*, is no longer recognized.

Literature references: *Stizostedion canadense boreum.* Evermann and Cox 1896:420 (North Platte River, Glenrock and Casper); Simon 1951:99-100 (North Platte River, Wind-Big Horn River); Personius and Eddy 1955:42 (reported from Little Missouri River in Wyoming before the mid-1930s).

Distinguished from:

walleyes by the black spots on its dorsal fins and by the larger number and shorter length of its pyloric caeca;

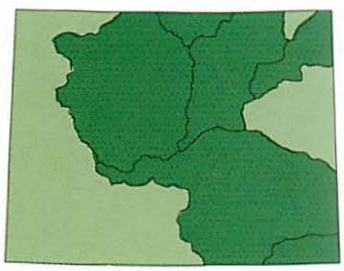
(Hybrids with the walleye are common, the "saugeye;" these fish usually have an intermediate number and size of pyloric caeca.)

Walleye
Stizostedion vitreum

Stizostedion-- prickle-breast;
vitreum-- glassy, apparently in reference to the silvery eye

Description: Body elongate; head moderate; eye large with a silvery appearance; mouth large with large canine teeth; head and cheek usually scaleless; operculum scaled; lateral line scales usually 80-100; first dorsal with 13 or 14 spines; second dorsal with 19-22 soft rays; anal fin with 2 spines and 12-13 soft rays; pyloric caeca usually 3, each as long as the stomach. Color brassy or olivaceous and lacking lateral blotches; dorsal surface may have several rather obscure saddle-like marks; belly white. First dorsal never with uniform round black spots, usually uniformly dusky with a dark blotch at its posterior end; second dorsal may show several rows of small black spots; pectoral fins with a dusky basal spot. Weight up to 18 pounds or more.

Distribution: The walleye is native from southern Canada and the Dakotas east to the Atlantic Coast and south to southern Alabama and Georgia. Where introduced in Wyoming, it has become common in many reservoirs (except west of the Continental Divide) since the late 1960s. It had been introduced into Wyoming in the early part of the century but was not established at that time.



Natural history: The walleye ordinarily prefers lakes to rivers but does occur naturally in large rivers such as the Missouri and Mississippi. It migrates from lakes into tributary streams to spawn. The walleye thrives best in elongate lakes with irregular shorelines where it migrates extensively, lives in large schools, and preys on smaller fishes in the vicinity of submerged bars. It tolerates cooler waters, being found north in Canada as far north as the MacKenzie River drainage. It is restricted to fresh water. In Europe, a pikeperch, *Stizostedion lucioperca*, is very similar to the walleye. The walleye will spawn in both lakes and rivers but will usually migrate into a tributary stream if it is available. In lakes, spawning takes place over rocky bottoms; in rivers, over gravel in moving water. The eggs are adhesive until water-hardened at which time they settle into interstices in the substrate. In Wyoming lakes and reservoirs, walleye spawn as soon as ice cover melts. Some spawning may occur under the ice. Adult walleye are largely piscivorous. The reflecting layer of the retina, which gives the fish its "wall-eye", adapts it to feeding in twilight and in turbid water. Young fish feed also on aquatic invertebrates as they may be available.

Relation to man: The walleye is a prized food and game species. Anglers have high regard for this fish, particularly for its eating quality. Walleye populations in Wyoming reservoirs benefit from the establishment of the emerald shiner, the spottail shiner, the gizzard shad, and other forage species, which are thriving in such reservoirs as Seminoe, Boysen, Keyhole, Glendo, Grayrocks and Hawk Springs. The walleye is hatched artificially in many states, including Wyoming. When the adhesive eggs are stripped and fertilized artificially, special treatment is needed for successful hatching. Cannibalism is a characteristic of the very young fish; when propagated artificially, these young must be provided with an abundance of food to prevent excessive cannibalism. In Wyoming, walleye fry are typically stocked shortly after hatching to circumvent cannibalism and other propagation problems.

Nomenclature: A subspecies *S. v. vitreum* is sometimes recognized. This fish is sometimes referred to as the "walleyed pike" or the pikeperch. It is a large perch and not a pike.

Literature references: *Stizostedion vitreum vitreum.* Simon 1951:100-101 (introduced into Wyoming).

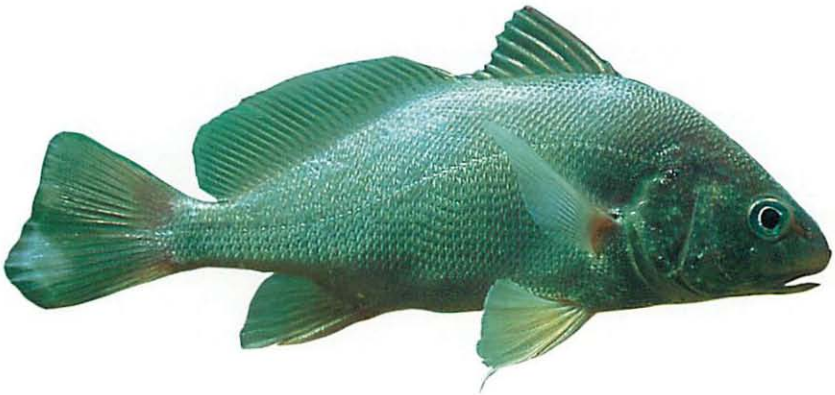
Distinguished from:

saugers by the absence of rounded black spots on its first dorsal fin and by its smaller number of longer pyloric caeca.

