

## Arctic Staghorn Sculpin to Ribbed Sculpin

### Arctic Staghorn Sculpin (*Gymnoanthus tricuspis*)

(Reinhardt, 1830)

#### Family Cottidae

**Colloquial Name:** *No colloquial name within U.S. Chukchi and Beaufort Seas.*

**Ecological Role:** Largely unknown. Current information about the precise occurrence in the U.S. Chukchi and Beaufort Seas is limited, although it appears to be one of the more common benthic fish species in the Arctic Ocean [1, 2]. Information regarding most of the biology and ecology of this species within the U.S. Chukchi and Beaufort Seas is not available. However, as one of the most common species in the Chukchi Sea, the Arctic Staghorn Sculpin is likely to represent a significant prey resource to higher level organisms.

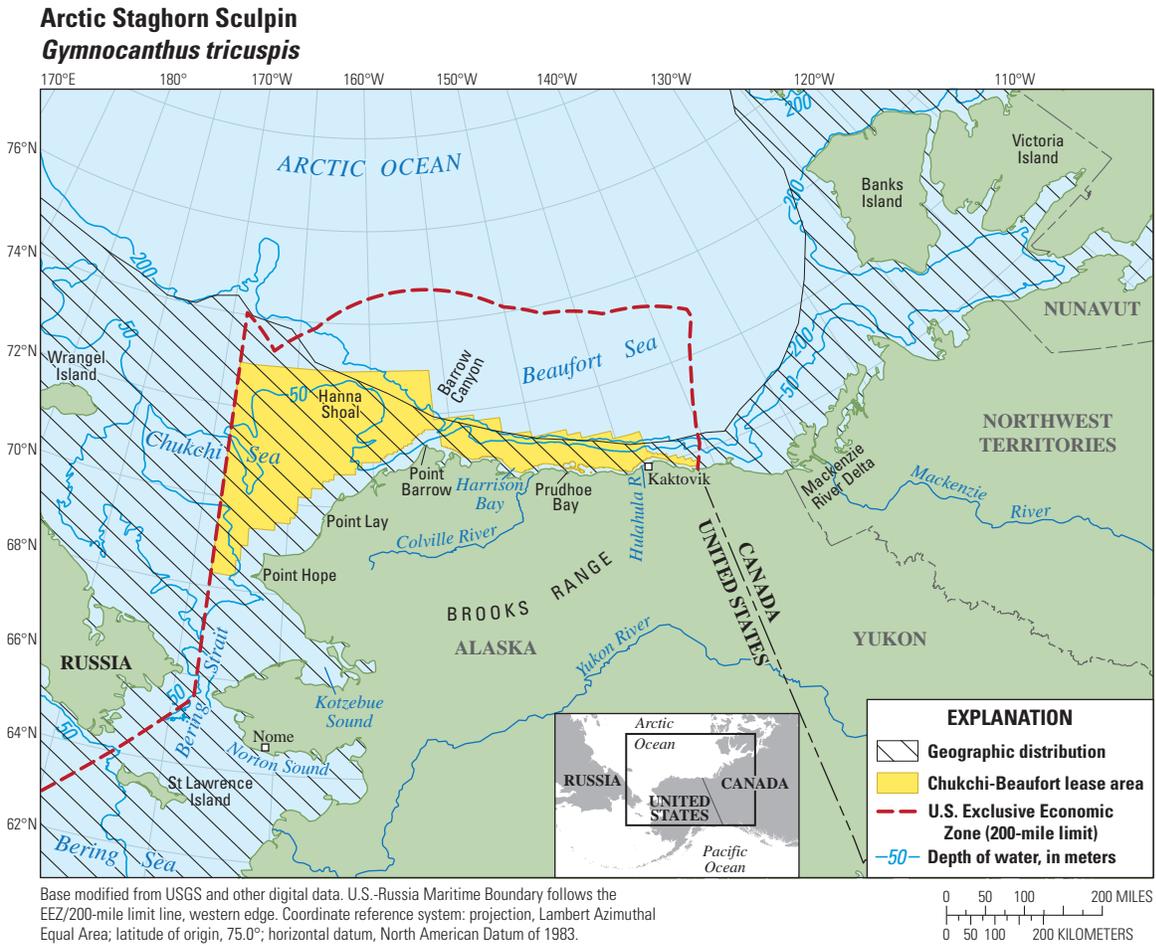
**Physical Description/Attributes:** Dark brown backs with dark blotches extending below lateral line and yellowish lower sides. Dark bars on dorsal and pectoral fins. First dorsal fin of males is blackish with scattered white spots. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 464) [3]. Swim bladder: Absent [3]. Antifreeze glycoproteins in blood serum: Unknown.

**Range:** *Throughout U.S. Chukchi and Beaufort Seas.* Elsewhere in Alaska, in eastern Bering Sea southwards to Saint Matthew Island (61°03'N, 173°40'W) [2]. Worldwide, circumpolar in distribution [3], in the Atlantic Ocean southward to Gulf of Maine (Eastport, Maine) and northern Norway [1].



Arctic Staghorn Sculpin (*Gymnoanthus tricuspis*) female, 146 mm TL, Chukchi Sea, 2007. Photograph by B. Sheiko, Russian Academy of Sciences and C.W. Mecklenburg, Point Stephens Research.

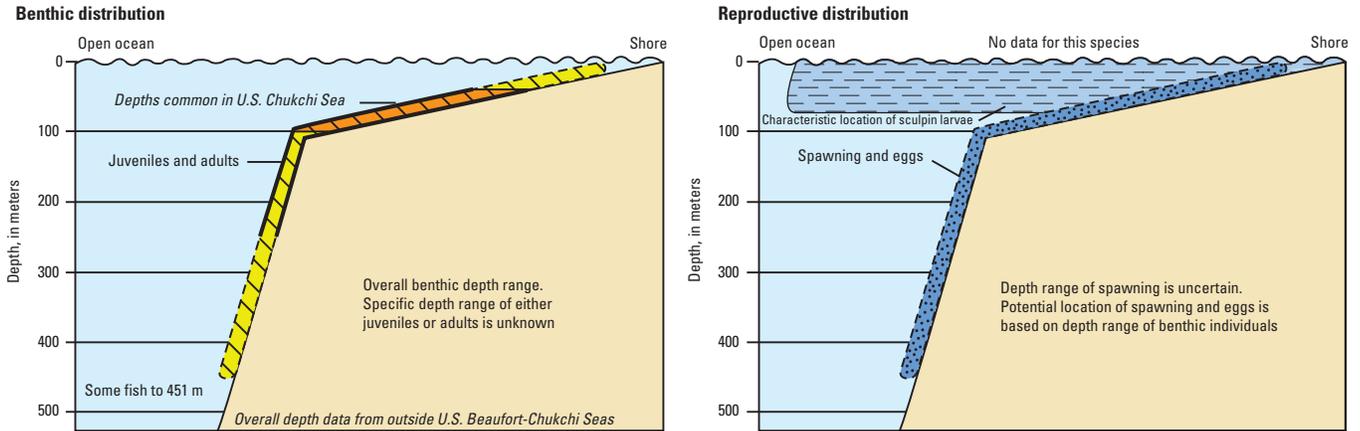
**Relative Abundance:** Common throughout U.S. Chukchi Sea at least as far north as 72°19'N, 175°57'W [2, 6, 7], and in the U.S. Beaufort Sea to at least Herschel Island, Yukon Territory [8, 9]. In the northern Bering Sea, common to just south of Bering Strait [10].



