Aquatic Invaders

A Guide to Potential Invasive Species of the Great Lakes

Version 2, 2015

United States Fish and Wildlife Service
Lower Great Lakes Fish and Wildlife Conservation Office

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The Great Lakes Restoration Initiative is the largest investment in the Great Lakes in two decades. Its success is due in part to a task force of 11 federal agencies committed to delivering five-year action plans outlining implementation of priorities. Action Plan II, spanning federal fiscal years 2015-2019, addresses four focus areas:

1. Cleaning up Great Lakes Areas of Concern
2. Preventing and controlling invasive species
3. Reducing nutrient runoff that contributed to harmful/nuisance algal blooms
4. Restoring habitat to protect native species

This guide was developed to enhance basin-wide early detection programs conducted in fulfillment of commitments for the control of invasive species. The early detection of invasive species increases the likelihood of successful control and eradication efforts.

This guide is not meant to be a definitive authority in identification of new invasive species. The U.S. Fish and Wildlife Service recommends sending a sample to a taxonomic authority and obtaining tissue samples for genetic confirmation.

This guide will be updated when needed, as new threats are identified.

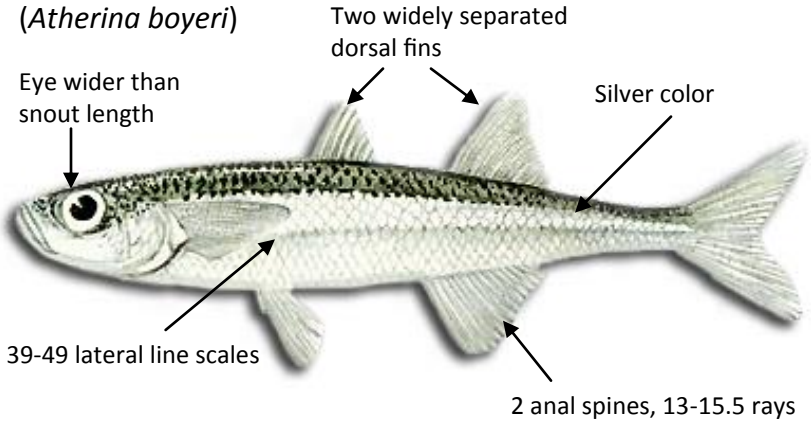
Sand Smelt
(*Atherina boyeri*)

Coloring: Silver
Size: Length: up to 145mm SL
Distinguishing Features:
- Dorsal spines (total): 7-10
- Dorsal soft rays (total): 8-16
- Anal spines: 2
- Anal soft rays: 13-15.5
- Eye diameter wider than snout length

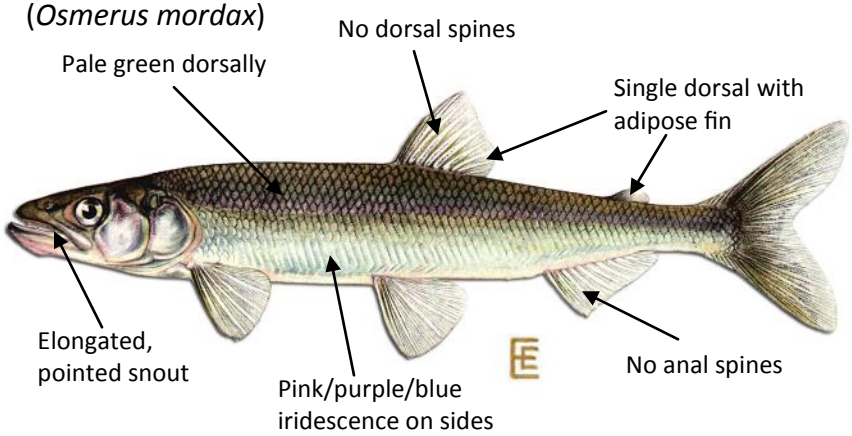
Habitat: Pelagic in lakes, slow or still waters
Similar Species: Rainbow Smelt (*Osmerus mordax*), Brook Silverside (*Labidesthes sicculus*)

Distinguishing Features:

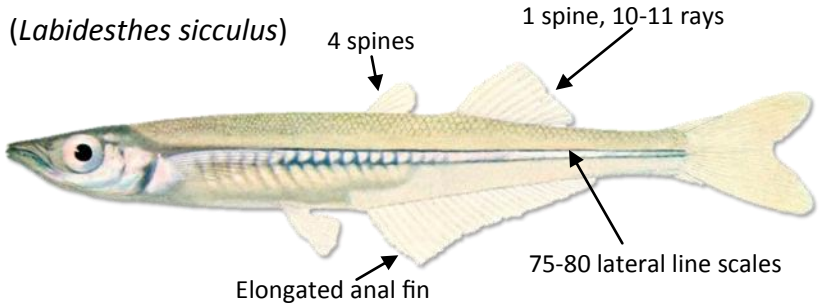
Sand Smelt (Non-native)
(*Atherina boyeri*)



Rainbow Smelt (Non -Native)
(*Osmerus mordax*)

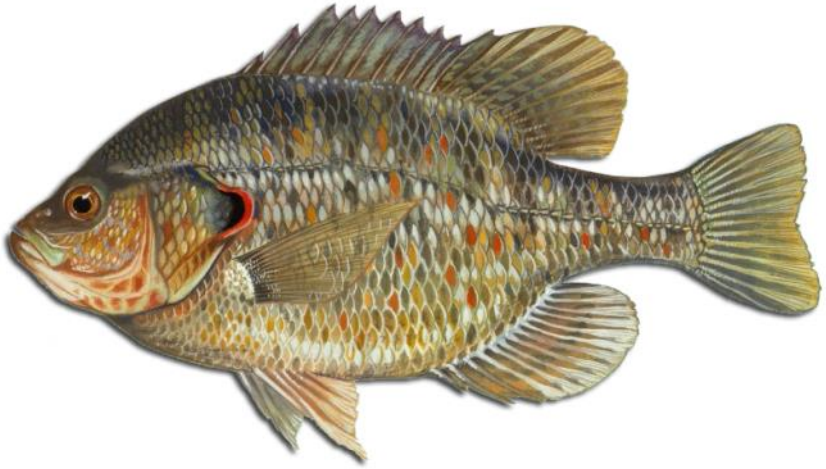


Brook Silverside (Native)
(*Labidesthes sicculus*)



Images are not to scale

Redear Sunfish
(*Lepomis microlophus*)



Coloring:
- Brownish-green to gray
- Bright red outer margin on opercular flap

Size: Length: up to 432mm TL; weight: up to 220.0g

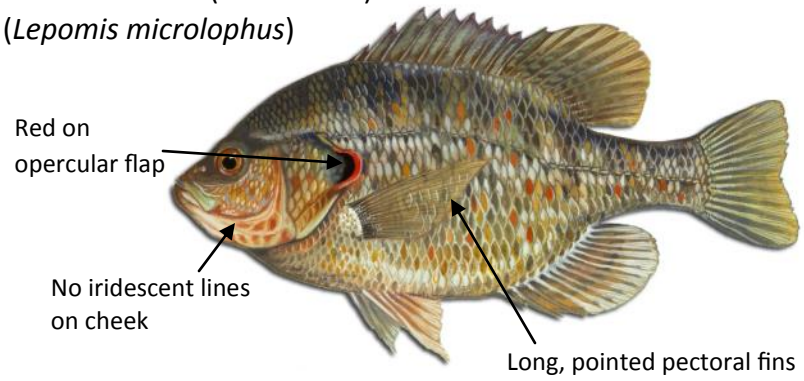
Distinguishing Features:
- Dorsal spines: 10-11
- Anal spines: 3
- Pectoral rays: 13-14
- Pectoral fins taper to a terminal point
- Pectoral fins greater than a athirst of the length typically found in sunfish

Habitat: Demersal; warm and calm or stagnant waters

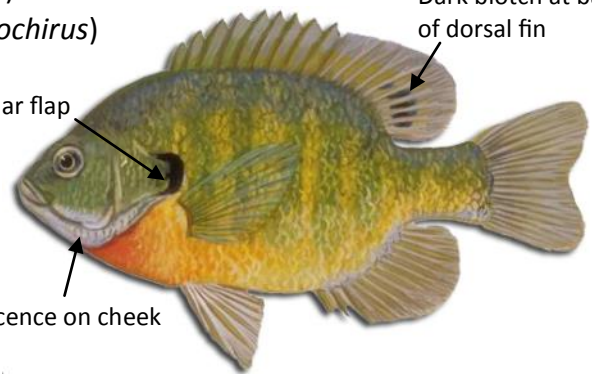
Similar Species: Bluegill (*Lepomis macrochirus*), Pumpkinseed (*Lepomis gibbosus*)

Distinguishing Features:

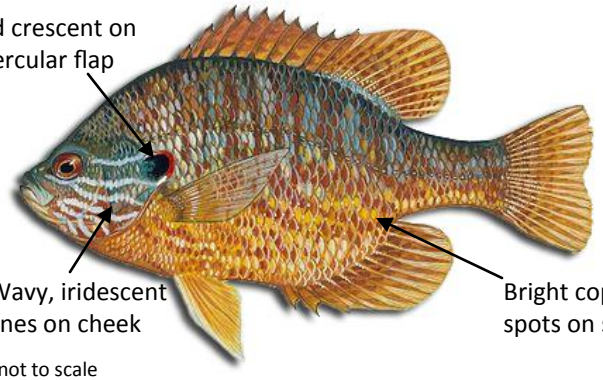
Redear Sunfish (Non-native)
(*Lepomis microlophus*)



Bluegill (Native)
(*Lepomis macrochirus*)



Pumpkinseed (Native)
(*Lepomis gibbosus*)



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Caspian Shad
(*Alosa caspia*)

Coloring:
- Blue to green dorsally
- Silver to copper on sides
- Black spot posterior to gill opening and occasionally further spots on sides

Size: Length: up to 280mm SL

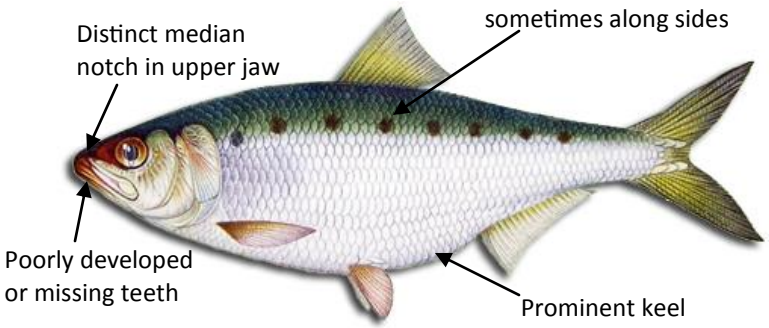
Distinguishing Features:
- Dorsal spines: 0
- Anal spines: 0
- Body 'shad-like', usually rather deep and compressed
- Total gill rakers 50 to 180, long and thin, distinctly longer than filaments
- Teeth poorly developed in jaws, sometimes barely detectable

Habitat: Pelagic-neritic; freshwater and brackish; occurs chiefly in brackish water, but enters freshwaters to spawn

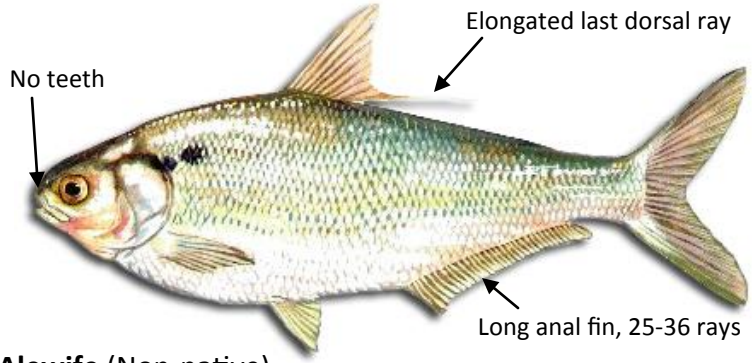
Similar Species: Gizzard Shad (*Dorosoma cepedianum*), Alewife (*Alosa pseudoharengus*)

Distinguishing Features:

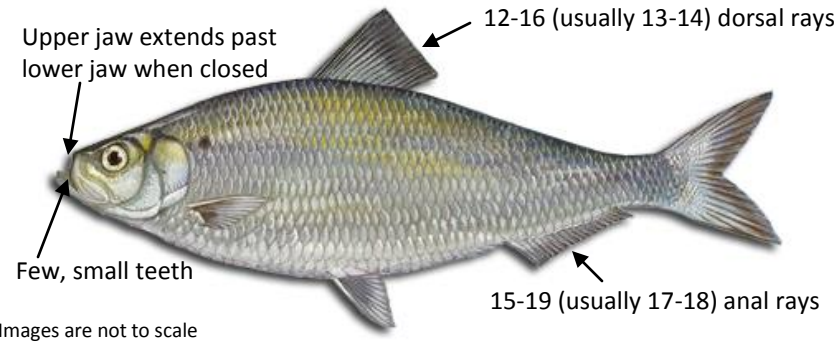
Caspian Shad (Non-native)
(*Alosa caspia*)



Gizzard Shad (Native)
(*Dorosoma cepedianum*)



Alewife (Non-native)
(*Alosa pseudoharengus*)



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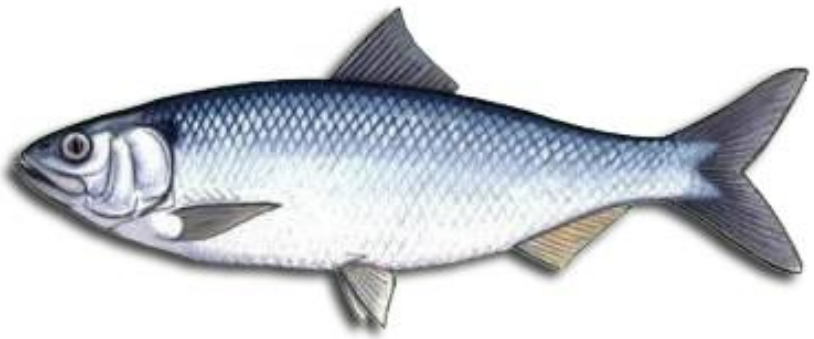
Black Sea Shad
(*Alosa immaculata*)



Coloring:
- Green to blue dorsally
- Silvery on sides
- Dark spot posterior to gills