(Hybrids with the sauger are common in Boysen Reservoir. These fish are intermediate in character.)

Family Sciaenidae

Drums or croakers



freshwater drum: photo courtesy of the Nebraska Game and Parks Commission

The drums are mostly marine fishes. They are heavy-bodied, spiny-rayed fishes, taking their name from their ability to produce sounds, using the swim bladder as a resonator. The freshwater drum, a freshwater species native in eastern North America, has been introduced into Wyoming in recent years.

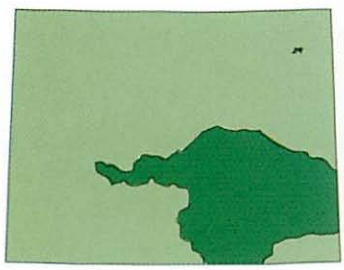
Freshwater drum *Aplodinotus grunniens*

Aplodinotus-- single; *grunniens*-- grunting

Description: Body robust, compressed laterally; head triangular; eye moderate to small; mouth moderate; dorsal fin of 2 parts, an anterior dorsal segment with about 9 spines and a posterior soft segment with about 35 soft rays; anal fin with 2 spines, the second spine greatly enlarged; scales in the lateral line 48-53, lateral line pores extending back onto the caudal fin.

Distribution: From Nebraska to Pennsylvania, and from Hudson's Bay to Central America. In Wyoming, the freshwater drum is found in Keyhole and Grayrocks reservoirs and possibly in other reservoirs east of the Continental Divide.

Natural history: The freshwater drum is a bottom-dwelling carnivore. It apparently prefers the shallows of



large lakes and backwaters of slower rivers. Spawning takes place in mid-summer. The eggs are buoyant, floating at the surface and hatching in a matter of a day or so (Scott and Crossman 1973). Adult fish feed mostly on other fish.

Relation to man: The freshwater drum was introduced to Keyhole Reservoir sometime in the late 1970s and has been established there and later in Grayrocks Reservoir. It is now classified as a game fish in Wyoming. Several large freshwater drum have been taken from Grayrocks and Keyhole reservoirs in recent years. One of the peculiar features of this exotic fish is the presence of very large otoliths in the internal ear.

Distinguished from:

all other Wyoming fishes by the enlarged second anal spine and by the extension of the pores of the lateral line which reach onto the caudal fin.