Geographic distribution of Arctic Staghorn Sculpin (*Gymnocanthus tricuspis*) within Arctic Outer Continental Shelf Planning Areas [4] based on review of published literature and specimens from historical and recent collections [1, 5].

**Depth Range:** In northern U.S. Chukchi Sea common from 40–100 m. One juvenile taken in midwaters at 37 m to surface and one at 81 m to surface. A few juveniles and larvae documented from midwaters with maximum tow depths varying from 51 to 29 m [11]. Elsewhere, 2–451 m, but uncommon less than 10–20 m [12–15].

*Gymnoanthus tricuspis*  
Arctic Staghorn Sculpin



Benthic and reproductive distribution of Arctic Staghorn Sculpin (*Gymnoanthus tricuspis*).



**Habitats and Life History**

**Eggs**—Size: 1–2 mm [16, 17]. Time to hatching: Unknown. Habitat: Benthic [3, 17].

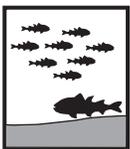
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: 18–30 mm [16, 17]. Days to juvenile transformation: Unknown. Habitat: Pelagic [17].

**Juveniles**—Age: Unknown. Size: 1.8–9.0 cm SL [16]. Habitat: Benthic.

**Adults**—Age and size at first maturity: Males mature at 6.0–7.0 cm SL (2–3 years) and females at about 9.0 cm SL (3–4 years). Females grow faster than males, reach a larger size, and are heavier at length [16]. Maximum age: In northeastern Chukchi Sea, females live to at least 9 years and males to 8 years [18]. Maximum size: 29.9 cm TL [3]. Habitat: Benthic [17]; soft or low relief sea floors, sometimes in association with algal beds [1, 16, 19].

**Substrate**—Documented on mud to gravel and rock in U.S. Chukchi Sea [2]. Elsewhere, sand, sand–mud, and gravel [1, 16, 20].

**Physical/chemical**—Temperature: -1.9–12.5 °C. Tolerant of a fairly broad range of temperatures but mainly about 0 °C or less [16, 21]. Salinity: Marine and brackish water as low as 8.1 ppt [16, 21].



**Behavior**

**Diel**—Partly buries itself in bottom substrates [17].

**Seasonal**—Unknown.

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—Unknown.



**Populations or Stocks**

There have been no studies.

**Reproduction**

**Mode**—Separate sexes; oviparous [22]. Internal fertilization likely [16].

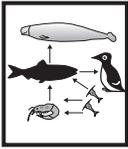
**Spawning season**—Autumn and early winter in Atlantic Ocean and White and Kara Seas [13, 16, 23].

**Fecundity**—*In U.S. Chukchi Sea*, 3,030–5,414 eggs [18]; Elsewhere, 2,060–3,512 eggs in an unidentified Arctic location [16].

**Food and Feeding**

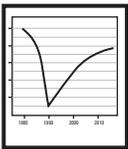
**Food items**—*In U.S. Chukchi Sea*, prey varies with site, but crustaceans (for example, amphipods, cumaceans, and hermit crabs), polychaetes, clam siphons, echiurioids, gastropods, bivalves, and larvaceans are all important [24]. In general, benthic and water column invertebrates [24, 25].

**Trophic level**—3.46 standard error 0.49 [26].

**Biological Interactions**

**Predators**—*In U.S. Chukchi Sea off Point Barrow, Alaska*, predators include Polar Cod, Bering Flounder, and Estuarine Eelpout [18]. In Canadian Arctic, Black Guillemots, Thick-billed Murres, and bearded seals [27, 28].

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.

**Resilience**

Medium, minimum population doubling time: 1.4–4.4 years ( $t_m=2-4$ ;  $t_{max}=9$ ; Fecundity=3,030) [26].

**Traditional and Cultural Importance**

None reported.

**Commercial Fisheries**

Currently, Arctic Staghorn Sculpin are not commercially harvested.

**Potential Effects of Climate Change**

As a predominantly Arctic species with a low temperature preference [16] a northward shift this species distribution is possible.

**Areas for Future Research [A]**

Life history information is limited; however, distribution and abundance data suggest its potential as an indicator of changing conditions. Research needs include: (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators. Arctic Staghorn Sculpin should be considered in vulnerability assessments of Arctic marine fish to climate change.

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**Butterfly Sculpin (*Hemilepidotus papilio*)**

(Bean, 1880)

**Family Cottidae**

**Note:** Except for physical description, relative abundance, and geographic range data, all information is from areas outside of the study area.

**Colloquial Name:** None within U.S. Chukchi and Beaufort Seas.

**Ecological Role:** Largely unknown. Current information about the occurrence of this fish is limited to the Chukchi Sea. The Butterfly Sculpin is unlikely to represent a significant prey resource to higher level organisms but may be an important consumer of benthic invertebrates.

**Physical Description/Attributes:** Reddish brown, yellow, and white, with metallic gold sheen and four more or less distinct blackish bars on upper sides and back extending onto dorsal fin [1]. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 431) [2]. Swim bladder: Absent [2]. Antifreeze glycoproteins in blood serum: Unknown.

**Range:** U.S. Chukchi Sea as far north as 69°55'N, 168°00'W [3]. Elsewhere in Alaska, eastern Bering Sea and along Aleutian Islands west to Buldir Island. Worldwide, from western Bering Sea to Sea of Okhotsk and Sea of Japan off Hokkaido, Japan [3].

**Relative Abundance:** Fairly common but not abundant in U.S. Chukchi Sea [6, 7]. Common in the Bering Sea [8], most common south of St. Matthew Island [6] and from Kamchatka Peninsula [9] to Sea of Okhotsk off eastern Sakhalin Island, Russia [10].



Butterfly Sculpin (*Hemilepidotus papilio*) 167 mm, Chukchi Sea, 2004. Photograph by C.W. Mecklenburg, Point Stephens Research.