Size: Length: up to 350mm SL

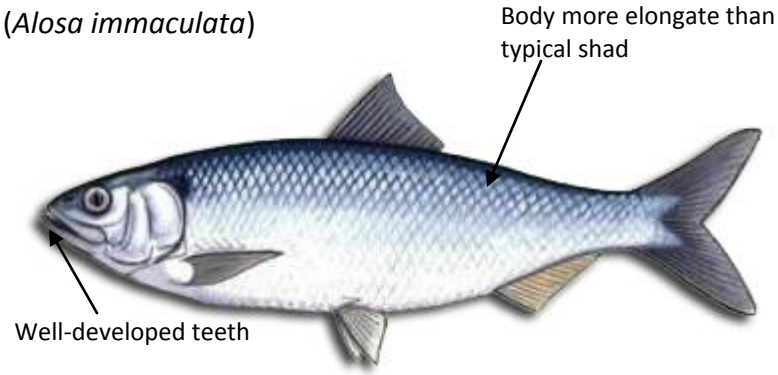
Distinguishing Features:
- Dorsal spines: 0
- Anal spines: 0
- Body fairy elongate, more 'herring-like' than 'shad-like'
- Gill rakers rather thin, longer than branchial filaments
- Teeth well developed in both jaws

Habitat: Pelagic-neritic; freshwater, brackish, and marine; depth range: 3-90m

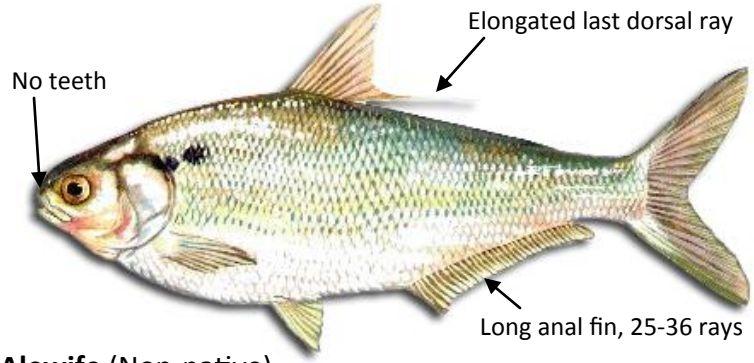
Similar Species: Gizzard Shad (*Dorosoma cepedianum*), Alewife (*Alosa pseudoharengus*)

Distinguishing Features:

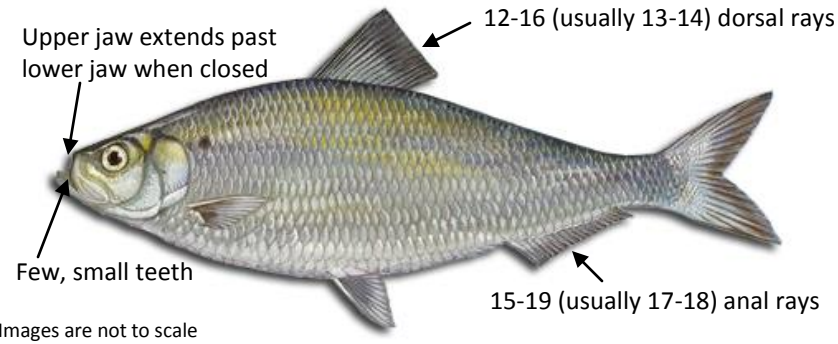
Black Sea Shad (Non-native)
(*Alosa immaculata*)



Gizzard Shad (Native)
(*Dorosoma cepedianum*)



Alewife (Non-native)
(*Alosa pseudoharengus*)



Images are not to scale

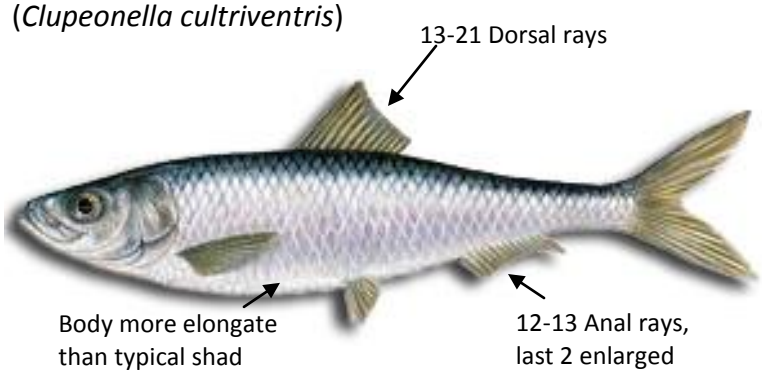
Black Sea Tyulka
(*Clupeonella cultriventris*)

Coloring: Silver
Size: Length: up to 80mm SL
Distinguishing Features:
- Dorsal rays: 13-21
- Anal rays: 12-23
- Last two anal rays enlarged
- Pectoral fin tips pointed
- Belly sharply keeled, with 24 to 29 scutes
- 49-62 gill rakers

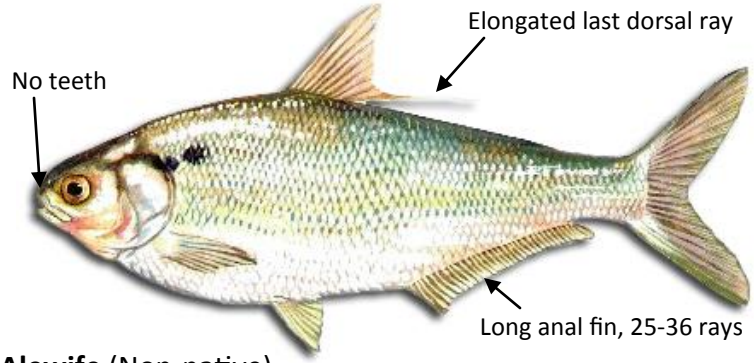
Habitat: Pelagic-neritic
Similar Species: Gizzard Shad (*Dorosoma cepedianum*), Alewife (*Alosa pseudoharengus*)

Distinguishing Features:

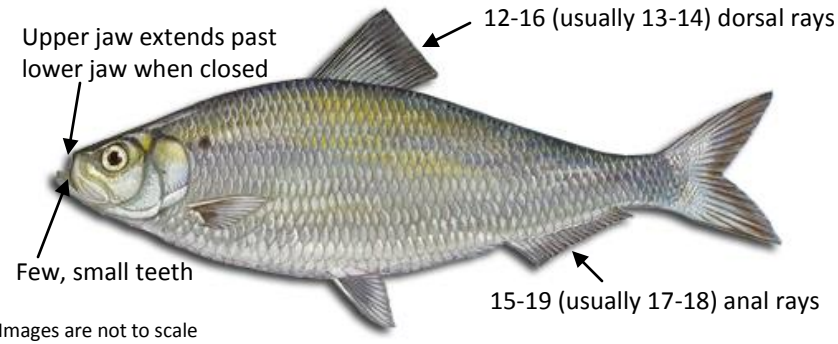
Black Sea Tyulka (Non-native)
(*Clupeonella cultriventris*)



Gizzard Shad (Native)
(*Dorosoma cepedianum*)



Alewife (Non-native)
(*Alosa pseudoharengus*)



Images are not to scale

European Bullhead
(*Cottus gobio*)

Coloring:
- Irregular dark brown markings on back and sides
- Pale underside

Size: Length: up to 90mm SL

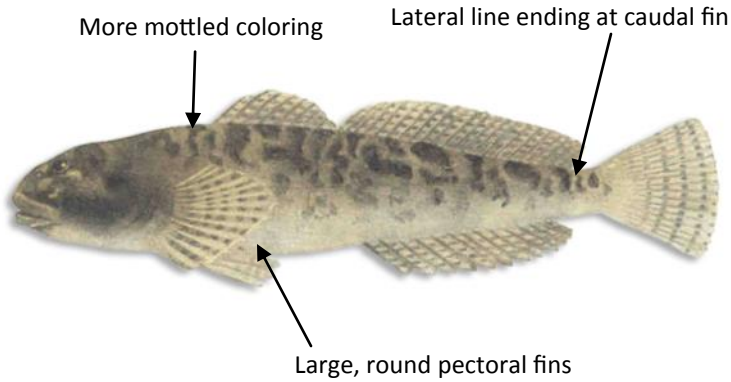
Distinguishing Features:
- Dorsal spines (total): 6-8
- Dorsal soft rays (total): 15-18
- Anal spines: 0
- Anal soft rays: 10-13
- Caudal rays: 13-14
- Large, rounded pectoral fins resembling wings when at rest on bottom
- Eyes located almost on top of the head

Habitat: Demersal; freshwater and brackish

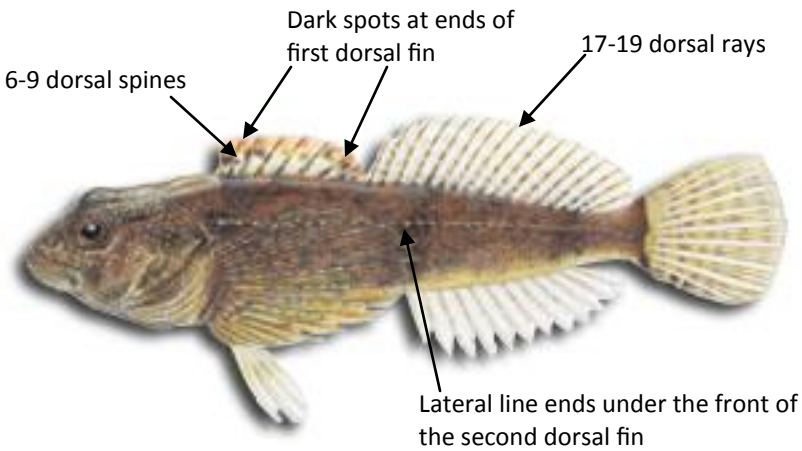
Similar Species: Mottled Sculpin (*Cottus bairdii*)

Distinguishing Features:

European Bullhead (Non-native)
(*Cottus gobio*)



Mottled Sculpin (Native)
(*Cottus bairdii*)



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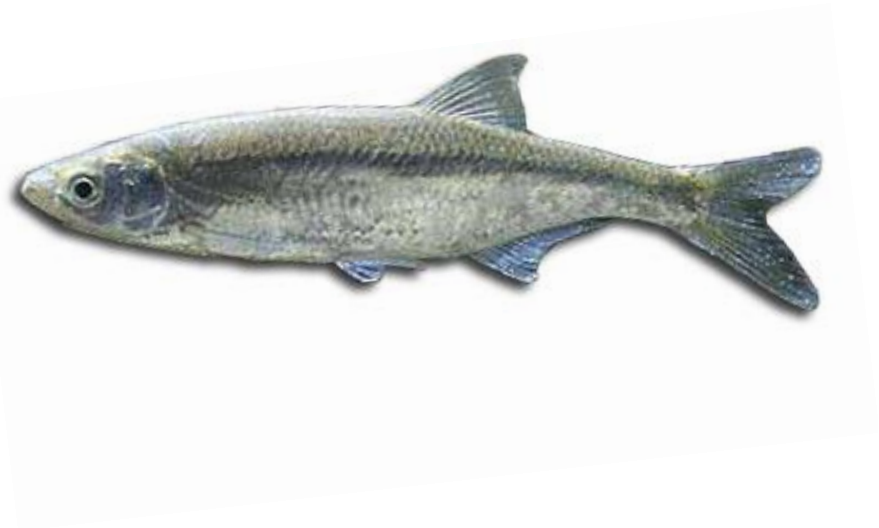
Bleak
(*Alburnus alburnus*)

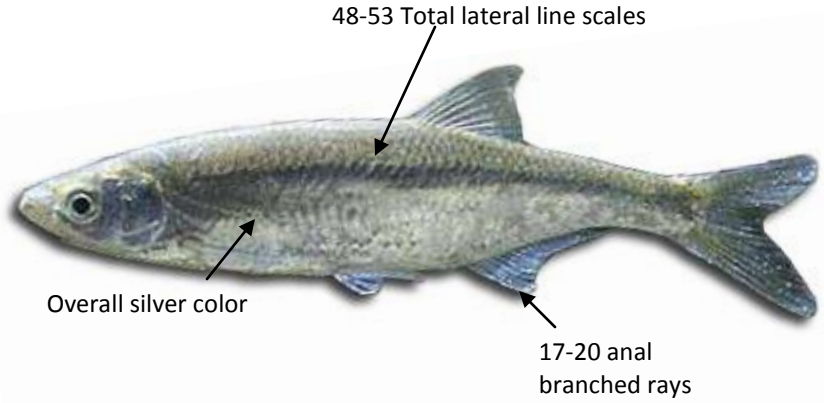


Coloring: Silver
Size: Length: up to 160mm SL
Distinguishing Features:
- 48-51 total lateral line scales
- Anal branched rays: 17-20.5
- Caudal rays: 19

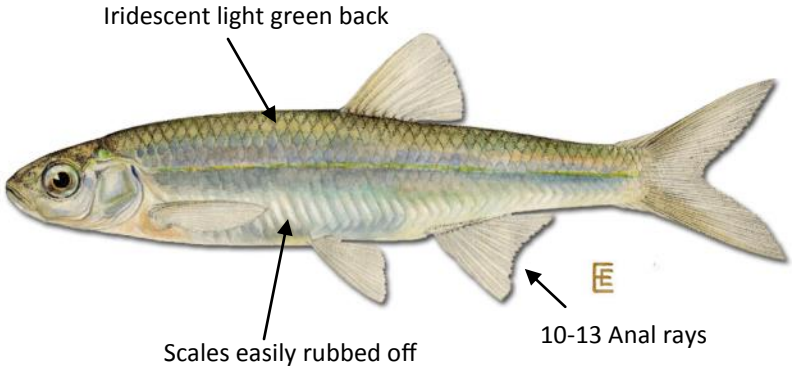
Habitat: Benthopelagic; adults occur in shoals near the surface and in open waters of lakes and rivers
Similar Species: Emerald Shiner (*Notropis atherinoides*)

Distinguishing Features:

Bleak (Non-native)
(*Alburnus alburnus*)

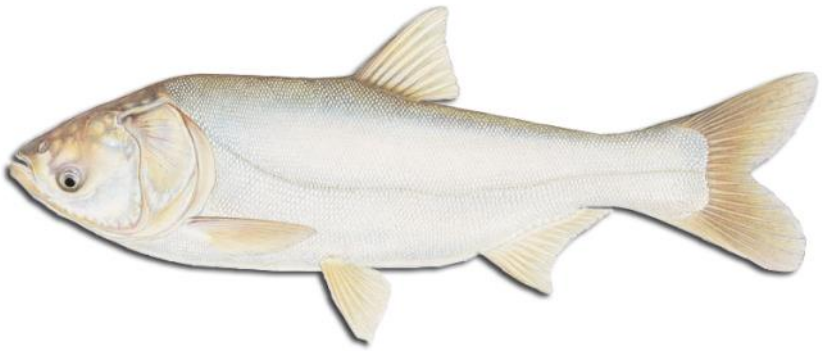


Emerald Shiner (Native)
(*Notropis atherinoides*)



Images are not to scale

Silver Carp
(*Hypophthalmichthys molitrix*)