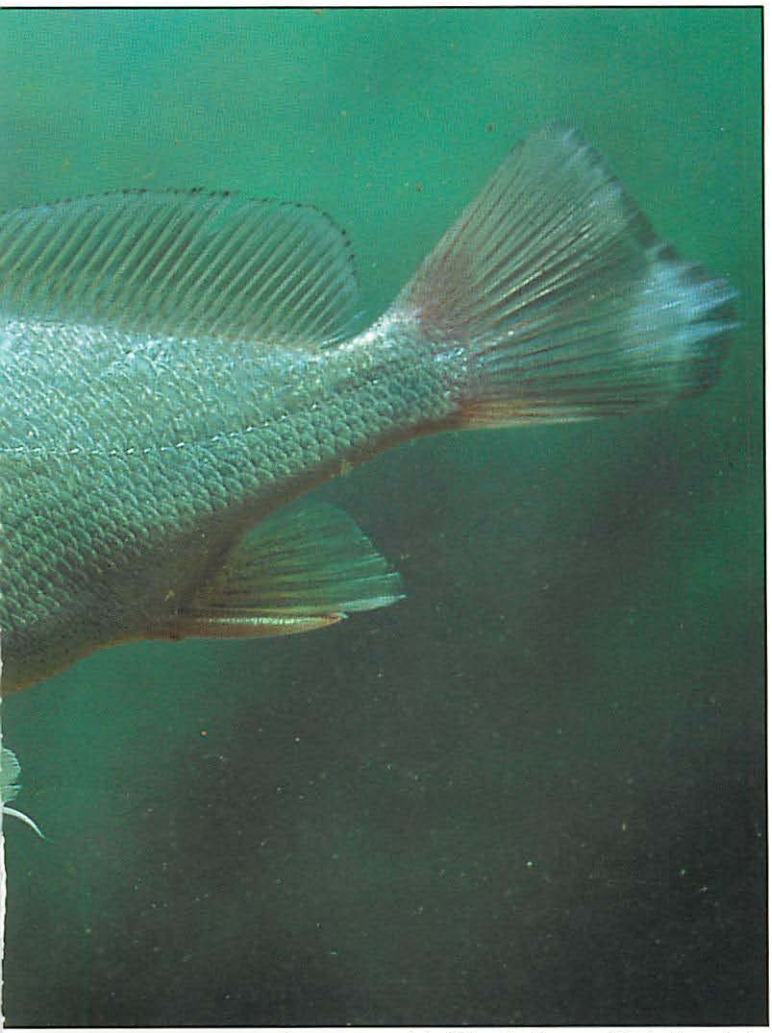


photo courtesy of the Nebraska Game and Parks Commission

distribution and zoogeography of fishes in Wyoming

Zoogeography is the study of the geographic distribution of animals, their place of origin, their present distribution, and when and how they arrived at that present distribution.

It seems likely that all the indigenous fishes of Wyoming had their origin in some other region in North America and later expanded their range to include the streams and lakes of this area. An understanding of climatic conditions and physical facilities required as well as the timing and avenues of dispersal for such expansion are interesting aspects of the biology of fishes.

Fossil History

Cavendar (1986) reviewed the fossil history of the freshwater fishes of North America. He noted that representatives of the sturgeon, mooneye, sucker and catfish families are found in formations deposited during the Paleocene epoch, which began about 65 million years ago (mya). Some of these probably had a Cretaceous origin (135-65 mya). Fossil fishes in the Green River formation (Eocene 53-38 mya) in western Wyoming include gars, several herrings, a bonytongue (ancestral to the goldeye) and a stingray. Modern genera (*Ictalurus*) of catfishes are found in Oligocene (38-25 mya) sediments; fossil suckers first appear in North America in Eocene deposits, minnows in Oligocene deposits. The earliest known freshwater salmonid in North America was fossilized in Eocene lake deposits in British Columbia (Cavendar 1986).

Fossils of extant genera of salmonids, minnows, suckers and sunfishes are found in formations laid down as early as the Miocene epoch (25 mya). Fossils of the goldeye, sand shiner, a fathead minnow, creek chub, rock bass, green sunfish, channel catfish, and a killifish have been found in Pliocene (5-1.8 mya) deposits in Nebraska and Kansas. Fossils of fish species found in Kansas, Nebraska, South Dakota and Texas deposited during the Pleistocene epoch (ca 1.8 mya) include (in addition to those species found in older sediments), the stoneroller, brassy minnow, plains minnow, flathead chub, hornyhead chub, common shiner, white sucker, mountain sucker, river carpsucker, bullhead, and Iowa darter (Cross et al. 1986).

Conditions affecting the post-glacial dispersal

Debris from volcanoes in western and northwestern North America virtually buried the Rocky Mountains

sometime during the Miocene or Pliocene epochs (Love et al. 1963). So the central and northern Rocky Mountain region has been subject to long periods of enormous erosion at different times in the last 25 million years. The effects of that erosion on fish life in both rivers and lakes are difficult to visualize, but must have been considerable. Fish species were evolving in adaptation to extreme environmental conditions and finding new paths for dispersal as river drainages changed.

At least four major glacial periods during the Pleistocene epoch, probably beginning about 600,000 years ago, and continuing to some 10,000 years ago, presumably covered the mountains with ice and snow and produced a tundra environment in the intermountain basins. In interglacial periods, climates may have been similar to those existing today, but, at other times, streams were subject to enormous runoff, and high turbidities.

When ice sheets covered a major part of what is now Canada and Alaska, fishes living in that area were forced into one or more of several refugia left free of ice. Refugia believed to have been used primarily by fish species found in Wyoming today were the Pacific (Columbian) refugium in the Pacific northwest and the Missourian refugium in the Great Plains area (McPhail and Lindsey 1970; Crossman and McAllister 1986). Some species took refuge in two or more different refugia. Ichthyologists note various differences in separate populations of the longnose dace, sand shiner, flathead chub, fathead minnow, longnose sucker and mountain whitefish; some of these differences are believed to have evolved as populations resided in isolated refugia during the Pleistocene epoch.

Origin and avenues of dispersal

The makeup of the fish fauna of the northern and central Rocky Mountains during different parts of the Pleistocene epoch was probably generally similar to that found at present. Ranges of different species expanded during interglacial periods and contracted in glacial periods, influenced by existing climates and avenues for dispersal.

Fossil evidences and present day distributions of indigenous fish species, have enabled ichthyologists to formulate a zoogeography of the fishes of the Rocky Mountains, the western Great Plains, and the Great Basin (Hubbs and Miller 1948; Miller 1958; Bailey and Allum 1962; Metcalf 1966; McPhail and Lindsey 1970;

Pflieger 1971; Cross et al. 1986; Minckley et al. 1986). These investigators have speculated on where different species of fish found refuge during the glacial periods, and by what route they made their way to the drainages where they are found today.

The following account uses the conclusions of the workers mentioned above to formulate an outline of the sources of the fish fauna of Wyoming.