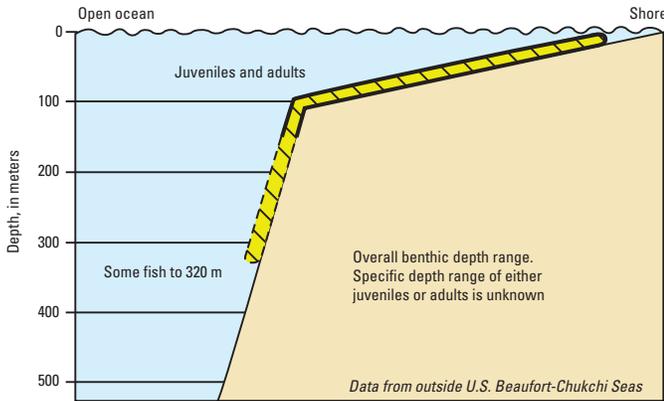


Geographic distribution of Butterfly Sculpin (*Hemilepidotus papilio*) within Arctic Outer Continental Shelf Planning Areas [4] based on review of published literature and specimens from historical and recent collections [5, 6].

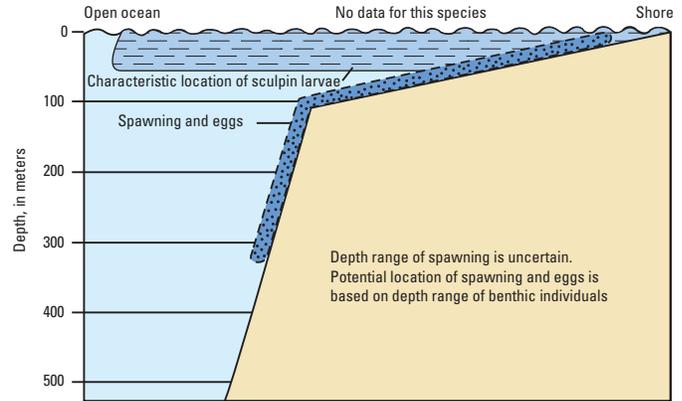
**Depth Range:** From intertidal zone to 320 m [2], and typically less than 150 m [11]. Larvae are found over continental shelf, slope, and in oceanic waters [12].

*Hemilepidotus papilio*  
Butterfly Sculpin

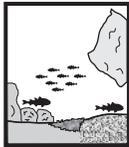
**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Butterfly Sculpin (*Hemilepidotus papilio*).



**Habitats and Life History**

**Eggs**—Size: Unknown. Time to hatching: Unknown. Habitat: Benthic [2].

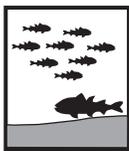
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Likely pelagic. Larvae of the related *Hemilepidotus hemilepidotus* are found over continental shelf, slope, and in oceanic waters [12].

**Juveniles**—Age and size: Unknown. Habitat: Benthic, primarily on low relief sea floors [13]. Frequently in tide pools [2].

**Adults**—Age and size at first maturity: Unknown. Maximum age: Unknown. Maximum size: About 42 cm TL [21]. Habitat: Benthic, primarily on low relief sea floors [13]. Frequently in tide pools [2].

**Substrate**—Mainly on stony-gravel bottoms [13].

**Physical/chemical**—Temperature: -1.8–11.8 °C [3, 5, 13, 14]; prefers 2.0 °C or less [9]. Salinity: Marine [13].



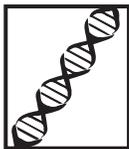
**Behavior**

**Diel**—Unknown.

**Seasonal**—Unknown.

**Reproductive**—Unknown.

**Schooling**—Unknown.



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Separate sexes; oviparous [15].

**Spawning season**—July in Bering Sea [16].

**Fecundity**—Unknown.

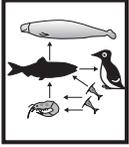


### Food and Feeding

**Food items**—In eastern Bering Sea, primarily benthic and epibenthic prey such as Tanner crabs, gammarid amphipods, young Walleye Pollock, and ostracods [17].

**Feeding**—Unknown.

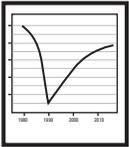
**Trophic level**—4.0 [18].



### Biological Interactions

**Predators**—Unknown.

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, other sculpins, poachers, and eelpouts.



### Resilience

Low, minimum population doubling time: 4.5–14 years (Preliminary *K* or Fecundity) [19].



### Traditional and Cultural Importance

None reported. Occasionally used as food by Alaska Natives on the Pribilof Islands. [20].



### Commercial Fisheries

Currently, Butterfly Sculpin are not commercially harvested.



### Potential Effects of Climate Change

As a predominantly Boreal species, Butterfly Sculpin would be expected to increase in abundance in the U.S. Chukchi Sea and to expand its range into the Beaufort Sea.



### Areas for Future Research [B]

Little is known about the ecology and life history of this species in the U.S. Arctic marine environment. Research needs include: (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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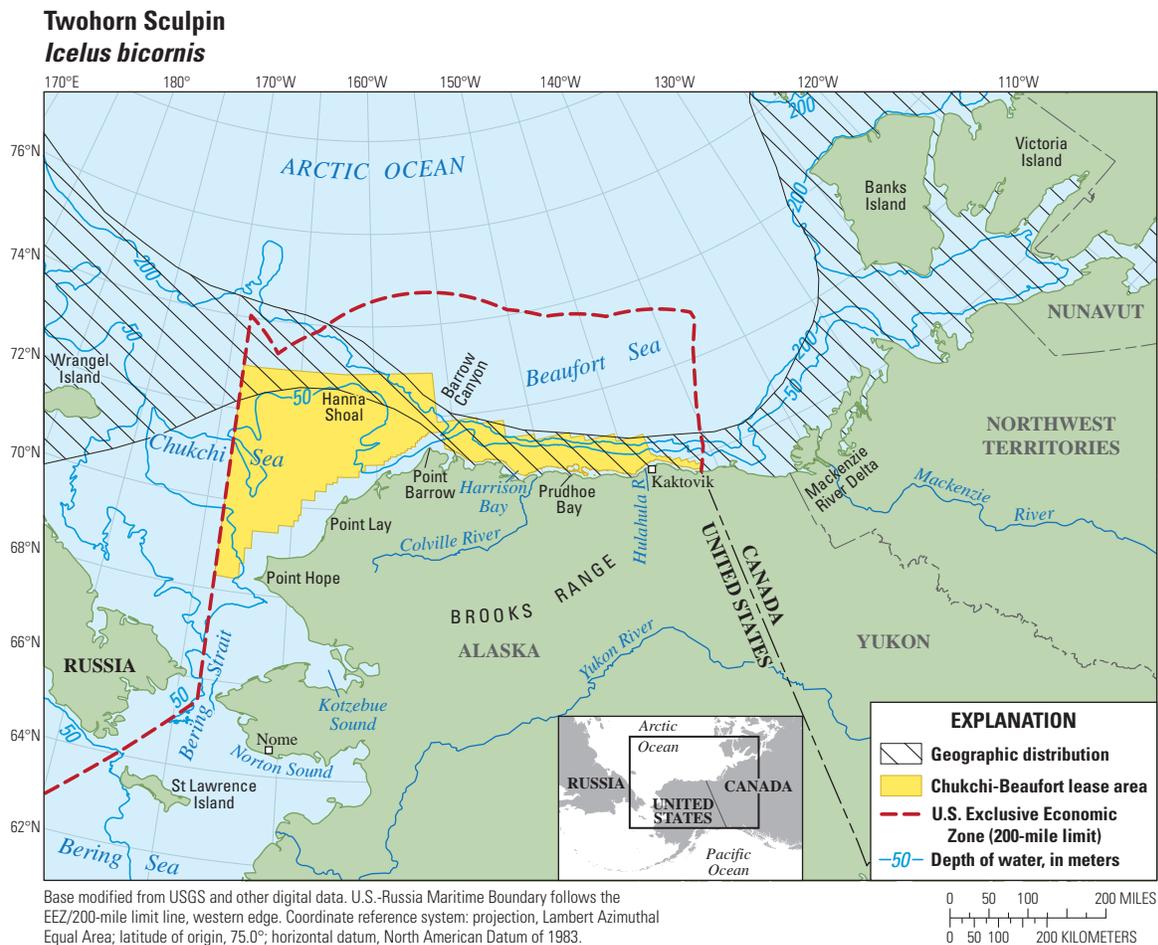
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**Twohorn Sculpin (*Icelus bicornis*)**