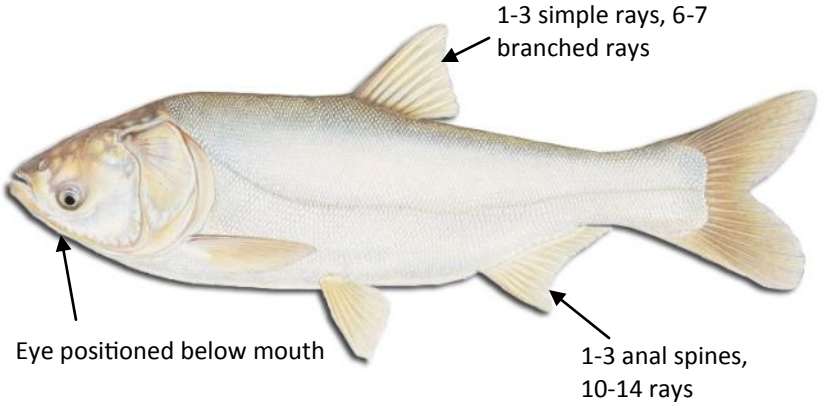


Coloring: Pale coloration, olivaceus along dorsal side and whitish on ventral surface
Size: Length: up to 1000mm SL
Distinguishing Features:
- Dorsal simple rays: 1-3
- Dorsal branched rays: 6-7
- Edge of last simple dorsal ray not serrated
- Anal simple rays: 1-3
- Anal branched rays 12-13.5
- Barbels absent
- Sharp, scaleless keel extends from isthmus to anus

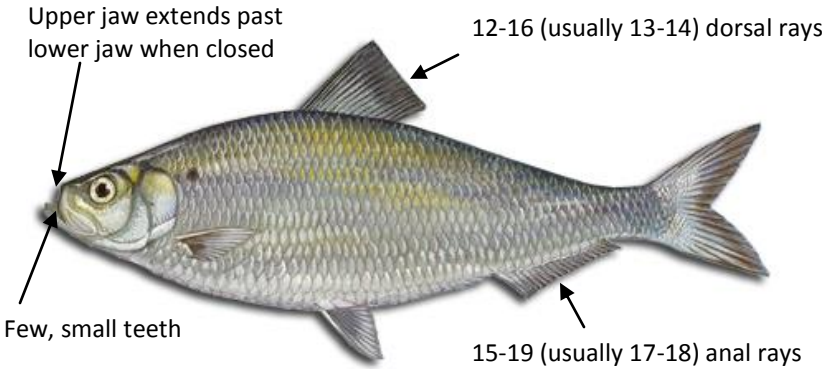
Habitat: Benthopelagic; freshwater; standing to slow-flowing conditions such as impoundments or the backwaters of large rivers
Similar Species: Alewife (*Alosa pseudoharengus*)

Distinguishing Features:

Silver Carp (Non-native)
(*Hypophthalmichthys molitrix*)

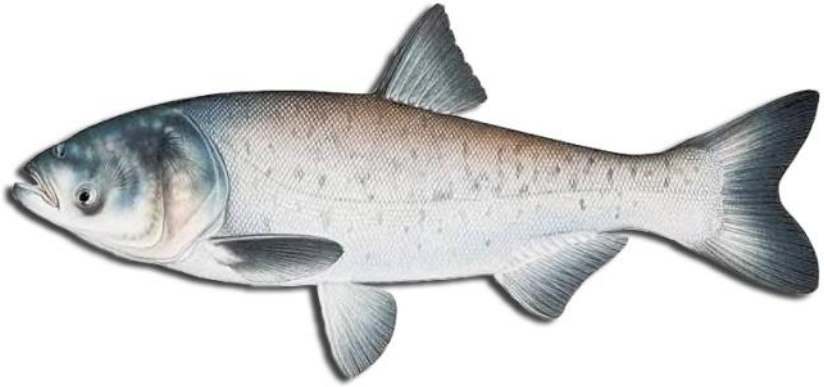


Alewife (Non-native)
(*Alosa pseudoharengus*)



Images are not to scale

Bighead Carp
(*Hypophthalmichthys nobilis*)

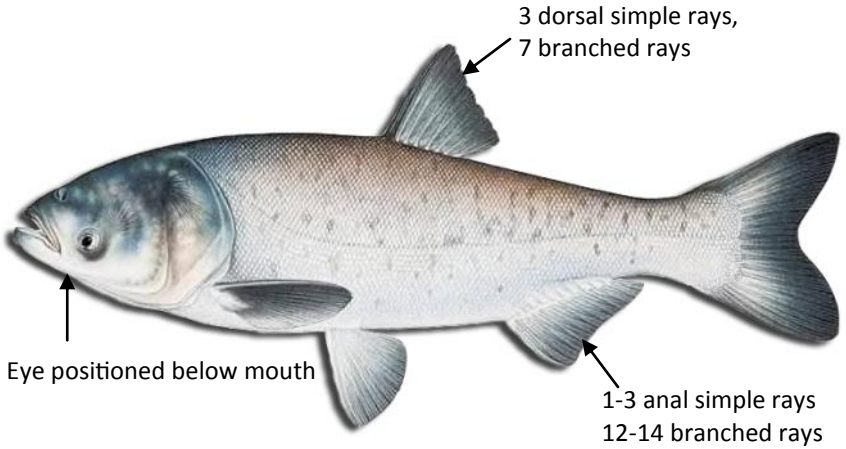


Coloring: Dark with large irregular blotches, fin bases and ventral side lighter in color
Size: Length: up to 1460mm SL; weight: up to 40kg
Distinguishing Features:
- Dorsal simple rays: 3
- Dorsal branched rays: 7
- Posterior margin of last simple dorsal ray not serrated
- Anal simple rays 1-3
- Anal branched rays: 12-14
- Branched anal rays 13-14.5
- Scaled keel extends from pelvic base to anus

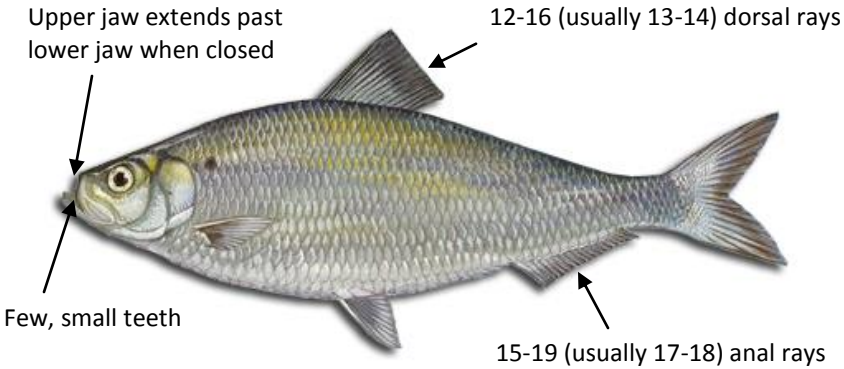
Habitat: Benthopelagic; freshwater
Similar Species: Alewife (*Alosa pseudoharengus*)

Distinguishing Features:

Bighead Carp (Non-native)
(*Hypophthalmichthys nobilis*)



Alewife (Non-native)
(*Alosa pseudoharengus*)



Images are not to scale

Sun Bleak
(*Leucaspius delineatus*)

Coloring:
- Large, silvery scales
- Inconspicuous intense silvery band along each side

Size: Length: up to 90mm SL

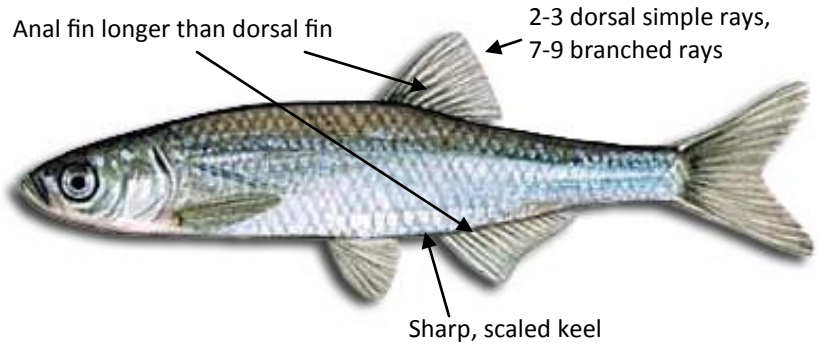
Distinguishing Features:
- Dorsal simple rays: 2-3
- Dorsal branched rays: 7-9
- Anal simple rays: 3
- Anal branched rays: 10-13
- Superior mouth
- Lateral line incomplete with 8-12 pored scales
- Sharp, scaled keel between pelvic fins and anus
- Scales are very loosely attaches and fall away if fish is handled

Habitat: Pelagic; found between weeds in shallow pools, creeks, lakes, peat and clay excavations, and canals

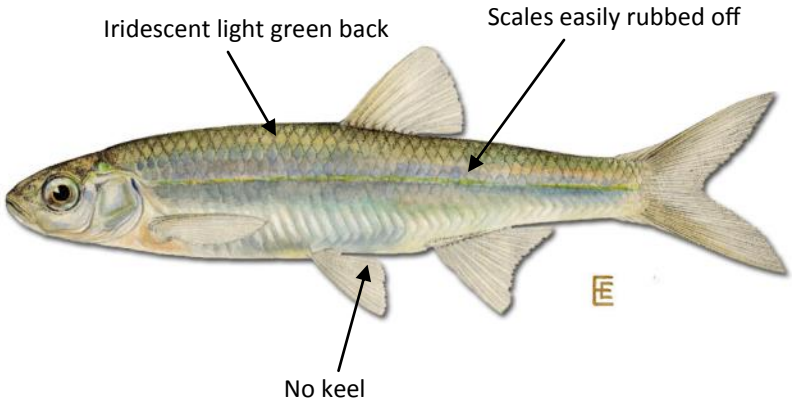
Similar Species: Emerald Shiner (*Notropis atherinoides*)

Distinguishing Features:

Sun Bleak (Non-native)
(*Leucaspius delineatus*)



Emerald Shiner (Native)
(*Notropis atherinoides*)



Images are not to scale

European Chub
(*Squalius cephalus*)

Coloring:
- Brown
- Orange-red pelvic and anal fins

Size: Length: up to 600mm SL; weight: up to 8.0kg

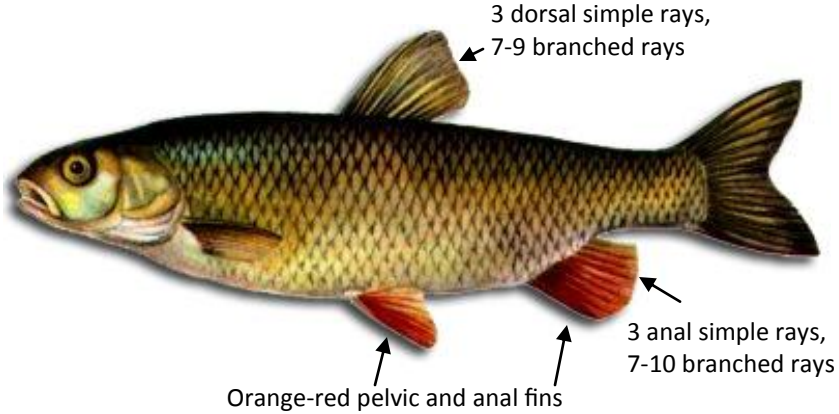
Distinguishing Features:
- Dorsal simple rays: 3
- Dorsal branches rays: 7-9
- Anal simple rays: 3
- Anal branched rays: 7-10
- Caudal rays: 19
- Discontinuity between head and trunk in dorsal profile
- Terminal mouth

Habitat: Benthopelagic; adults occur in creeks and fast flowing rivers, occasionally in lakes

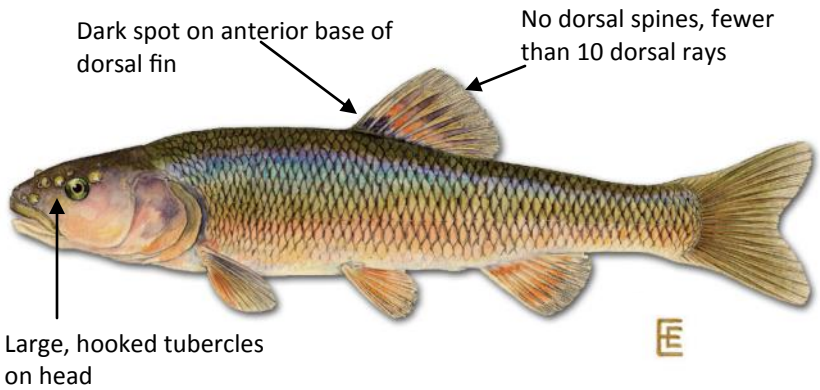
Similar Species: Creek Chub (*Semotilus atromaculatus*)

Distinguishing Features:

European Chub (Non-native)
(*Squalius cephalus*)

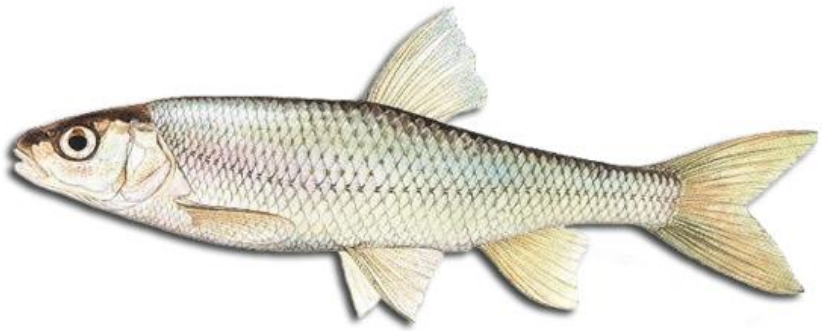


Creek Chub (Native)
(*Semotilus atromaculatus*)



Images are not to scale

Common Dace
(*Leuciscus leuciscus*)

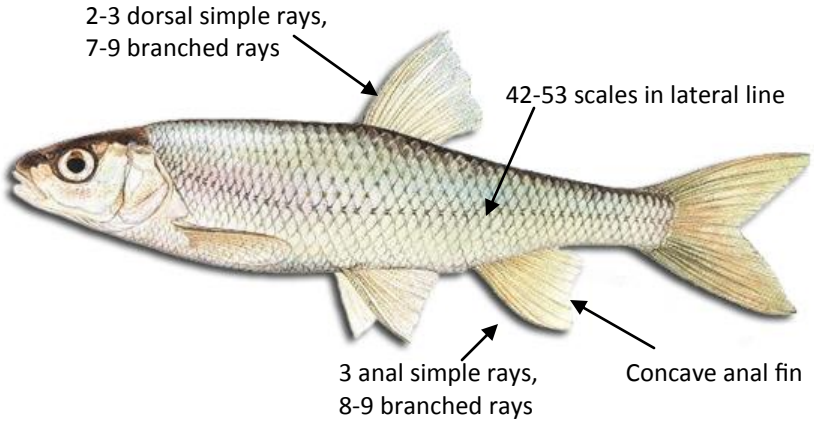


Coloring: Silver
Size: Length: up to 250mm SL; weight: up to 1.0kg
Distinguishing Features:
- Dorsal simple rays: 2-3
- Dorsal branched rays: 7-9
- Anal simple rays: 3
- Anal branched rays: 8-9
- Anal fin concave
- Caudal fin rays: 19
- Total lateral line scales 42-53
- Subterminal mouth