East of the Continental Divide

Northern species derived from a pre-glacial Arctic drainage. Geologists generally agree that river systems draining northern and northeastern (present) Wyoming, at least to the Cheyenne River were included in a Hudson Bay watershed. Ichthyologists (Bailey and Allum 1962; Metcalf 1966; McPhail and Lindsey 1970; Pflieger 1971) have variously listed the fish species believed to have lived in the Missouri refugium during some parts of the Pleistocene epoch and to have originally resided in the Hudson Bay system. The following species of fish native to Wyoming have been included in that pre-glacial fauna (with some differences of opinion among different authorities): goldeye, bigmouth shiner, brassy minnow, fathead minnow, finescale dace, flathead chub (ssp. *communis*), pearl dace, sturgeon chub, western silvery minnow, white sucker, shorthead redhorse, stonecat, burbot, and sauger.

Several additional native Wyoming fishes are northern in distribution. All are found on both sides of the Continental Divide. Which refugia they occupied and whether they moved from west or east across the Divide is speculative. These species are: lake chub, longnose dace, longnose sucker, mountain sucker, mountain whitefish, cutthroat trout, Arctic grayling, and mottled sculpin.

Species derived from Mississippi and/or southern plains drainages. Some native Wyoming fishes evolved in the Mississippi River Basin and made their way to the area now occupied by the state of Wyoming by way of either the Niobrara River (tributary to the upper Missouri) or the Platte River system. Metcalf recognized two different groups, an Upper Mississippi component, and a Southern Plains component (Metcalf 1966).

Upper Mississippi Component. Some species of this group are tolerant of high turbidities, others are considered "clear water" species. These somehow found their way (via the main channel or tributaries of the muddy Missouri or Platte rivers) to the clear foothills streams of

eastern Wyoming. Bailey and Allum (1962) speculated that species living in small clear-water streams made their way up the large and turbid Missouri and Platte rivers by moving from tributary to tributary during periods when the rivers proper were clear. Metcalf (1966) termed this method of dispersal "tributary hopping."

Species included in these groups are: turbidity tolerators – fathead minnow, sand shiner (ssp. *stramineus*), river carpsucker, quillback, and channel catfish; clear water dwellers–common shiner, creek chub, hornyhead chub, stoneroller, Iowa darter, and johnny darter.

Southern Plains Component. A pre-glacial plains system drained south into the Gulf of Mexico, probably via an ancestral Red River (of Oklahoma) system (Metcalf 1966). Fish from this system were mostly tolerant of high turbidities (an exception being the orangethroat darter): flathead chub (ssp. *gulonella*), plains minnow, red shiner, sand shiner (ssp. *missouriensis*), suckermouth minnow, plains killifish, and orangethroat darter.

The plains topminnow does not appear in any of these lists. This species occurs today in separate areas, in Nebraska and west into Colorado and Wyoming, and in central and southern Missouri into Arkansas occupied by the state of Nebraska with subsequent dispersal to the south, or vice versa (Cross et al. 1986).

West of the Continental Divide

Conclusions regarding the zoogeography of fishes west of the Continental Divide are based on the studies of Miller (1958, 1965), Smith (1966) and Minckley et al. (1986). On the west side of the Continental Divide, native fishes found their way into Wyoming river drainages via two routes: the Snake River/Bonneville Basin system, and the Green River system. Geologic events which had a major influence on these distributions include:

1. In pre-Pleistocene time the Snake River, instead of coursing north from what is now central Idaho to become the major tributary of the Columbia River, flowed south and west to the Pacific, via what is now the Sacramento River drainage (see Miller 1965, Figure 3).

2. The falls in the Snake River in Idaho blocked the upstream movement of such Columbia River drainage species as the Pacific salmons and the white sturgeon.

3. At different times the Bear and Snake river drainages were connected, permitting exchanges of species.

From Columbia-Bonneville systems. These systems are considered together. On at least two different occasions they were connected, once when the Bear River flowed north into the Snake River and later, when at the end of one or more glacial periods, Lake Bonneville was filled to such a level that it captured tributaries of the Snake River drainage. Some species native to Wyoming were derived from the Columbia System, others from the Bonneville system.

Probably of Bonneville origin: leatherside chub, Utah chub, speckled dace, bluehead sucker, Utah sucker,

Bonneville cutthroat trout, mottled sculpin (ssp. *semiscaber*). Probably of Columbia origin: longnose dace (ssp. *dulcis*), redside shiner, westslope cutthroat trout, Yellowstone cutthroat trout, mottled sculpin (ssp. *punctulatus?*), longnose sucker, mountain sucker, and mountain whitefish (the last three are also found east of the Continental Divide).

Minckley et al. (1986) suggest that the Snake River sucker, now believed to be extinct, may have evolved in a pre-glacial Snake River (before that river became tributary to the Columbia), and that this may also be true of the mottled sculpin (Minckley et al. 1986).