(Reinhardt, 1840)

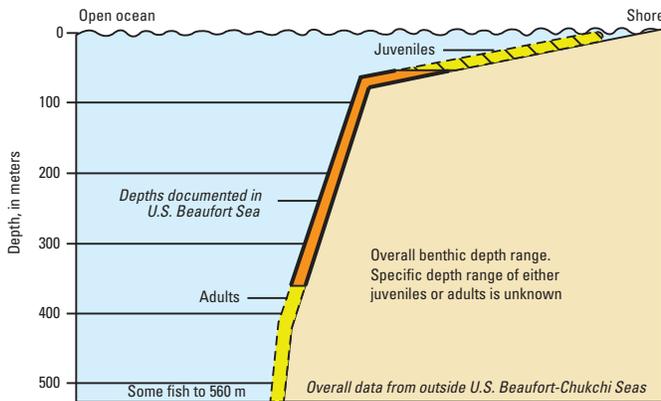
**Family Cottidae****Colloquial Name:** *None within U.S. Chukchi and Beaufort Seas.***Ecological Role:** Twohorn Sculpin are uncommon in the U.S. Chukchi and Beaufort Seas. Their ecological role in benthic ecosystems, though not fully known, is thought to be minor with respect to predation and energy flows.**Physical Description/Attributes:** Yellowish brown with brown spots. Nasal tubes and cirri are pale. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 456) [1]. Swim bladder: Absent [1]. Antifreeze glycoproteins in blood serum: Unknown.**Ranges:** *U.S. Beaufort Sea; presence in U.S. Chukchi Sea assumed from confirmed presence in adjacent waters of the East Siberian Sea, the slope north of the U.S. Chukchi Sea, and reported presence in western Chukchi Sea* [2]. Worldwide: Predominantly Arctic; circumpolar [2].**Relative Abundance:** *Uncommon on outer continental shelf of U.S. Beaufort Sea* [2].Twohorn Sculpin (*Icelus bicornis*) 88 mm, Beaufort Sea, 2011. Photograph by C.W. Mecklenburg, Point Stephens Research.

Geographic distribution of Twohorn Sculpin (*Icelus bicornis*) within Arctic Outer Continental Shelf Planning Areas [3] based on review of published literature and specimens from historical and recent collections [1, 2, 4].

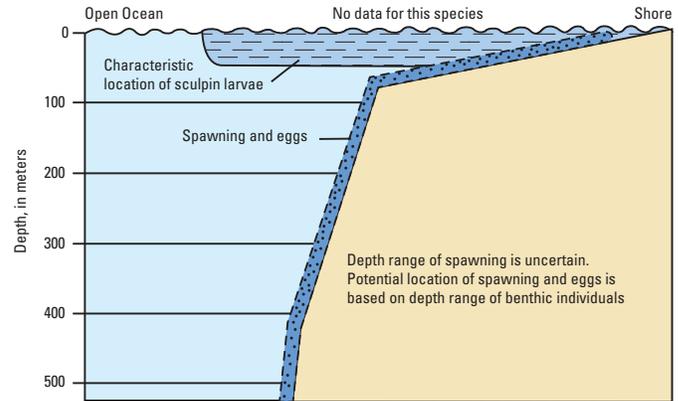
**Depth Range:** Documented in U.S. Beaufort Sea at depths of 41–360 m [4]. At depths of 14–560 m, but mostly at 50–180 m on outer shelf [2, 4, 5]. Larvae of *Icelus* sp. are abundant in surface waters [6]. Juvenile fish live in shallow waters [5].

*Icelus bicornis*  
Twohorn Sculpin

#### Benthic distribution



#### Reproductive distribution



Benthic and reproductive distribution of Twohorn Sculpin (*Icelus bicornis*).



#### Habitats and Life History

**Eggs**—Size: Almost ripe eggs are 3.1 mm [5]. Time to hatching: Unknown. Habitat: Likely benthic based on life history patterns of many other members of this family [1].

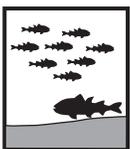
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Likely pelagic based on life history patterns of many other members of this family [1].

**Juveniles**—Age and size: Unknown. Habitat: Benthic, frequently in algal beds [5].

**Adults**—Age and size at first maturity: In U.S. Beaufort Sea, females grew larger than males and matured at about 4 years and 6 cm TL [7]. Maximum age: At least 5 years, based on a small sample from the Beaufort Sea [7]. Maximum size: 17 cm TL [4]. 8.8 cm TL in the U.S. Beaufort Sea [4]. Habitat: Benthic [1].

**Substrate**—Mud, shell hash, or cobble sea floors [5].

**Physical/chemical**—Temperature: -1.8–8.8 °C, preferably around 0 °C [5]. Salinity: Marine and brackish-water at salinities as low as 25.4 ppt [5].



#### Behavior

**Diel**—Unknown.

**Seasonal**—Unknown.

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—Unknown.



#### Populations or Stocks

There have been no studies.



#### Reproduction

**Mode**—Separate sexes; oviparous [9].

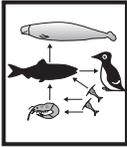
**Spawning season**—August–October [5].

**Fecundity**—79–1,300 eggs [7, 8].



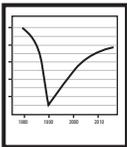
**Food and Feeding**

**Food items**—Food habits of larvae unknown. Major prey includes gammarid amphipods: polychaetes, euphausiids, hyperiid amphipods, isopods, shrimps, cumaceans, and sipunculids also are consumed [5, 7].  
**Trophic level**—3.13 standard error 0.35 [10].



**Biological Interactions**

**Predators**—Unknown.  
**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.



**Resilience**

Medium, minimum population doubling time: 1.4–4.4 years (Preliminary *K* or Fecundity) [10].



**Traditional and Cultural Importance**

None reported.