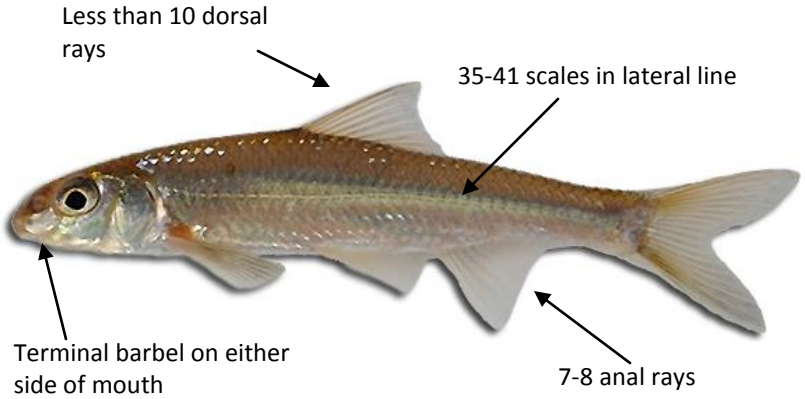
Habitat: Benthopelagic; prefers upper reach of rivers and clear, cool lakes
Similar Species: Silver Chub (*Macrhybopsis storeriana*)

Distinguishing Features:

Common Dace (Non-native)
(*Leuciscus leuciscus*)



Silver Chub (Native)
(*Macrhybopsis storeriana*)



Images are not to scale

Eurasian Minnow
(*Phoxinus phoxinus*)

Coloring:
- Greenish-brown back
- Darker spots that form a 'banded' effect

Size: Length: up to 100mm SL

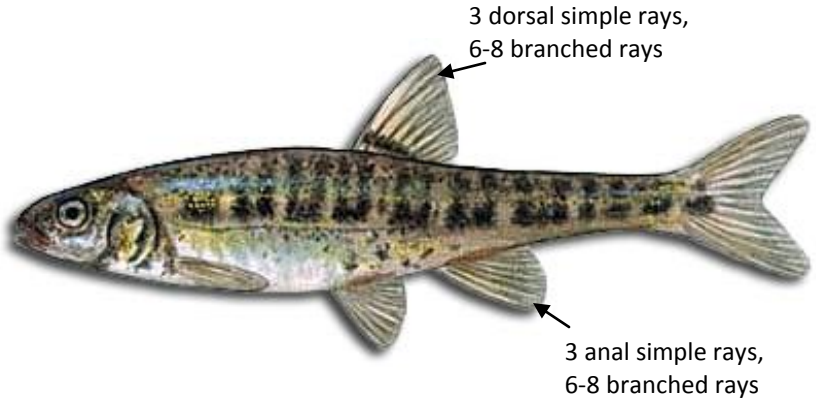
Distinguishing Features:
- Dorsal simple rays: 3
- Dorsal branched rays: 6-8
- Anal simple rays: 3
- Anal branched rays: 6-8
- Anal fin origin in front of base of last dorsal ray

Habitat: Demersal; lives in cold, running or still, yet well oxygenated, waters over gravel substrate

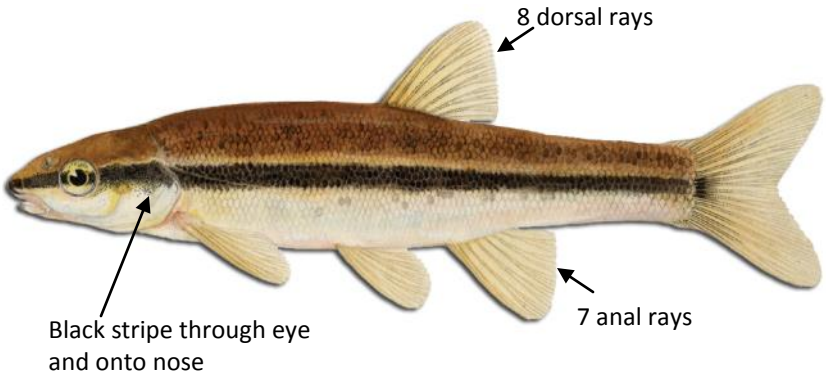
Similar Species: Blacknose Dace (*Rhinichthys atratulus*)

Distinguishing Features:

Eurasian Minnow (Non-native)
(*Phoxinus phoxinus*)



Blacknose Dace (Native)
(*Rhinichthys atratulus*)



Images are not to scale

Roach
(*Rutilus rutilus*)

Coloring:
- Silver
- Orange-red pectoral, pelvic, and anal fins

Size: Length: up to 500mm SL; weight: up to 1,840.0g

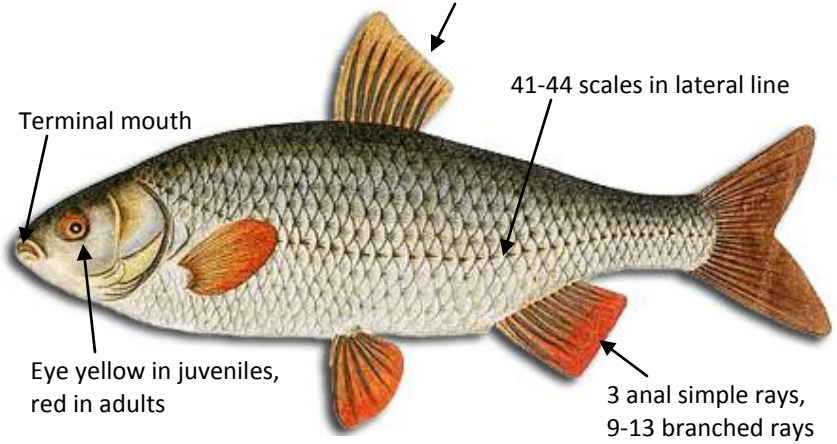
Distinguishing Features:
- Dorsal simple rays: 3
- Dorsal branched rays: 9-12
- Anal simple rays: 3
- Anal branched rays: 9-13
- Caudal rays: 18-19
- 41-44 total scales in lateral line
- Terminal mouth
- Pointed snout

Habitat: Benthopelagic; adults inhabit still or slow-flowing, muddy waters

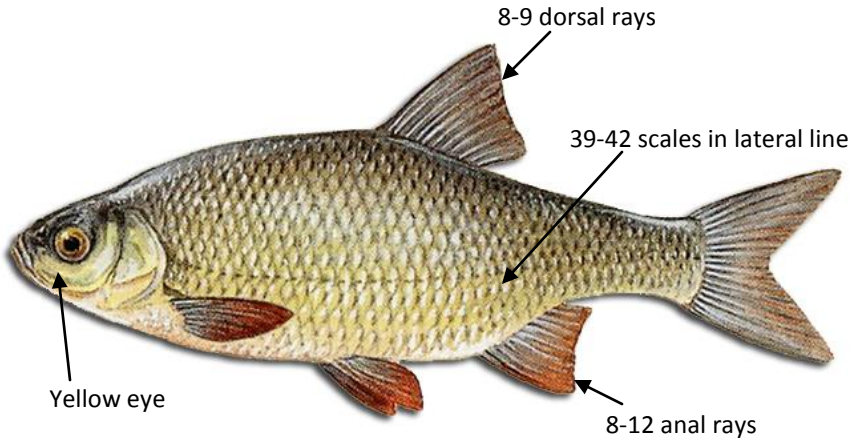
Similar Species: Common Rudd (*Scardinius erythrophthalmus*)

Distinguishing Features:

Roach (Non-native)
(*Rutilus rutilus*)



Common Rudd (Non-native)
(*Scardinius erythrophthalmus*)



Images are not to scale

Tench
(*Tinca tinca*)

Coloring:
- Olive-green, at times dark green or almost black
- Golden reflections on ventral surface
- Dark fins
- Eye orange-red, small

Size: Length: up to 700mm SL; weight: up to 7.5kg

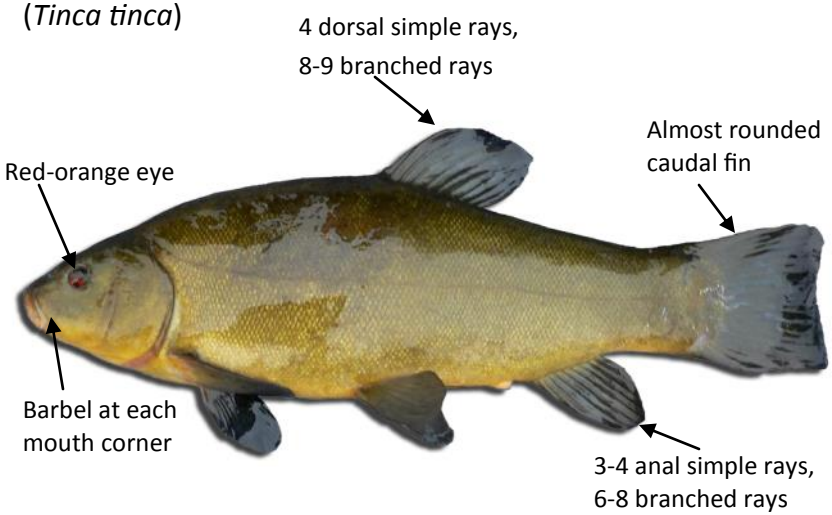
Distinguishing Features:
- Dorsal simple rays: 4
- Dorsal branched rays: 8-9
- Anal simple rays: 3-4
- Anal branched rays: 6-8
- 96-115 total lateral line scales
- Caudal peduncle characteristically deep and short
- Mouth terminal, small in size with thick lips
- Pair of well-developed maxillary barbels

Habitat: Demersal; adults inhabit warm lakes and pools with weed and mud bottom

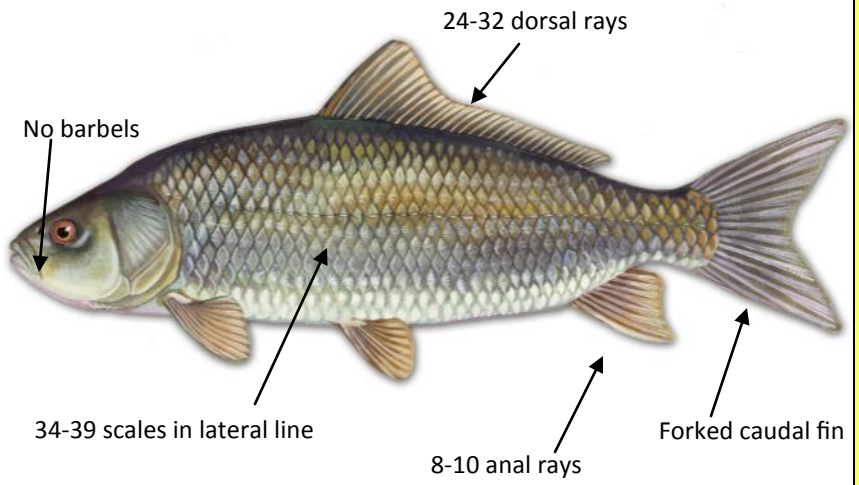
Similar Species: Bigmouth Buffalo (*Ictiobus cyprinellus*)

Distinguishing Features:

Tench (Non-native)
(*Tinca tinca*)



Bigmouth Buffalo (Native)
(*Ictiobus cyprinellus*)



Images are not to scale

Mediterranean Toothcarp
(*Aphanius fasciatus*)

Coloring:
- Silvery
- Yellow to yellow-orange caudal fin with possible dark submarginal bar
- Males: 8-15 dark blue to gray bars
- Females: 11-17 short dark brown bars, grayish midlateral stripe

Size: Length: up to 60mm SL

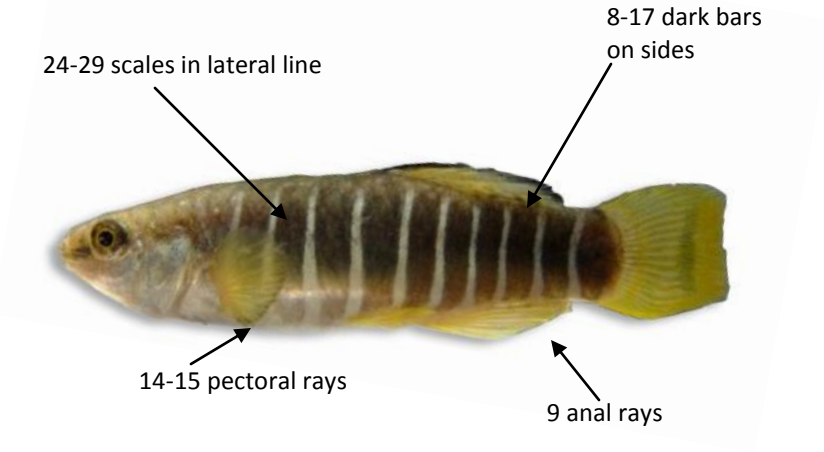
Distinguishing Features:
- Anal soft rays: 9
- Pectoral rays: 14-15
- 24-29 total lateral line scales

Habitat: Demersal; freshwater, brackish, and marine; occurs in ponds, ditches, and swamps

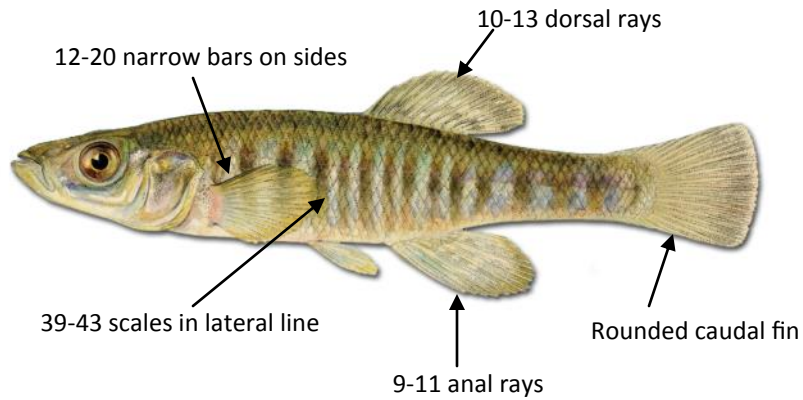
Similar Species: Banded Killifish (*Fundulus diaphanous*)