The Snake River cutthroat trout may conceivably be the only native subspecies that evolved within the area now occupied by Wyoming.

Green River system. This system shares some of its native species with the Snake River/Bonneville Basin system, indicating earlier connections with that system. Kinky Creek tributary to both Tosi Creek of the upper Green River and to headwaters of the Gros Ventre River in extreme southeastern Teton County is an example of an existing connection between the two drainages (Smith 1966). The native fish in this system include: the bonytail, roundtail chub, speckled dace, Colorado River squawfish, flannelmouth sucker, bluehead sucker, razorback sucker, Colorado River cutthroat trout, and mottled sculpin. The bonytail, squawfish (see page 115), and razorback sucker are extirpated from Wyoming. The speckled dace, bluehead sucker, and mottled sculpin are considered (above) to have had origin in the Bonneville-Snake River system and have made their way into the Green River system by stream capture.The greenback trout, found today in the South Platte River and other drainages in Colorado, but no longer found in Wyoming, surely arrived, by stream capture, from the Green River system.

changes in the composition and distribution of Wyoming's fish fauna

In this book, we list 76 species of fish believed to have viable populations in the state, 49 of which are native, 27 introduced.

Native species

Fifty-three species of native fish are believed to have lived in Wyoming's waters before the introduction of non-native game fishes and the extinctions and extirpations of the twentieth century; 49 native species are still present.

The bonytail (*Gila elegans*), the Colorado squawfish (*Ptychocheilus lucius*) (see page 115), the Snake River sucker (*Chasmistes muriei*) and the razorback sucker (*Xyrauchen texanus*) are native species now considered extirpated or extinct.

We do not consider the river shiner (*Notropis blennius*) to be native to Wyoming. That species was reported from the North Platte River drainage by Evermann and Cox (1896) and by Simon (1946, 1951). The report of Evermann and Cox pertained to the sand shiner (Cross 1967), and Simon included the river shiner in Wyoming's fish fauna on the basis of collections from the North Platte River in Nebraska near the Wyoming-Nebraska state line. We know of no specific records of the river shiner collected within the boundaries of the state.

Introduced species that are established

The Annotated Checklist (page 14) of 76 species lists 27 species of fish that have been introduced and which presently have established populations within the state.

Early nongame introductions: The common carp was introduced as early as 1883 to supplement the supply of food fish to the residents of the state (Miller 1890). The goldfish and golden shiner were later introduced, apparently inadvertently, and included by Simon (1951) in his account of species.

Nongame forage fishes: Since 1951, the gizzard shad, the emerald shiner and the spottail shiner have been introduced as forage fish.

Game fishes: Nineteen species of game fish have been introduced at various times since 1880. The northern pike is an introduced cool water pike. Introduced salmonids include the rainbow, brook, lake, brown, golden and Ohrid trouts and kokanee. Warm water game fishes which have been introduced and become established are the smallmouth bass, large-

mouth bass, rock bass, bluegill, green sunfish, pumpkinseed, black and white crappie, yellow perch, walleye and freshwater drum.

Mosquito control: The western mosquitofish has been introduced to help control mosquitoes.

Aquatic vegetation control: Sterile grass carp have been introduced to help control submerged aquatic vegetation.

Provisional species

This category includes game, nongame and exotic species which have been collected or are known to have been planted, but the existence of viable populations has not been demonstrated. In some cases, limited populations are known, but their fate remains in question. We subdivide these into three groups:

1) Some species of "exotic" fish have been reported, observed or collected in the state at various times; both their source and fate are unknown. The brown bullhead (*Ameirus nebulosis*) and spotted bass (*Micropterus punctulatus*) have been either reported from habitats in the state or observed by fisheries workers in shipments of warm water fish from out of state and presumed to have been released in Wyoming waters. The brook stickleback (*Culaea inconstans*) was planted with other exotic fishes in a small lake in the Lonetree Creek drainage near Cheyenne. That habitat was subsequently treated with piscicide to eliminate those plants. The 1993 surveys showed that the stickleback is still present in Lonetree Creek near the Wyoming-Colorado state line. Brook stickleback were captured in 1994 from Elkhorn Creek, a tributary of the North Platte River. The status of stickleback populations is unknown.

2) Some species have been introduced to provide forage for game fishes but have not reappeared since their introduction. Threadfin shad (*Dorosoma pretenense*), brook silversides, Bonneville cisco (*Prosopium gemmiferum*), Bear Lake whitefish (*Prosopium abyssicola*) and Bear Lake sculpin (*Cottus extensus*) were introduced into Flaming Gorge Reservoir and other fisheries to supplement forage fish populations. The flathead catfish (*Pylodictus olivaris*) has been released into the North Platte River below Guernsey Reservoir in Goshen County.