**Commercial Fisheries**

Currently, Twohorn Sculpin are not commercially harvested.



**Potential Effects of Climate Change**

The Twohorn Sculpin is a predominantly Arctic species. The potential effects of climate change could be expected to shift the species distribution farther northwards.



**Areas for Future Research [B]**

Little is known about the ecology and life history of this species from this region. Research needs include (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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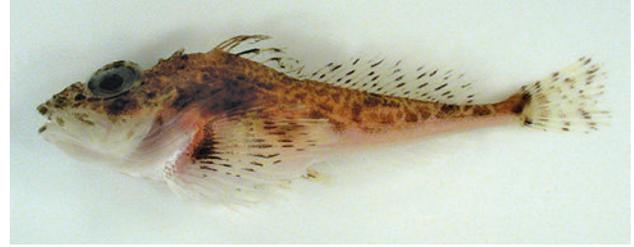
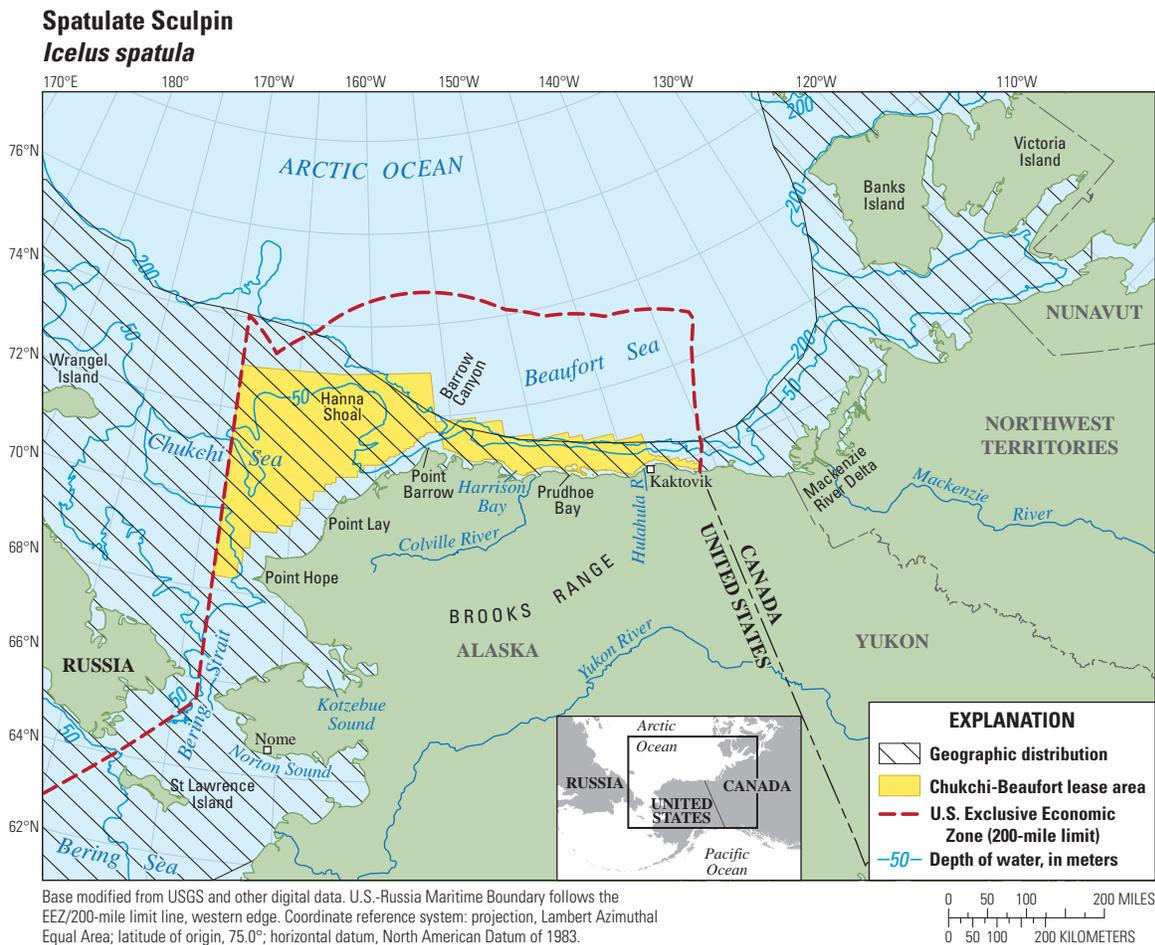
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**Spatulate Sculpin (*Icelus spatula*)**

Gilbert &amp; Burke, 1912

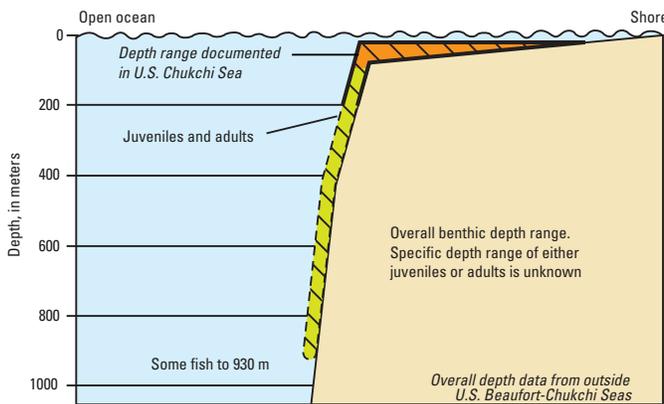
## Family Cottidae

**Colloquial Name:** *None within U.S. Chukchi and Beaufort Seas.***Ecological Role:** Largely unknown. Specific information regarding biology and ecology is sparse. This species is not a dominant species in the U.S. Chukchi and Beaufort Seas and is unlikely to be ecologically significant in regional food webs.**Physical Description/Attributes:** Light brown backs with four or five indistinct dark saddles and white underside. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, p. 455) [1]. Swim bladder: Absent [1]. Antifreeze glycoproteins in blood serum: Unknown.**Ranges:** *U.S. Chukchi and Beaufort Seas* [1–4]. Elsewhere in Alaska, in Bering Sea and Aleutian Islands west to Atka Island, and eastern Gulf of Alaska at Glacier Bay [1]. Worldwide, in Sea of Okhotsk, around Kuril Islands, Russia, and in western North Pacific off Kamchatka Peninsula to Arctic seas off Russia, and Canada to western Greenland and Labrador [1]. In Arctic Ocean, documented to 77°26'N [3] north of Siberia and to about 81°N in the Canadian High Arctic archipelago [5].**Relative Abundance:** *Common in U.S. Chukchi and Beaufort Seas* [1–4, 7]. Elsewhere, common in Sea of Okhotsk, along Kuril Islands and Kamchatka Peninsula, Russia, and in Bering Sea [1, 3, 8, 9].Spatulate Sculpin (*Icelus spatula*) 79 mm, western Chukchi Sea, 2004. Photograph by C.W. Mecklenburg, Point Stephens Research.Geographic distribution of Spatulate Sculpin (*Icelus spatula*) within Arctic Outer Continental Shelf Planning Areas [6] based on review of published literature and specimens from historical and recent collections [1, 7].