Distinguishing Features:

Mediterranean Toothcarp (Non-native)
(*Aphanius fasciatus*)

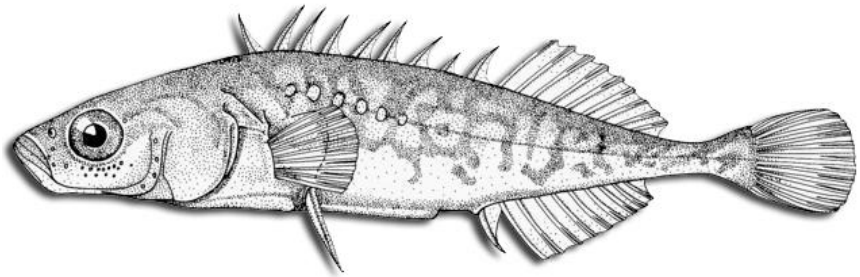


Banded Killifish (Native)
(*Fundulus diaphanus*)



Images are not to scale

Ukrainian Stickleback
(*Pungitius platygaster*)



Coloring:
- Gray to light brown
- Brown blotches

Size: Length: up to 60mm SL

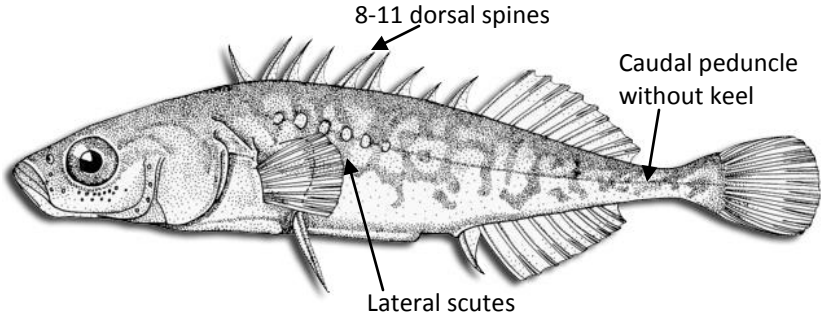
Distinguishing Features:
- Dorsal spines: 8-11
- Side of caudal peduncle without keel
- Large lateral scutes

Habitat: Benthopelagic; freshwater and brackish

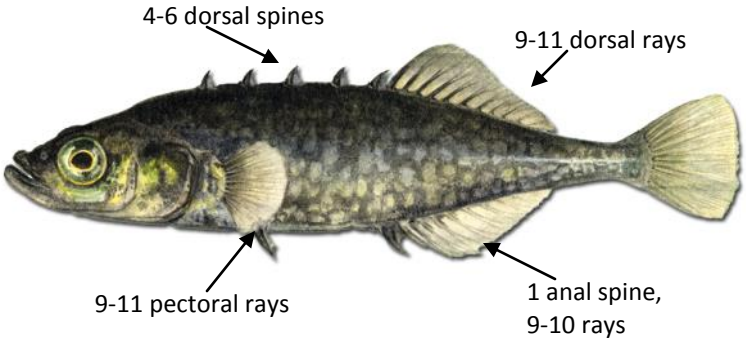
Similar Species: Brook Stickleback (*Culaea inconstans*), Ninespine Stickleback (*Pungitius pungitius*)

Distinguishing Features:

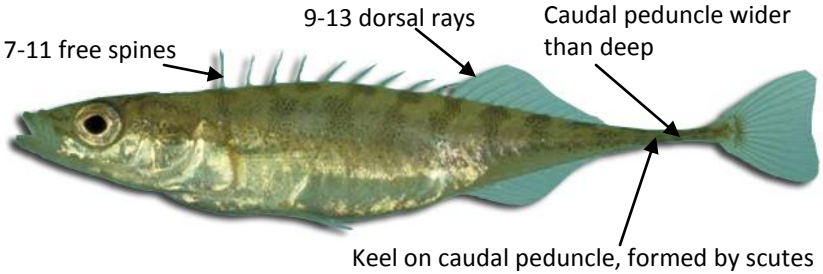
Ukrainian Stickleback (Non-native)
(*Pungitius platygaster*)



Brook Stickleback (Native)
(*Culaea inconstans*)

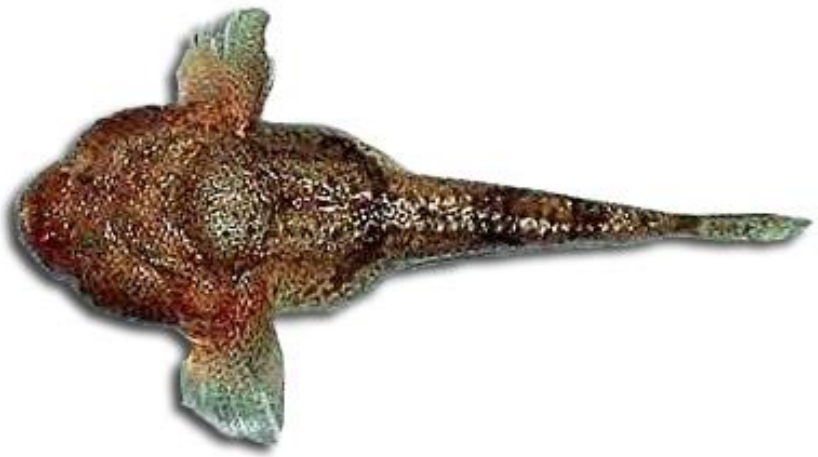


Ninespine Stickleback (Native)
(*Pungitius pungitius*)



Images are not to scale

Starry Tadpole-goby
(*Benthophilus stellatus*)



Coloring:
- Light gray to sandy or reddish brown
- Visible dark spots on body and head

Size: Length: up to 117mm SL

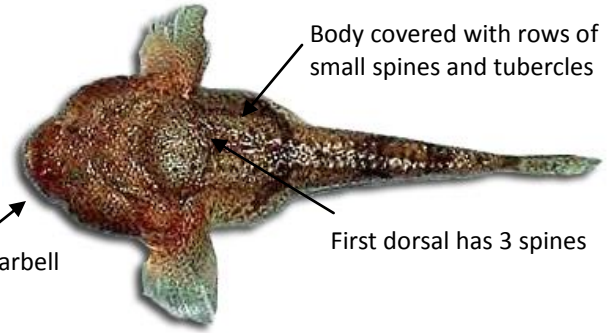
Distinguishing Features:
- First dorsal spines: 3
- Origin of second dorsal in front of anal origin
- Body covered with small spines and round osseous tubercles
- 27-30 tubercles in ventral row
- Single tubercle between eyes
- Wide skin fold at side of mouth
- Conspicuous barbel on chin

Habitat: Demersal; freshwater and brackish

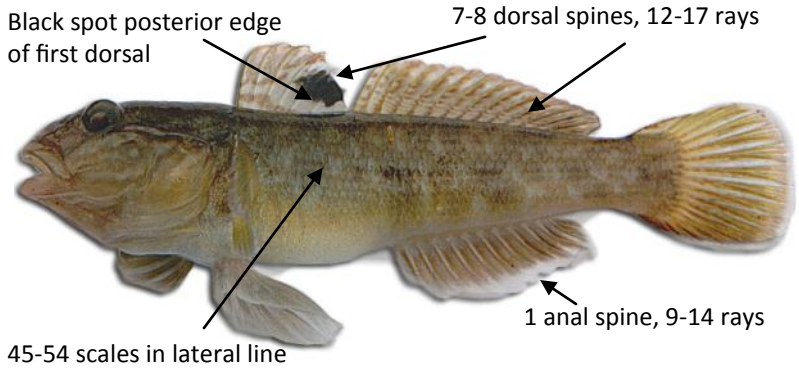
Similar Species: Round Goby (*Neogobius melanostomus*), Tubenose Goby (*Proterorhinus marmoratus*)

Distinguishing Features:

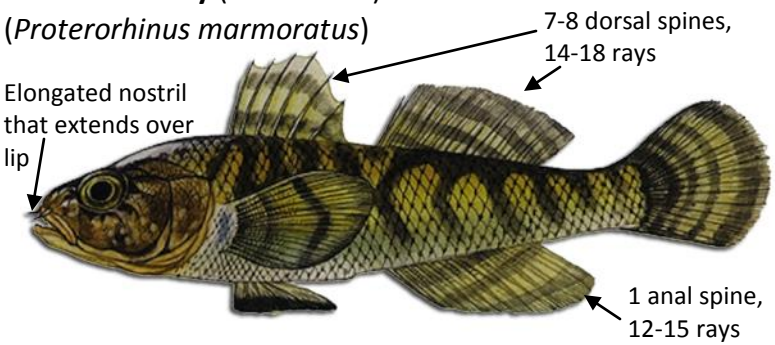
Starry Tadpole-goby (Non-native)
(*Benthophilus stellatus*)



Round Goby (Non-native)
(*Neogobius melanostomus*)

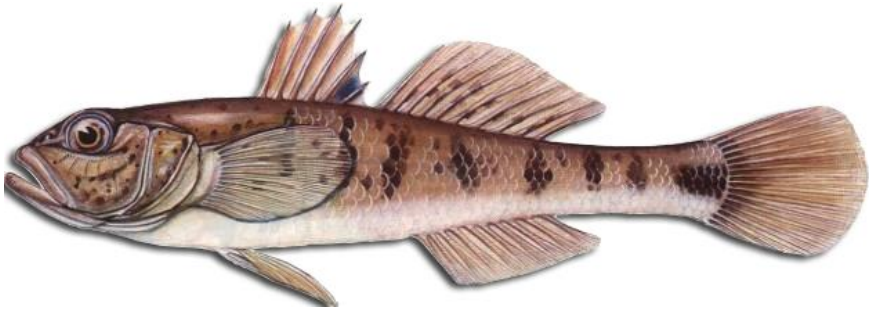


Tubenose Goby (Non-native)
(*Proterorhinus marmoratus*)



Images are not to scale

Caucasian Dwarf Goby
(*Knipowitschia caucasica*)



Coloring:
- Brown
- Vertical stripes

Size: Length: up to 50mm SL

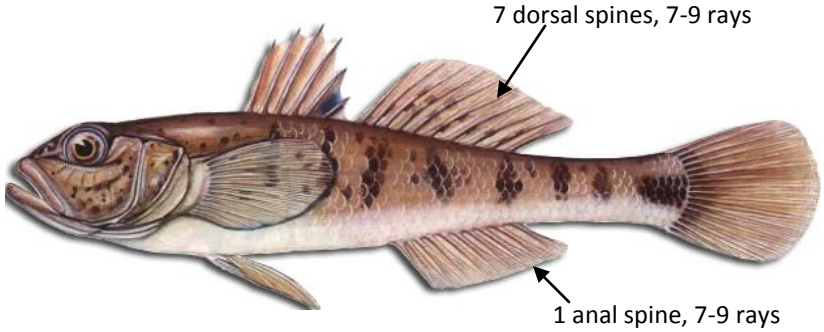
Distinguishing Features:
- Dorsal spines (total): 7
- Dorsal soft rays (total): 7-9
- Anal spines: 1
- Anal soft rays: 7-9
- 31-38 total lateral line scales

Habitat: Demersal; inhabits fresh to hyper-saline shallow waters of lakes, estuaries and lagoons, with abundant vegetation

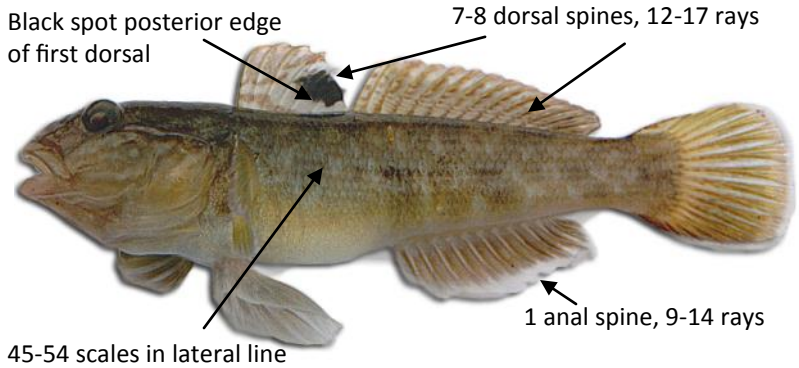
Similar Species: Round Goby (*Neogobius melanostomus*), Tubenose Goby (*Proterorhinus marmoratus*)

Distinguishing Features:

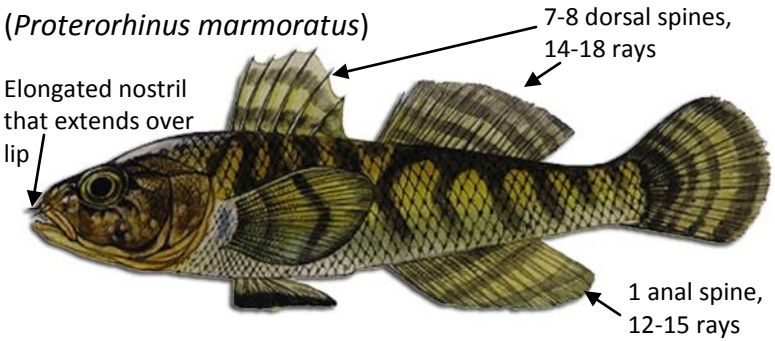
Caucasian Dwarf Goby (Non-native)
(*Knipowitschia caucasica*)



Round Goby (Non-native)
(*Neogobius melanostomus*)

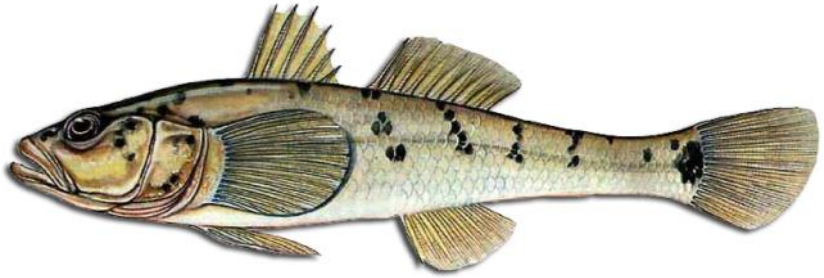


Tubenose Goby (Non-native)
(*Proterorhinus marmoratus*)



Images are not to scale

Longtail Dwarf Goby
(*Knipowitschia longecaudata*)