3) Aquarium fishes have been illegally released into thermal waters. The guppy (*Poecilia reticulata*) and green swordtail (*Xiphophorus helleri*) have been known to occur in thermal waters in the Jackson Hole region together with several other exotic aquarium fishes including at

least the convict cichlid (*Cichlasoma nigrofasciatum*) and possibly the tiger barb (*Puntius tetrazona*). More recent introductions of larger and more aggressive species such as the convict cichlid have nearly extirpated the populations of guppies and green swordtails, and the fate of other native and exotic species remains to be determined. Such introductions are illegal. They are detrimental to the habitats where they are released and to the populations of native fish, such as the Kendall Warm Springs dace, that inhabit thermal springs. They also do not add to the esthetics of the natural environment.

With the dozens of small warm water lakes in or near urban areas in the state, it is quite likely that other exotic species presently live in Wyoming's waters but have not yet been recognized.

A List of Native, Introduced, and Provisional Species of Fish in Wyoming

Native

shovelnose sturgeon
goldeye
central stoneroller
lake chub
red shiner
Utah chub
leatherside chub
roundtail chub
western silvery minnow
brassy minnow
plains minnow
common shiner
sturgeon chub
pearl dace
hornyhead chub
bigmouth shiner
sand shiner
finescale dace
suckermouth minnow
fathead minnow
flathead chub
longnose dace
speckled dace
redside shiner
creek chub
*Colorado squawfish
(see page 115)

*bonytail
river carpsucker
quillback
Utah sucker
longnose sucker
white sucker
bluehead sucker
flannelmouth sucker
mountain sucker
*Snake River sucker
redhorse sucker
*razorback sucker
black bullhead
channel catfish
stonecat
cutthroat trout
mountain whitefish
Arctic grayling
burbot
plains topminnow
plains killifish
Iowa darter
johnny darter
orangethroat darter
sauger
mottled sculpin
Paiute sculpin

*now extirpated or extinct

Introduced (established)

gizzard shad
carp
grass carp
goldfish
golden shiner
emerald shiner
spottail shiner
northern pike
rainbow trout
brook trout
brown trout
lake trout
golden trout
Ohrid trout
kokanee
largemouth bass
smallmouth bass
bluegill
black crappie
white crappie
green sunfish
pumpkinseed
rock bass
yellow perch
walleye
freshwater drum
western mosquitofish

Provisional, not known to be established

brown bullhead
spotted bass
brook stickleback
threadfin shad
brook silversides
Bonneville cisco
Bear Lake whitefish
Bear Lake sculpin
redear sunfish
guppy
green swordtail
flathead catfish
convict cichlid

Species added to or deleted from this edition

Added:	Deleted:
emerald shiner	bonytail
grass carp	river shiner
spottail shiner	razorback sucker
Ohrid trout	coho salmon
western mosquitofish	dolly varden
freshwater drum	Colorado squawfish
	June sucker (now Snake River sucker)

Causes of Changes in Distribution of Fishes in Recent Years

Some changes are documented by voucher specimens deposited in museums or by computer data bases. Others are observational.

Changes in distribution have resulted principally from human activities, including the following:

Construction of Reservoirs: The positive effect of

impounding reservoirs in the economy of the western states is undeniably great. Nevertheless these impoundments exert important influences on fish populations. The presence of reservoirs often interferes with spawning migrations of fish. In Wyoming, this is not as dramatic as in the Pacific Northwest with its important Pacific salmon migrations.

Large rivers in the western United States often carry large amounts of silt. The settling of silt into, and release of water from the depths of, the reservoir usually changes the tailwater from a warmer, turbid stream to a colder, clear water stream. Such changes in habitat often change the fish fauna, favoring species such as the trouts, the white sucker and some minnows adapted to living in clear water.

In the North Platte River, downstream from the reservoirs in central Wyoming, the sturgeon, goldeye, sauger, plains minnow and sturgeon chub have disappeared since the turn of the century. These species are generally adapted to turbid water. Although some types of pollution may be partly responsible for these disappearances, it seems likely that the clearing of the water flowing through the reservoirs is the primary cause.

The construction of Flaming Gorge Reservoir in 1963 eliminated the torrential canyon waters of that section of the Green River. This was the preferred habitat of the Colorado squawfish, razorback sucker and bonytail chub which have not been reported from the mainstem Green River since 1963.

Agricultural Activities: Grazing, tilling and irrigation from deep wells with subsequent increased runoff and erosion and lowering of water tables have had detrimental effects on fish. Since the early 1940s, the hornyhead chub has apparently disappeared from all streams in eastern Wyoming except the North Laramie River upstream from Wheatland, and populations of the common shiner, suckermouth minnow and the stonecat have been reduced. These changes have apparently been caused by siltation and dewatering; sand and gravel, needed by some species for successful spawning, have been replaced by silt in many stream sections.

Introductions of Non-Native Species: Accidental and deliberate introductions of both game and forage fishes into large reservoirs in the state have changed the makeup of the fish fauna. Deliberate introductions have been planned and their advisability investigated prior to introduction. They have been justified by their projected benefits to game fisheries. Reservoirs are artificial

habitats sustaining largely artificial ecosystems.