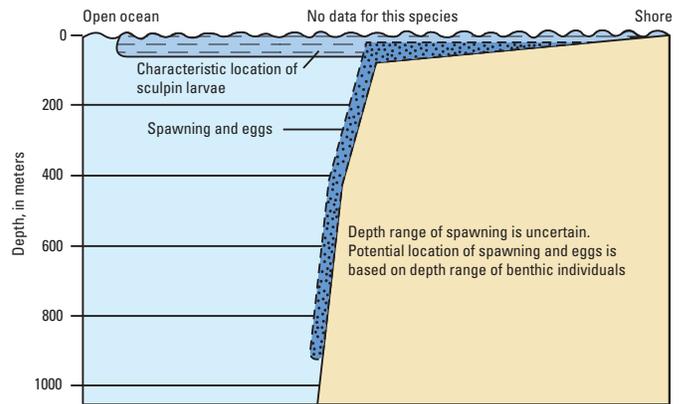
**Depth Range:** In U.S. Chukchi Sea, documented in 100 m or less [3]. Elsewhere, 12–930 m [10], mainly shallower than 200 m [11]. Larvae of *Icelus* sp. are abundant in surface waters in Gulf of Alaska [12]. In U.S. Chukchi Sea, one *Icelus* sp. juvenile was found in midwaters between 37 m and the surface [4].

*Icelus spatula*  
Spatulate Sculpin

**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Spatulate Sculpin (*Icelus spatula*).



**Habitats and Life History**

**Eggs**—Size: 1.4 mm. Pale yellow in color [11]. Time to hatching: Unknown. Habitat: Benthic [11].

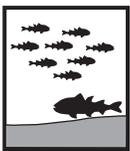
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Pelagic [12].

**Juveniles**—Age and size: Unknown. Habitat: Benthic [11].

**Adults**—Age and size at first maturity: Unknown. Maximum age: 10 years [11]. Maximum size: About 21 cm TL. Females grow larger than males [11]. Habitat: Benthic [11].

**Substrate**—Complex substrates (for example, rocks and sponges) and soft sea floor [3, 11, 13].

**Physical/chemical**—Temperature:  $-1.8$ – $10.5$  °C [3, 7]. Salinity: Primarily marine, documented as low as 24.7 ppt [13].



**Behavior**

**Diel**—Unknown.

**Seasonal**—In autumn, fish along the northern Kuril Islands migrate from the mid-continental shelf to the shelf-slope break [11].

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—Have been observed feeding in water column to 1 m above the bottom [14].



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Separate sexes; oviparous [15].

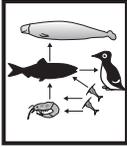
**Spawning season**—August–December [11, 16].

**Fecundity**—110–9,100 eggs, in a single batch [11, 16].



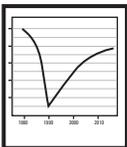
**Food and Feeding**

**Food items**—In U.S. Chukchi and Beaufort Seas, epibenthic and benthic prey, such as mysids, gammarid amphipods, shrimps, and polychaetes [16]. In Russia, similar prey, as well as fishes and mollusks [11, 13].  
**Trophic level**—3.92 standard error 0.67 [17].



**Biological Interactions**

**Predators**—Bearded seals and Thick-billed Murres in Canadian Arctic [18, 19], river otters in southeastern Alaska [20], and Great Sculpin off Kamchatka Peninsula [21].  
**Competitors**—Presumably a wide range of other zoobenthos feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, flatfish, and other sculpins.



**Resilience**

Medium, minimum population doubling time: 1.4–4.4 years (Preliminary *K* or Fecundity) [17].



**Traditional and Cultural Importance**

None reported.



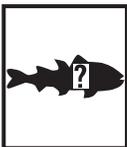
**Commercial Fisheries**

Currently, Spatulate Sculpin are not commercially harvested.



**Potential Effects of Climate Change**

The Spatulate Sculpin is an Arctic Boreal species [10]. Although climate warming may not greatly affect the species current distribution, abundance patterns are likely to change and probably increase.



**Areas for Future Research [B]**

Little is known about the ecology and life history of this species from this region. Research needs include: (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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**Belligerent Sculpin (*Megalocottus platycephalus*)**  
(Pallas, 1814)

Family Cottidae

**Colloquial Name:** None within U.S. Chukchi and Beaufort Seas.

**Ecological Role:** Unknown but likely minimal, especially in the U.S. Beaufort Sea.

**Physical Description/Attributes:** Olive-brown or gray-brown with white or yellow markings. Lower sides have a series of light spots, the belly is white, the underside of head dark, and all fins are spotted and barred. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 475) [1]. Swim bladder: Absent [1]. Antifreeze glycoproteins in blood serum: Unknown.

**Ranges:** U.S. Chukchi Sea to western U.S. Beaufort Sea off Point Barrow, Alaska, at about 71°22'N, 156°19'W [2]. Elsewhere in Alaska, in eastern Bering Sea south to Herendeen Bay [1]. Worldwide, from Sea of Japan at Peter the Great Bay to Sea of Okhotsk and western Bering Sea [1, 3–5].

**Relative Abundance:** Common in eastern U.S. Chukchi Sea [7] and rare in U.S. Beaufort Sea [1, 2]. Common in Sea of Japan, Sea of Okhotsk, and parts of Bering Sea [3–5].



Belligerent Sculpin (*Megalocottus platycephalus*). Photograph by Doyne W. Kessler, National Marine Fisheries Service.

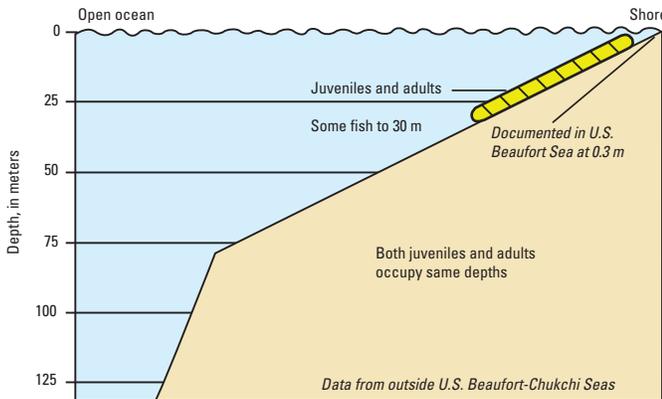


Geographic distribution of Belligerent Sculpin (*Megalocottus platycephalus*) within Arctic Outer Continental Shelf Planning Areas [6] based on review of published literature and specimens from historical and recent collections [1, 2, 7].