Coloring:
- Body grayish to fawn
- Breeding males with 4-5 darks bars

Size: Length: up to 40mm SL

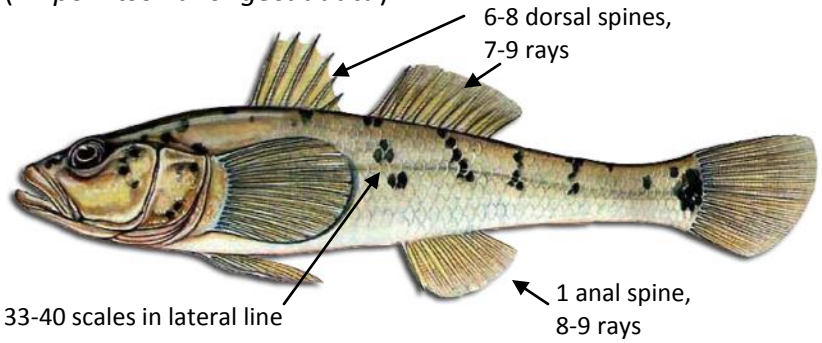
Distinguishing Features:
- Dorsal spines (total): 6-8
- Dorsal soft rays (total): 7-9
- Anal spines: 1
- Anal soft rays: 8-9
- Upper portion of caudal fin longer than lower portion
- 33-40 scales in lateral line

Habitat: Demersal; freshwater and brackish; occurs in shallow water, on sand and among weeds

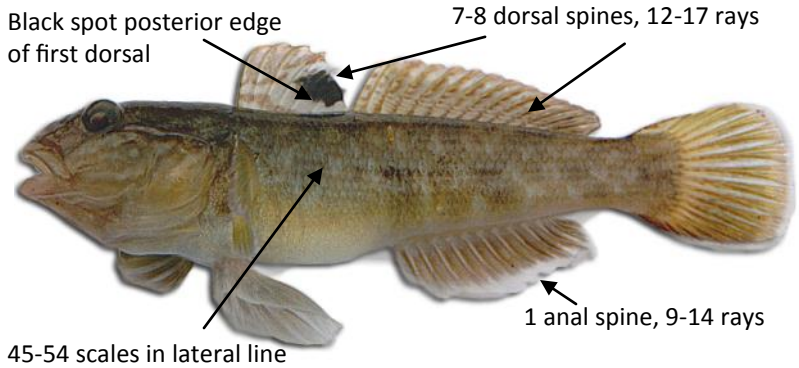
Similar Species: Round Goby (*Neogobius melanostomus*), Tubenose Goby (*Proterorhinus marmoratus*)

Distinguishing Features:

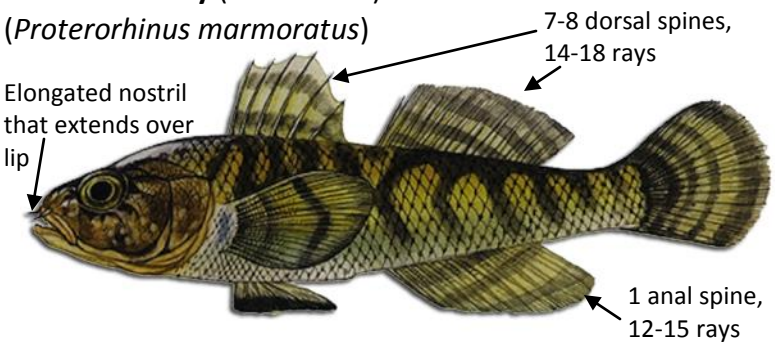
Longtail Goby (Non-native)
(*Knipowitschia longecaudata*)



Round Goby (Non-native)
(*Neogobius melanostomus*)

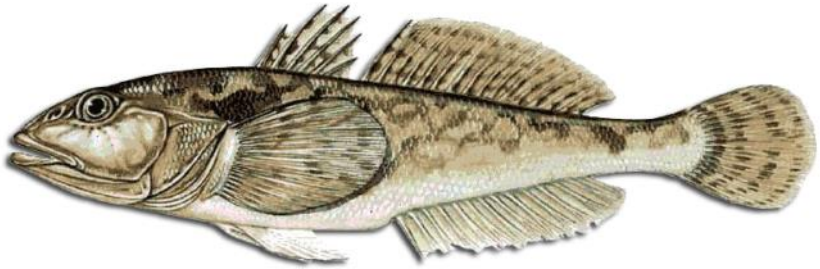


Tubenose Goby (Non-native)
(*Proterorhinus marmoratus*)



Images are not to scale

Monkey Goby
(*Neogobius fluviatilis*)



Coloring:
- Light to medium brown
- Dark patches
- No spot on posterior of first dorsal fin

Size: Length: up to 200mm SL

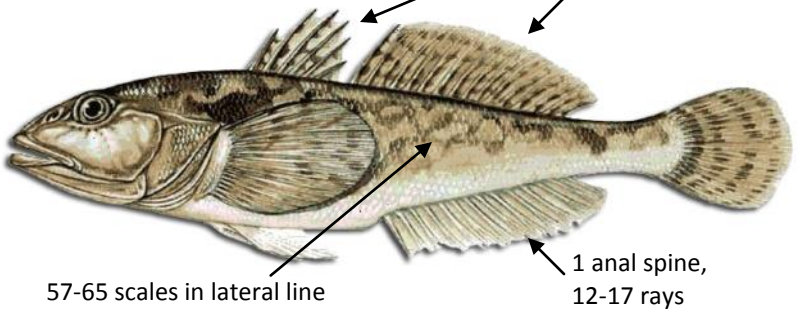
Distinguishing Features:
- Dorsal spines (total): 7
- Dorsal soft rays (total): 14-18
- Anal spines: 1
- Anal soft rays: 12-17
- 57-65 total scales in lateral line
- First branched ray of second dorsal almost twice as long as second to last

Habitat: Benthopelagic; freshwater and brackish

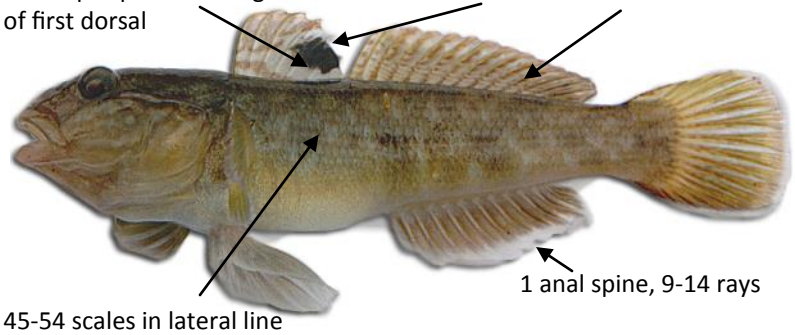
Similar Species: Round Goby (*Neogobius melanostomus*), Tubenose Goby (*Proterorhinus marmoratus*)

Distinguishing Features:

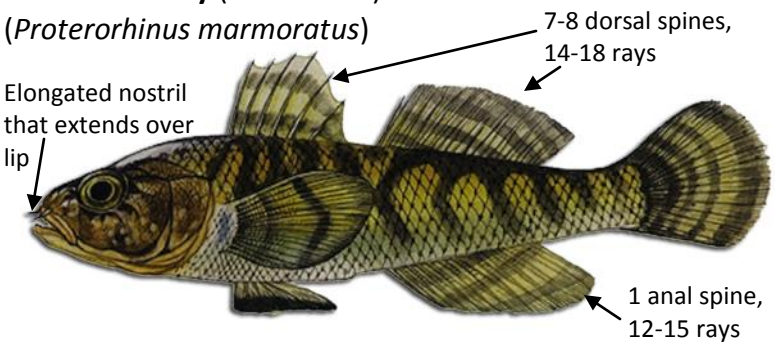
Monkey Goby (Non-native)
(*Neogobius fluviatilis*)



Round Goby (Non-native)
(*Neogobius melanostomus*)

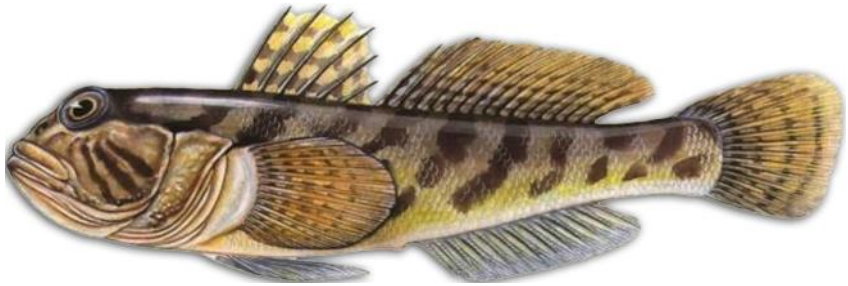


Tubenose Goby (Non-native)
(*Proterorhinus marmoratus*)



Images are not to scale

Racer Goby
(*Neogobius gymnotrachelus*)



Coloring:
- Brown
- Dark, diagonal bars irregular in shape and placement
- First dorsal without posterior black spot

Size: Length: up to 160mm SL

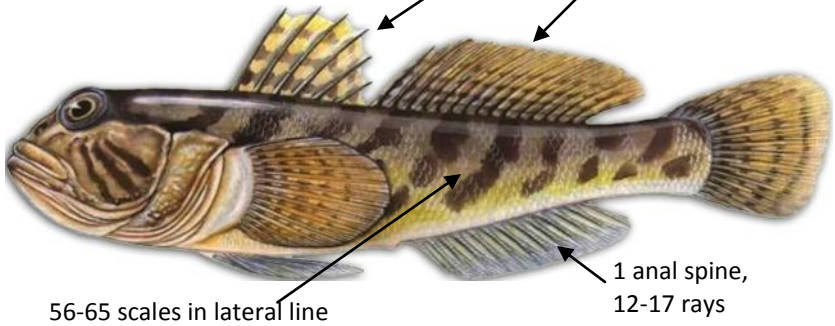
Distinguishing Features:
- Dorsal spines (total): 7-8
- Dorsal soft rays (total): 14-18
- Anal spines: 1
- Anal soft rays: 12-17
- 56-65 scales in lateral line

Habitat: Benthopelagic; occurs in lower reaches of rivers and coastal lagoons, on sand or mud bottom

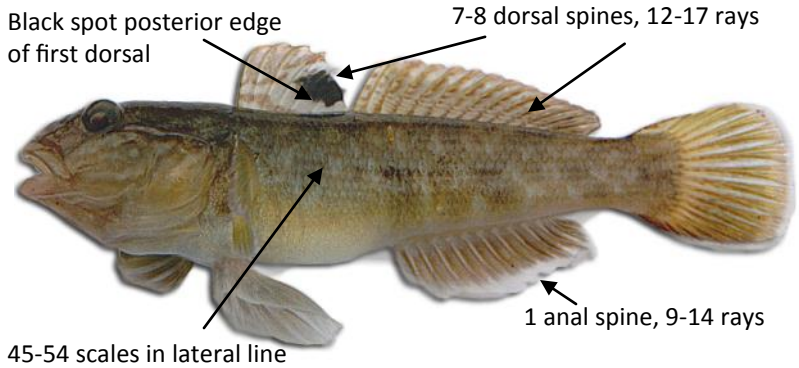
Similar Species: Round Goby (*Neogobius melanostomus*), Tubenose Goby (*Proterorhinus marmoratus*)

Distinguishing Features:

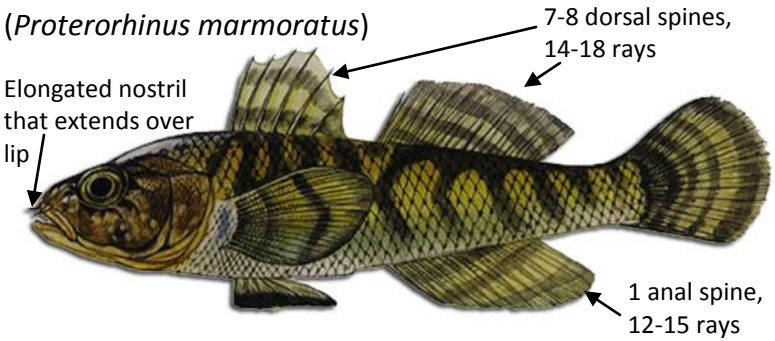
Racer Goby (Non-native)
(*Neogobius gymnotrachelus*)



Round Goby (Non-native)
(*Neogobius melanostomus*)

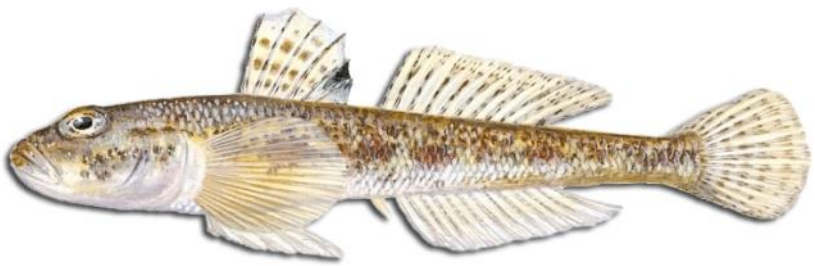


Tubenose Goby (Non-native)
(*Proterorhinus marmoratus*)



Images are not to scale

Sand Goby
(*Pomatoschistus minutus*)



Coloring:
- Light brown
- Dark spot on the posterior end of first dorsal fin

Size: Length: up to 110mm TL

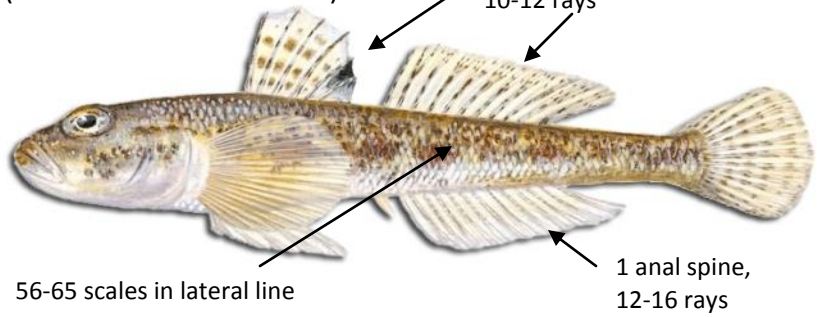
Distinguishing Features:
- Dorsal spines (total): 6-8
- Dorsal soft rays (total): 10-12
- Anal spines: 1
- Anal soft rays: 12-16
- 56-65 scales in lateral line