The outcome of introductions of the walleye into the reservoirs of the North Platte River, non-native game fishes into Flaming Gorge and Grayrocks reservoirs, the northern pike and freshwater drum into Keyhole Reservoir as well as other introductions remains to be seen. In recent years, the gizzard shad, emerald shiner and spottail shiner have been introduced into reservoirs east of the Continental Divide in Wyoming.

The creek chub, lake chub, fathead minnow, white sucker and channel catfish have been established west of the Continental Divide in the Green and Little Snake river drainages. Except for the catfish, these introductions apparently resulted from the use of bait minnows.

In the northwestern counties, the lake chub and redside shiner have been introduced into Yellowstone Lake, and the mottled sculpin and Utah chub are now present in headwaters of the Wind River. These introductions were probably made by bait fishermen.

Bait fishermen probably also introduced the longnose dace; lake, leatherside and Utah chubs, and the redside shiner into the Green River drainage.

The introduction of a non-native species into a drainage may upset ecologic balances among native fish assemblages. The white sucker and creek chub are widespread, competitive fish, native to extensive river drainages with diverse fish faunas. When introduced into western drainages they can be expected to eventually dominate some habitats.

Laws prohibiting the use of bait fishes that are not native to a drainage and the release of exotic aquarium fishes into warm springs are designed to prevent such ecologic imbalances. Anglers and aquarists should be aware of the detrimental effects of such releases.

Ranges of some species have expanded in the last 40 years. The green sunfish, originally introduced, has become common in smaller streams in eastern Wyoming. The plains killifish has become a common species in river drainages in northern Wyoming in the last 20 years. The johnny darter has become common in the upper North Platte River and in Rock River and the Medicine Bow River (at lower elevations) in Carbon and Albany counties. The exact reasons for these expansions are not clear; the green sunfish and plains killifish are tolerant of more extreme conditions such as drought, dewatering and increase in alkalinity. The expansion of the range of the johnny darter may be from these same factors.

glossary

abdominal: pertaining to the belly region or abdomen. Pelvic fins are abdominal in position when situated well behind the pectoral fins.

adipose fin: a fleshy, rayless fin situated dorsally between the dorsal and caudal fins.

adnate: grown together; the adnate adipose fin is attached to the body along its entire length.

anadromous: pertaining to fishes which spend their adult lives in marine water and migrate to fresh water to spawn.

axillary process: a small flap situated at the base of the pelvic or pectoral fin.

barbel: a small, whisker-like appendage situated on or near the lips or mouth of fish. It is a tactile or taste organ.

basin: in geology and physiography, a geographic area drained by a single drainage system.

basioccipital: the most posterior bone on the underside of the braincase of the skull; its posterior process extends backward and expands into a plate against which the pharyngeal teeth, in suckers and minnows, perform a grinding action.

basibranchial teeth: small teeth on the basibranchial (glossohyal) bone behind the tongue of fishes.

branched rays: those soft rays in the fins of fishes which divide into two or more branches.

branchiostegals: a series of flat bones in the floor of the gill cavity. Their action produces the pumping action of the operculum.

caecum (pl. caeca): hollow, fingerlike outpouchings from the stomach and anterior intestine of some fish.

canine teeth: long sharp teeth in the jaws of some fish such as the walleye.

cardiform teeth: brushlike teeth arranged in patches.

carnivorous: feeding upon flesh.

catadromous: pertaining to fishes which spend their adult life in fresh waters and migrate to salt water to spawn.

caudad: toward the tail.

caudal(fin): the tail fin.

caudal peduncle: the narrowest part of the body of a fish at the base of the tail fin.

circulus (pl. circuli): bony ridges which appear as concentric rings on the surface of a scale.

ctenii: minute tooth-like projections at the free edge of the ctenoid scale.

ctenoid scale: the scale of spiny-rayed fishes with ctenii at the free edge.

cycloid scale: the rounded scale of (usually) soft-rayed fish, lacking ctenii at the free margin.

dorsal (fin): the median unpaired fin(s) on the back, not including the adipose fin.

ecosystem: the habitat and associated living organisms: together they function as an energetic system.

exotic: not native.

falcate: sickle-shaped.

fin rays: bony or cartilaginous supports in the fins.

frenum: a bridge of tissue or a membrane connecting two body parts.

fusiform: cigar shaped; tapering at both ends.

gas bladder: a membranous, gas-filled sac in the body of fishes, serving to bouy the body up.

gibbous: the shape of the profile of a football; biconvex.

gill arch: the bony support for the gill filaments.

gill filaments: the finger-like projections making up the gills.

gill rakers: bony projections borne on the anterior face of the gill arches.

girdle(s): the bony supports for the paired fins.

gravid: pregnant; heavy with eggs.

gonopodium: an extension of the anal fin in male live-bearers; also called an intromittent organ.