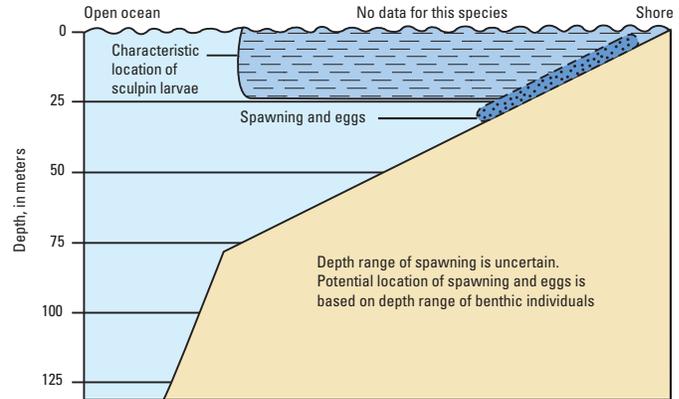
**Depth Range:** Documented in U.S. Beaufort Sea at 0.3 m [2]. Juveniles and adults are found from shallow subtidal to 40 m [1, 7, 9].

*Megalocottus platycephalus*  
Belligerent Sculpin

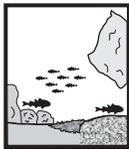
**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Belligerent Sculpin (*Megalocottus platycephalus*).



**Habitats and Life History**

**Eggs**—Size: Unknown. Time to hatching: Unknown. Habitat: Benthic [9].

**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Pelagic [9].

**Juveniles**—Age and size: Unknown. Habitat: Benthic, shallow nearshore waters [9].

**Adults**—Age and size at first maturity: Unknown. Maximum age: Unknown. Maximum size: 42 cm TL [5]. Habitat: Benthic, shallow coastal waters, estuaries, and occasionally lower parts of rivers [3, 9].

**Substrate**—Unknown.

**Physical/chemical**—Temperature: 2.6–12.6 °C [7]. Salinity: Brackish to marine waters [9].



**Behavior**

**Diel**—Unknown. **Seasonal**—Along western Kamchatka Peninsula (Russia) coast, lives in coastal waters in winter and spring and ascends well up estuaries and short distances up rivers in summer and fall [5].

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—Unknown.



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Separate sexes; oviparous [10].

**Spawning season**—Unknown.

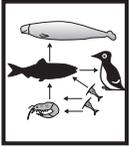
**Fecundity**—Unknown.



**Food and Feeding**

**Food items**—Off western Kamchatka Peninsula, smaller fish feed on algae, and crustaceans such as copepods, cumaceans, amphipods, and mysids. Larger fish feed on similar prey as well as small fishes [11].

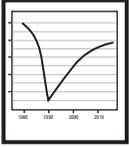
**Trophic level**—4.08 standard error 0.70 [12].



**Biological Interactions**

**Predators**—Unknown.

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, other sculpins, and eelpouts.



**Resilience**

Low, minimum population doubling time: 4.5–14 years (assuming fecundity = 10–100) [12].



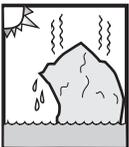
**Traditional and Cultural Importance**

*Historically, an important subsistence species* in northeastern Bering Sea and U.S. Chukchi Sea [13, 14].



**Commercial Fisheries**

Currently, Belligerent Sculpin are not commercially harvested.



**Potential Effects of Climate Change**

A predominantly Boreal Pacific species [2] that appears to be common in parts of the Bering Sea and uncommon in the U.S. Chukchi Sea. Belligerent Sculpin would be expected to increase in abundance in the U.S. Chukchi Sea and potentially the Beaufort Sea as waters warm.



**Areas for Future Research [B]**

Little is known about the biology and ecology of this species from the region. Research needs include: (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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Mecklenburg, C.W., Møller, P.R., and Steinke, D., 2011, Biodiversity of Arctic marine fishes—Taxonomy and zoogeography: Marine Biodiversity, v. 41, no. 1, p. 109–140, Online Resource 1. [2]

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**Brightbelly Sculpin (*Microcottus sellaris*)**  
(Gilbert, 1896)

Family Cottidae

**Colloquial Name:** None within U.S. Chukchi and Beaufort Seas.

**Ecological Role:** Unknown in benthic ecosystems over the continental shelf.

**Physical Description/Attributes:** Purplish body spotted and mottled with either black and white or with red or black. Body has two or more white bars and bright yellow belly. Pelvic fins have black or red spots along rays. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 483) [1]. Swim bladder: Absent [1]. Antifreeze glycoproteins in blood serum: Unknown.

**Ranges:** Southern U.S. Chukchi Sea [2–4]. Elsewhere in Alaska, to southern Bering Sea and Commander–Aleutian Islands chain. Worldwide: From Gulf of Anadyr southward to the northern Sea of Japan, southern Okhotsk Sea, and Kuril Islands, Russia [1].

**Relative Abundance:** Rare in U.S. Chukchi Sea [2–4]; absent from the U.S. Beaufort Sea. Common as far north as Norton Sound, eastern Bering Sea and southward to Sea of Japan and Kamchatka Peninsula, Russia [6–8].



Brightbelly Sculpin (*Microcottus sellaris*). Photograph by Doyne W. Kessler, National Marine Fisheries Service.

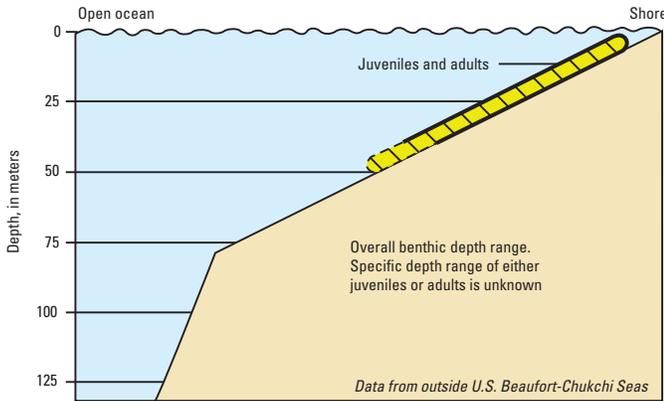


Geographic distribution of Brightbelly Sculpin (*Microcottus sellaris*) within Arctic Outer Continental Shelf Planning Areas [5] based on review of published literature and specimens from historical and recent collections [1, 3, 4].

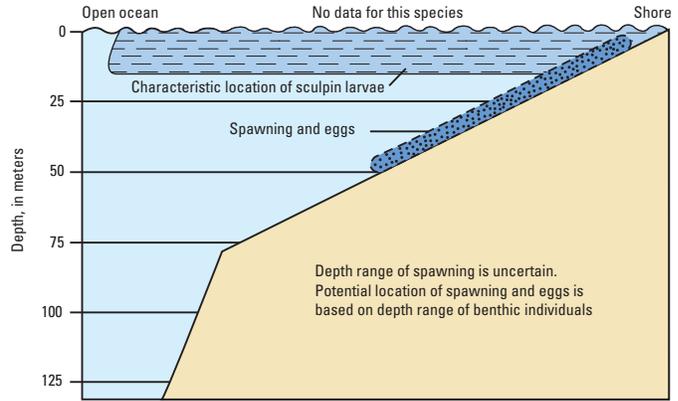
**Depth Range:** Coastal, shallow waters down to 50 m, most often from shallow subtidal to about 40 m [1, 6, 9–11]. Some juveniles are found in nearshore waters [6].