Habitat: Demersal; brackish and marine

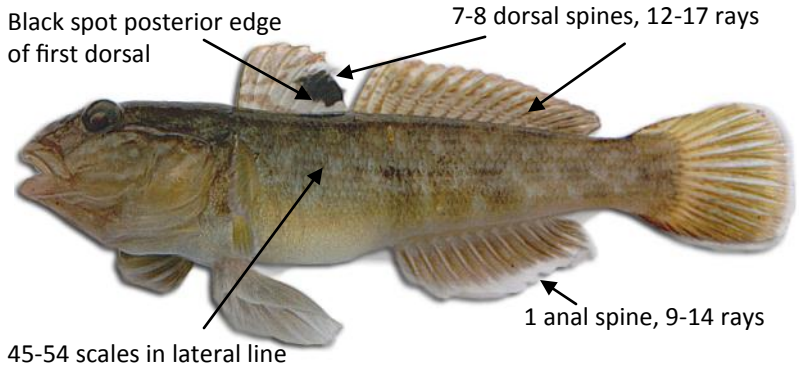
Similar Species: Round Goby (*Neogobius melanostomus*), Tubenose Goby (*Proterorhinus marmoratus*)

Distinguishing Features:

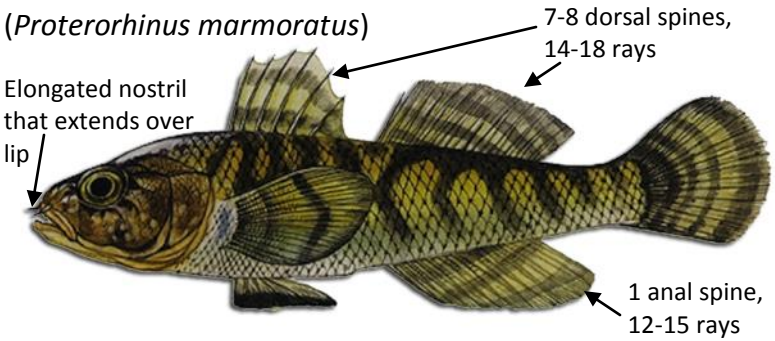
Sand Goby (Non-native)
(*Pomatoschistus minutus*)



Round Goby (Non-native)
(*Neogobius melanostomus*)

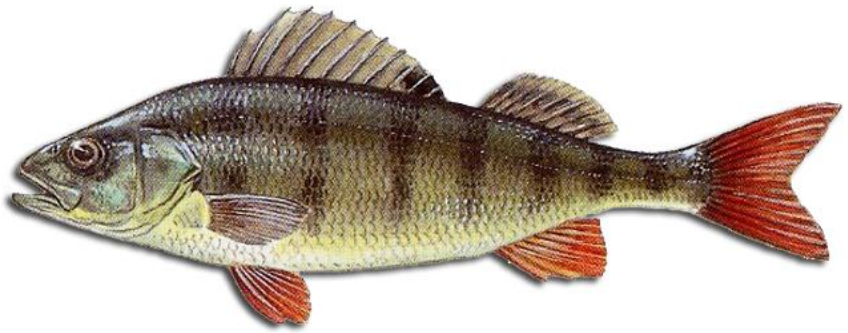


Tubenose Goby (Non-native)
(*Proterorhinus marmoratus*)



Images are not to scale

European Perch
(*Perca fluviatilis*)



Coloring:
- Body greenish-yellow
- 5-8 transverse black bands on sides
- First dorsal has dark blotch on posterior end
- Pelvic and anal fins yellow to red

Size: Length: 200mm SL, up to 600mm SL; weight: up to 4.8Kg

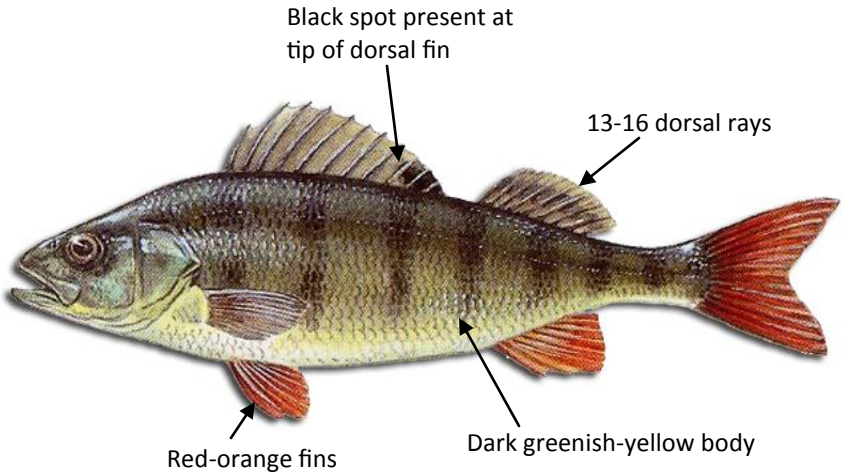
Distinguishing Features:
- Dorsal spines (total): 14-20
- Dorsal soft rays (total): 13-16
- First dorsal fin markedly higher than the second
- Dorsal fins clearly separated
- Anal spines: 2
- Anal soft rays: 7-10
- 56-77 total scales in lateral line

Habitat: Demersal; freshwater and brackish

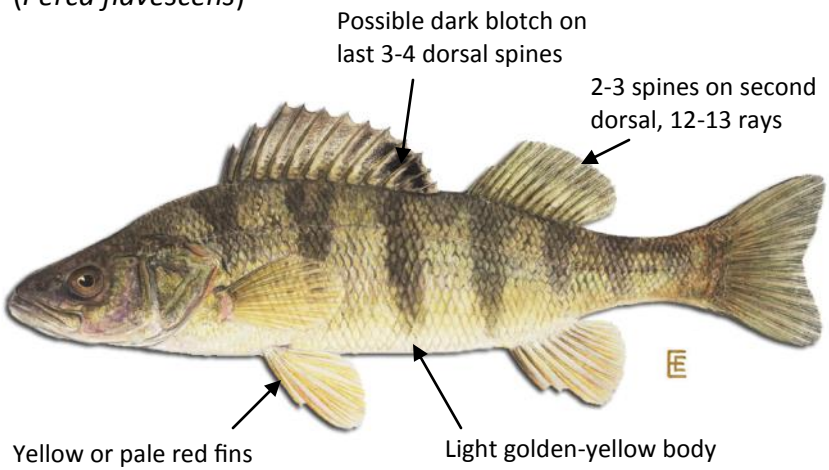
Similar Species: Yellow Perch (*Perca flavescens*)

Distinguishing Features:

European Perch (Non-native)
(*Perca fluviatilis*)

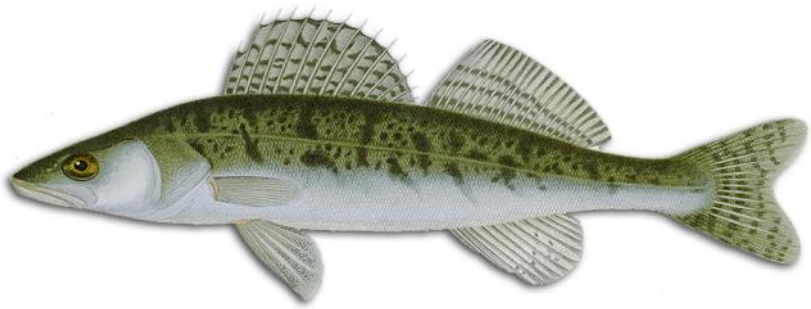


Yellow Perch (Native)
(*Perca flavescens*)



Images are not to scale

Zander
(*Sander lucioperca*)



Coloring:
- Green-brown
- Vertical dark stripes

Size: Length: 500mm TL, up to 1000mm TL; weight: up to 20kg

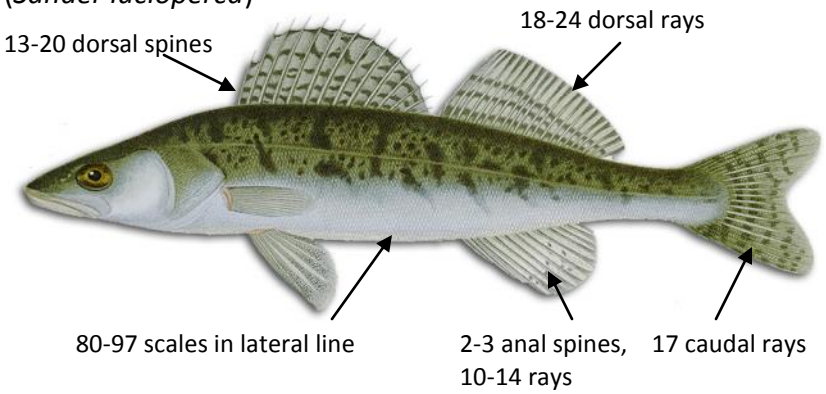
Distinguishing Features:
- Dorsal spines (total): 13-20
- Dorsal soft rays (total): 18-24
- Anal spines: 2-3
- Anal soft rays: 10-14
- Caudal rays: 17
- 80-97 total scales in lateral line
- Long slender body, without cross bars
- No spines on gill cover

Habitat: Pelagic; inhabits deep, calm waters of lakes, reservoirs, canals, and rivers

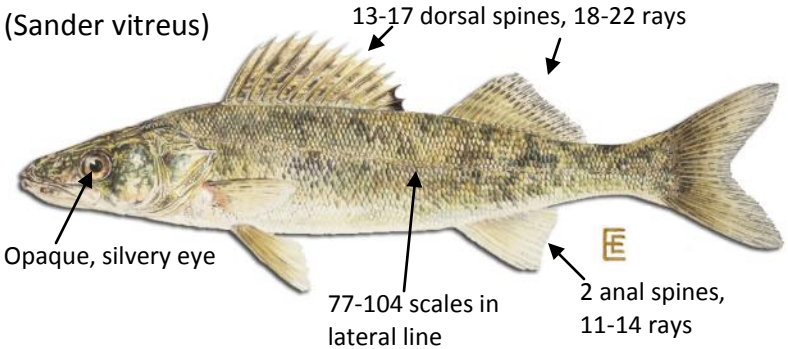
Similar Species: Walleye (*Sander vitreus*), Sauger (*Sander canadensis*)

Distinguishing Features:

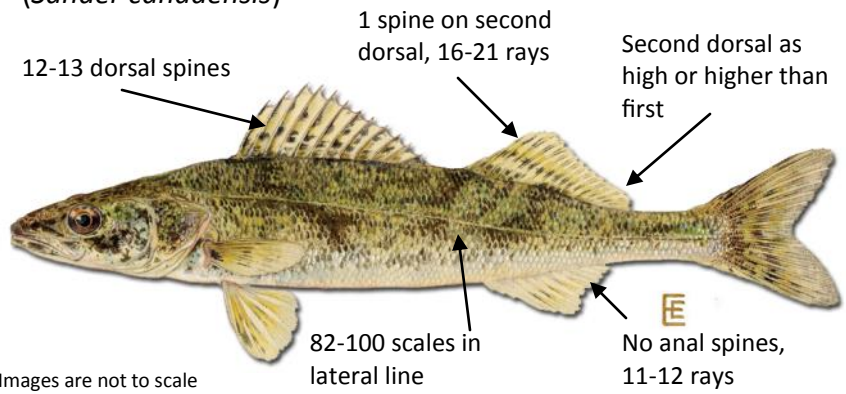
Zander (Non-native)
(*Sander lucioperca*)



Walleye (Native)
(Sander vitreus)

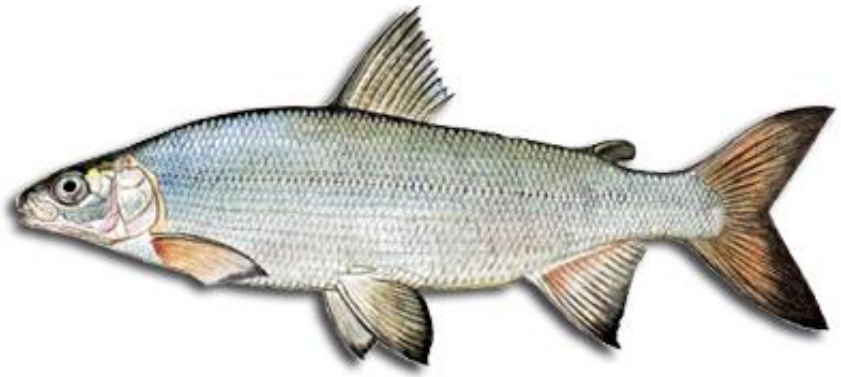


Sauger (Native)
(*Sander canadensis*)



Images are not to scale

Baltic Cisco
(*Coregonus albula*)



Coloring:
- Bluish-green dorsally with white underside
- Silver on sides
- Fins are gray, becoming darker at margins

Size: Length: up to 230mm SL; weight: up to 1kg

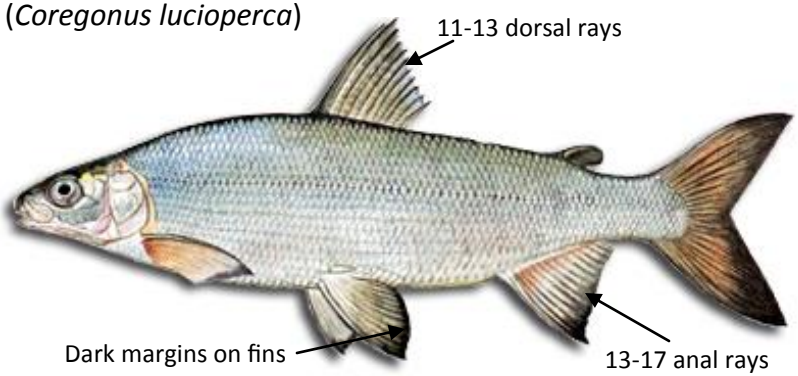
Distinguishing Features:
- Dorsal rays: 11-13
- Anal rays: 13-17
- Adipose fin present

Habitat: Pelagic-neritic; freshwater, brackish, and marine

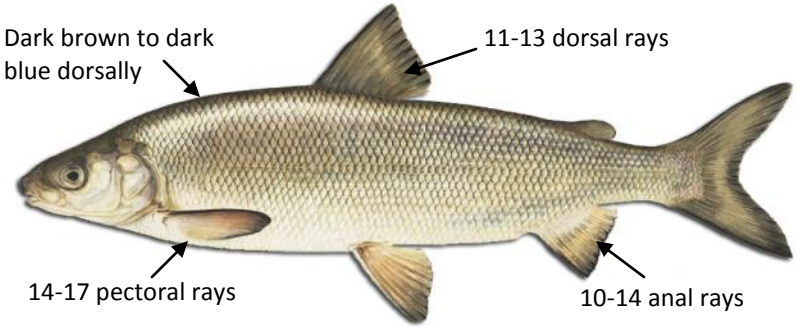
Similar Species: Lake Whitefish (*Coregonus clupeaformis*), Round Whitefish (*Prosopium cylindraceum*)

Distinguishing Features:

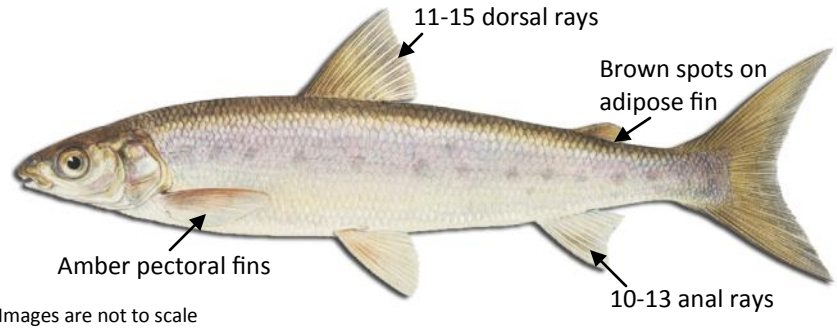
Baltic Cisco (Non-native)
(*Coregonus lucioperca*)



Lake Whitefish (Native)
(*Coregonus clupeaformis*)



Round Whitefish (Non-native)
(*Prosopium cylindraceum*)



Images are not to scale

Chum Salmon
(*Oncorhynchus keta*)

Coloring:
- Steel-blue dorsally, with speckles of black
- Silver on sides
- Silvery to white ventrally

Size: Length: 580mm TL, up to 1000mm FL; weight: up to 16kg

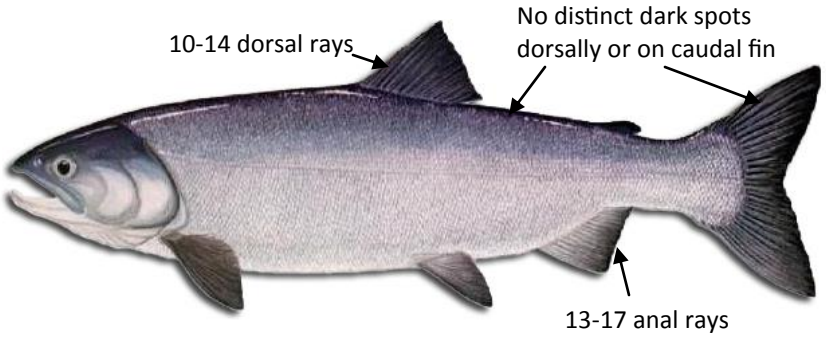
Distinguishing Features:
- Dorsal spines: 0
- Dorsal soft rays: 10-14
- Anal spines: 0
- Anal soft rays: 13-17
- Pelvic fins with axillary process
- 18 to 28 short, stout, smooth gill rakers on the first arch
- Caudal truncate to slightly emarginate

Habitat: Benthopelagic

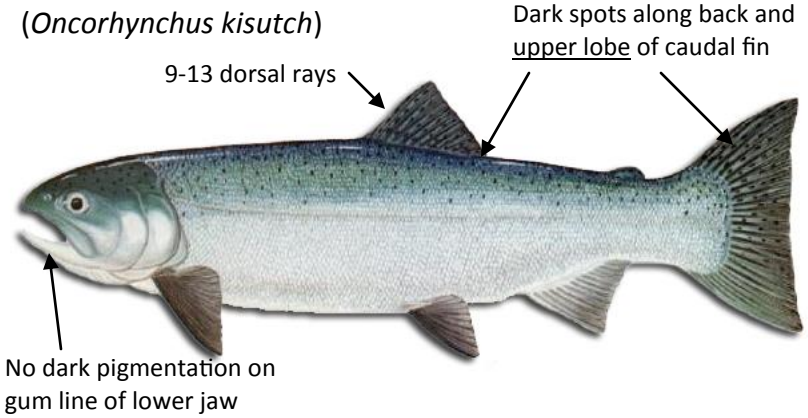
Similar Species: Coho Salmon (*Oncorhynchus kisutch*), Chinook Salmon (*Oncorhynchus tshawytscha*)

Distinguishing Features:

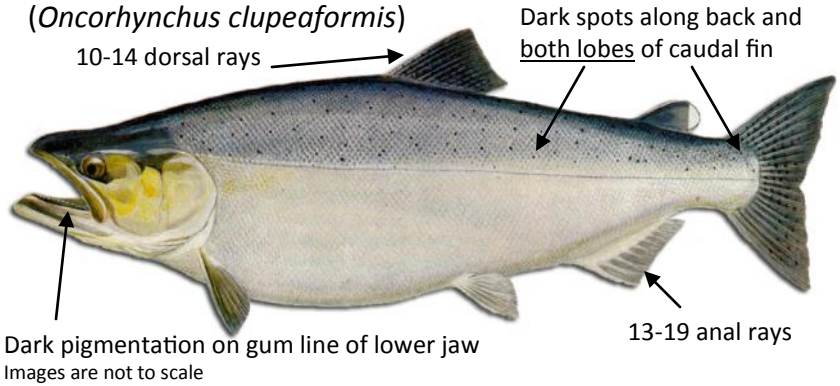
Chum Salmon (Non-native)
(*Oncorhynchus keta*)



Coho Salmon (Non-native)
(*Oncorhynchus kisutch*)



Chinook Salmon (Non-native)
(*Oncorhynchus clupeaformis*)



Images are not to scale

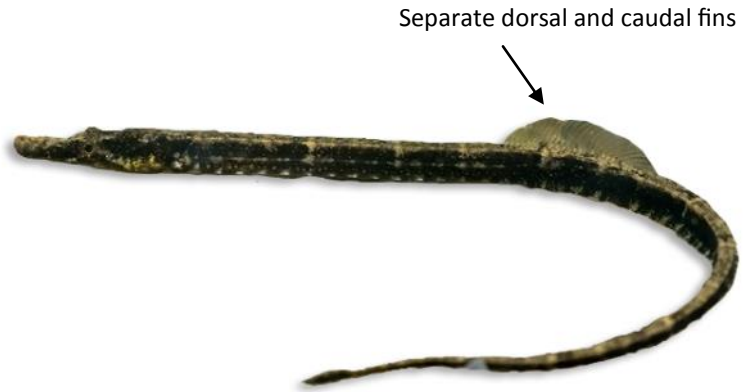
Black-striped Pipefish
(*Syngnathus abaster*)

Size: Length: up to 190mm SL
Distinguishing Features:
- Dorsal soft rays: 33-34
- Anal soft rays: 3
- Pectoral soft rays: 12-13
- Tube-like snout, no more than half the head length
- Mouth terminal
- Caudal, pectoral, and anal fin present and not fused

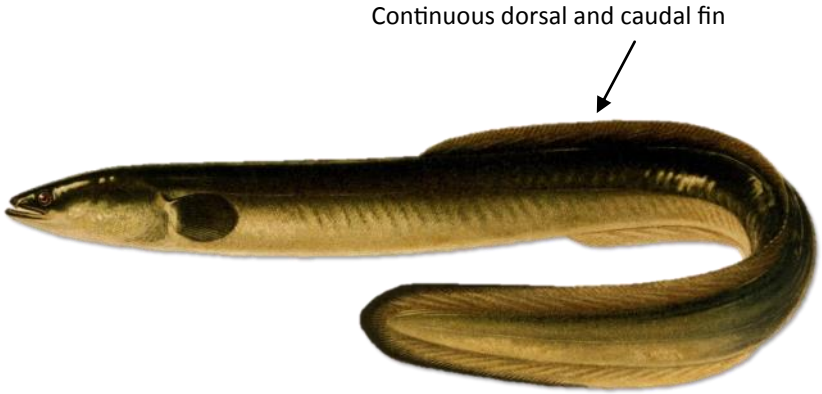
Habitat: Demersal; freshwater, brackish, and marine
Similar Species: American Eel (*Anguilla rostrata*)

Distinguishing Features:

Black-striped Pipefish (Non-native)
(*Syngnathus abaster*)

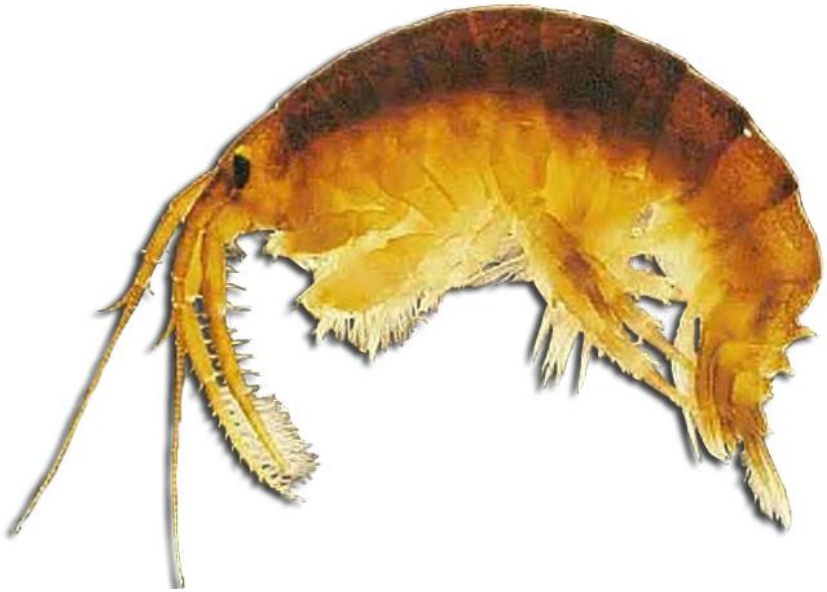


American Eel (Native)
(*Anguilla rostrata*)



Images are not to scale

Gammarid Amphipod
(*Dikerogammarus villosus*)



Coloring:
- Semi-transparent
- May appear striped or uniform in coloration pattern

Size: Length: up to 30mm

Distinguishing Features:
- Body is laterally compressed and curled
- Thorax consists of seven segments
- Abdomen consists of six segments

Habitat: Freshwater and brackish

Gammarid Amphipod
(*Pontogammarus robustoides*)

Coloring: NA

Size: Length: 12mm average, range: 4.5-21mm

Distinguishing Features:
- Both pairs of antennae (A1, A2) are short, obese, more or less the same length
- First segment of the A1 peduncle is broadened
- Armature of urosomal segment I variable from a fan of delicate setae in medial part to row of 5-7 spines
- On urosome segment II always more than 2 spines in mid-dorsal group
- Abdomen consists of six segments

Habitat: Phytophilous; often found on stony or sand-muddy bottom

Mysid Shrimp
(*Limnomysis benedeni*)

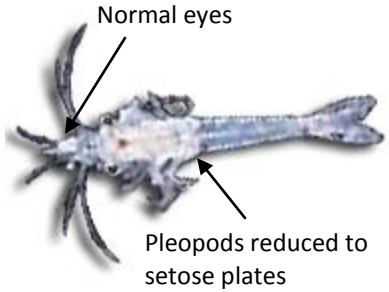
Coloring: NA
Size: Length: 6-13mm
Distinguishing Features:
- Eyes normal, cylindrical eyestalks are 1.4-2.3 times the length of the cornea
- Antennal scale setose all around
- Anterior margin of the carapace extends into a pair of lateral spine-like processes
- Pleopods reduced to small setose plates in both sexes, except third and fourth in males
- Telson short, with spines all along lateral margins
- Short, rounded apical incision armed with a number of laminar processes

Habitat: Demersal; brackish and marine; occurs in onshore shallow zone with aquatic vegetation and high temperature
Similar Species: Opossum Shrimp (*Mysis relicta*), Bloody Red Shrimp (*Hemimysis anomala*)

Distinguishing Features:

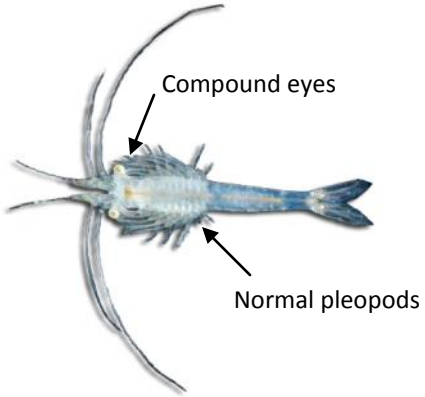
Mysid Shrimp (Non-native)
(*Limnomysis benedeni*)

- Anterior margin of the carapace extends into a pair of lateral spine-like processes
- Pleopods reduced to small setose plates in both sexes, except for the third and fourth in males

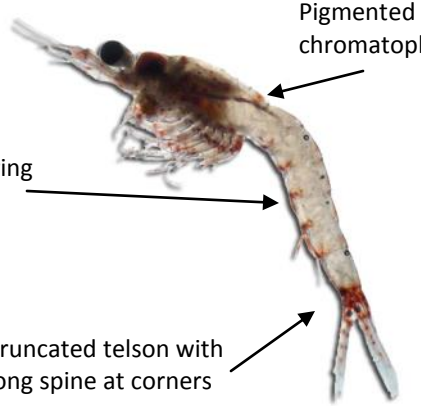


Opossum Shrimp (Native)
(*Mysis relicta*)

- Mature females have plates on the last two thoracic segments
- Abdomen includes six segments
- Each abdominal segment bears a pair of pleopods
- Mature males have extremely long fourth pleopods



Bloody Red Shrimp (Non-native)
(*Hemimysis anomala*)



Images are not to scale

Golden Mussel

(*Limnoperna fortunei*)

Coloring: Shell appears golden or yellowish
Size: Length: 200mm, up to 600mm in Asia
Distinguishing Features:

- Umbones very nearly terminal
- Dorsal ligament margin is nearly straight
- Does not possess hinge teeth or byssal notch
- Mantle fusion occurs dorsally
- Presences of a nacreous layer within the shell

Habitat: Freshwater lakes and rivers
Similar Species: Quagga Mussel (*Dreissena bugensis*), False Dark Mussel (*Mytilopsis leucophaeata*), Zebra Mussel (*Dreissena polymorpha*)

Distinguishing Features:

Golden Mussel (Non-native)
(*Limnoperna fortunei*)

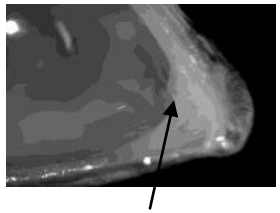
Average length: up to 20cm

Quagga Mussel (Non-native)
(*Dreissena bugensis*)

Average length: up to 6cm

False Dark Mussel (Non-native)
(*Mytilopsis leucophaeata*)

Average length: 1cm



Projection on the inside of the shell near umbo

Zebra Mussel (Non-native)
(*Dreissena polymorpha*)

Average length: up to 5cm

Images are not to scale

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Roach (*Rutilus rutilus*): http://home.hccnet.nl/pm.jansen/images/imagesmap1/voorn.gif
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Tench (*Tinca tinca*): http://2.bp.blogspot.com/_POLhgcb0HxI/TThcjDAhO7I/AAAAAAAAAfw/nU7oUBgQwlY/s1600/Tinca+Tinca+-+Tenca+-+Pez.jpg
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