habitat: the physical environment in which an organism lives.

herbivorous: feeding upon vegetable materials.

heterocercal: a caudal fin which is asymmetrical; the dorsal lobe is longer, and with the vertebral column extending into the dorsal lobe.

homocercal: a caudal fin which is symmetrical, dorsal and ventral lobes of approximately equal size.

hybrid: the product of a cross between individuals of different species.

hypurals: hypural plate: the flattened terminal vertebral elements forming the skeletal base of the caudal fin.

inferior: situated below or underneath.

insertion (of fins): the line of attachment of a fin.

interradial membranes: membranes between the fin rays.

isthmus: the narrow part of the breast of a fish projecting forward between the gill chambers.

jugular: in the throat region.

keel (of a scale): a median ridge on a scale.

lateral: pertaining to the side.

lateral line: a sensory structure along the side of a fish usually marked by pores opening into an underlying canal.

lower pharyngeals: tooth bearing bones in the floor of the gill cavity.

maxilla, maxillary: the bone which forms the posterior part of the upper jaw, behind the premaxilla.

median, medial: on the midline.

melanophores: black pigment cells.

meristics: pertaining to numbers of parts of an organism, such as fin rays, etc.

midges: a group of aquatic mosquito-like flies.

nape: back of the head.

nuchal: pertaining to the nape.

nares: nostrils, usually double in fishes.

nuptial: pertaining to the breeding season.

oblique: in reference to the mouth, angling abruptly downward from the snout.

omnivorous: feeding on both flesh and vegetable matter.

opercle, operculum, opercular bone, gill cover: the structure covering the gill chamber.

opercular flap: a fleshy extension from the opercle, as in sunfishes.

oral valve: a flap-like valve on the inside of the lips.

paired fins: the pelvic and pectoral fins.

palatine teeth: teeth borne on the palatine bones, paired bones situated laterally on the roof of the mouth.

papillose: covered with minute fingerlike projections.

parasphenoid: the unpaired median bone in the roof of the mouth.

parr marks: serially arranged dark blotches on the side of the young of salmonid fishes.

pectoral (fins): the paired fins inserted just behind the gill chamber.

pelvic (fins): paired fins on the abdomen, usually inserted behind or below the pectorals, also called ventral fins.

pelvic (or pectoral) appendage: see axillary process.

peritoneum: the membrane lining the body cavity.

pharyngeal teeth: bony teeth borne on the last gill arch of some fishes.

physoclistous: lacking a connection between the gas bladder and gut.

physostomous: with a connection between the gas bladder and gut.

plaited, pleated: folded longitudinally.

Pleistocene: a geologic time period, beginning about two million years ago.

plicate: pleated.

pneumatic duct: the duct connecting the gas bladder to the gut.

premaxilla, premaxillary (bone): paired bones forming the anterior part of the upper jaw.

principal rays: fin rays which extend to the distal margin of the fin.

protractile: that can be thrust out, extensible.

protrusible: that can be thrust out or downward.

pyloric caeca: finger-like outpouchings from the stomach or pylorus.

pylorus: the posterior or lower part of the stomach, at the exit to the small intestine.

radii: grooves radiating out from the center of a fish scale.

ray: the supporting structures of the fin, see fin ray.

redd: the nest constructed in gravel substrate by some fishes.

regenerated scales: scales which have formed, replacing lost scales.

retractor muscles (of the pharyngeal arch): small muscles extending backward and downward from the skull to fasten to and retract the pharyngeal arches.

rough fish: a term used by fishery managers for fish other than game or forage fish. Also called trash fish.

rudimentary rays: unbranched fin rays which do not extend to the fin margin.

serrate: minutely notched or toothed along the edge.

species: the basic taxonomic category in biology; a population of similar individuals which interbreed freely.

spiny rays, spines: sharp, bony unbranched fin rays.

spiracle: an anterior opening on the head of some fishes, i.e. sturgeons, dorsal and posterior to the gill chamber.

subspecies: a taxonomic category in biology, designating a geographic race or color variety of a species.

subterminal: slightly inferior, not quite terminal.

superior: toward the dorsal surface; slightly upturned.

swimbladder: the gas bladder, a membranous, gas-filled sac in the body of fish, serving to bouy the body up.

teleost: a representative of the modern fishes, as distinguished from more primitive fishes such as the sturgeons and gars.

terminal (mouth): upper and lower jaws form the anterior tip of the head.

terete: round or oval in cross section.

thoracic: located in the chest region.

tubercle: a lump or wart. Nuptial tubercles refer to the tubercles on the skin of breeding fishes.

tuberculate: with tubercles.

venter: in reference to the belly, or ventral surface.

viviparous: bearing live young.

vomer: a median, usually unpaired bone at the roof of the mouth, in front of the parasphenoid.

Weberian (Weber's) apparatus: a series of specialized bones connecting the swimbladder and the internal ear in minnows and related fishes. Also called Weberian ossicles.

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