*Microcottus sellaris*  
Brightbelly Sculpin

**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Brightbelly Sculpin (*Microcottus sellaris*).



**Habitats and Life History**

**Eggs**—Size: Unknown. Time to hatching: Unknown. Habitat: Likely benthic, based on other members of this family [1, 9].

**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Likely pelagic, based on other members of this family [1].

**Juveniles**—Age and size: Unknown. Habitat: Likely benthic, based on other members of this family [1, 9]. Some juveniles are found in nearshore eelgrass beds [6].

**Adults**—Age and size at first maturity: Unknown. Maximum age: Unknown. Maximum size: 17 cm TL [15]. Habitat: Likely benthic, based on other members of this family [1, 9].

**Substrate**—Unknown.

**Physical/chemical**—Temperature: 2–10 °C in summer off western Kamchatka Peninsula, primarily 6–8 °C [7]. Salinity: Marine and estuarine fish [9].



**Behavior**

**Diel**—Unknown.

**Seasonal**—Unknown.

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—At night may move off bottom to feed [6].



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Separate sexes; oviparous [12].

**Spawning season**—Unknown.

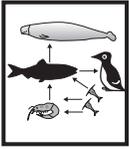
**Fecundity**—Unknown.



### Food and Feeding

**Food items**—Juveniles living in eelgrass beds in eastern Bering Sea feed on polychaetes, amphipods and other crustaceans, snails, eelgrass, and fishes [6, 13].

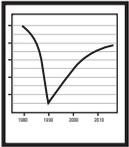
**Trophic level**—3.4 standard error 0.53 [14].



### Biological Interactions

**Predators**—Unknown.

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.



### Resilience

Medium, minimum population doubling time: 1.4–4.4 years (Preliminary *K* or Fecundity) [14].



### Traditional and Cultural Importance

None reported.



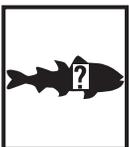
### Commercial Fisheries

Currently, Brightbelly Scuplin are not commercially harvested.



### Potential Effects of Climate Change

As a predominantly Boreal Pacific species that appears to be common in the eastern Bering Sea and relatively rare in the Chukchi Sea, Brightbelly Sculpin could be expected to increase in abundance in the U.S. Chukchi Sea and perhaps to expand their distribution into the Beaufort Sea as waters warm.



### Areas for Future Research [B]

Little is known about the biology and ecology of this species from the region. Research needs include:

- (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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**Plain Sculpin (*Myoxocephalus jaok*)**

(Cuvier, 1829)

**Family Cottidae**

**Colloquial Name:** *None within U.S. Chukchi and Beaufort Seas.*

**Ecological Role:** Plain Sculpin have been only rarely observed. There ecological significance is suspected to be of minor importance in nearshore and shelf habitats.

**Physical Description/Attributes:** Gray-brown body covered in small black spots. Lower sides have white spots. Fins are barred and spotted. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 481) [1]. Swim bladder: Absent [1]. Antifreeze glycoproteins in blood serum: Unknown.

**Ranges:** *U.S. Chukchi Sea and western Beaufort Sea eastward to at least 71°N, 153°W* [1, 2]. Elsewhere in Alaska, throughout Bering Sea to eastern Gulf of Alaska at Limestone Inlet [1] and Glacier Bay [3]. Worldwide, from Sea of Japan off North Korea to Sea of Okhotsk [1].

**Relative Abundance:** *Uncommon in U.S. Chukchi Sea and western Beaufort Sea* [2, 5]. Common throughout eastern Bering Sea as far north as Norton Sound and southwards to about Kodiak Island, Alaska, and westwards to Sakhalin Island (Russia), Sea of Okhotsk [6–10].



Plain Sculpin (*Myoxocephalus jaok*) 133 mm, northeastern Chukchi Sea, 2007. Photograph by C.W. Mecklenburg, Point Stephens Research.



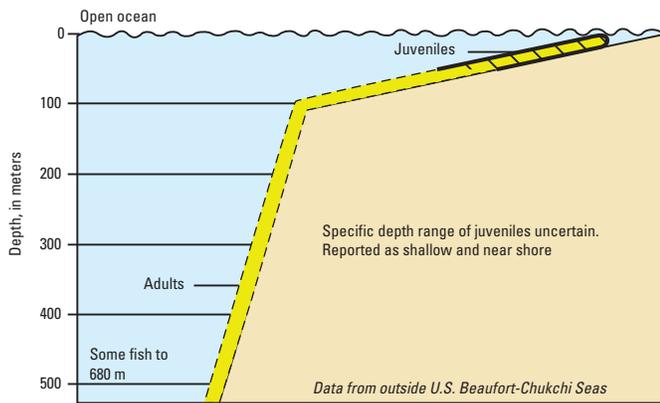
Base modified from USGS and other digital data. U.S.-Russia Maritime Boundary follows the EEZ/200-mile limit line, western edge. Coordinate reference system: projection, Lambert Azimuthal Equal Area; latitude of origin, 75.0°; horizontal datum, North American Datum of 1983.

Geographic distribution of Plain Sculpin (*Myoxocephalus jaok*), within Arctic Outer Continental Shelf Planning Areas [4] based on review of published literature and specimens from historical and recent collections [1, 2, 5].

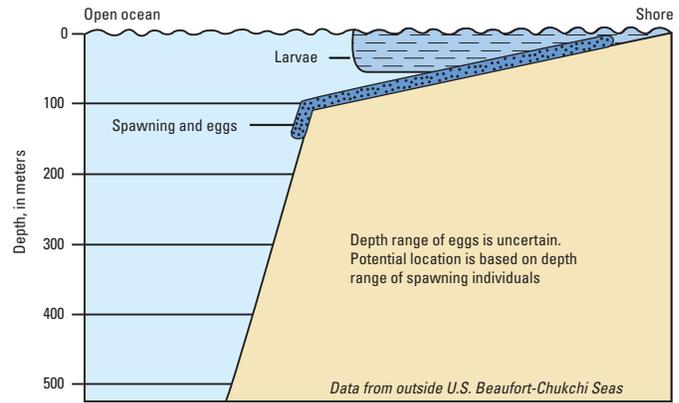
**Depth Range:** Intertidal to 680 m, mainly less than depth of 50 m off North America [6] and deeper than 5 m in western Pacific Ocean [11]. Larvae live over coastal and continental shelf waters [12]. Juveniles are in shallow nearshore waters [11, 13]. Spawning has been noted at nearshore at 6–8 m and on mid-continental shelf at 80–130 m [14].

*Myoxocephalus jaok*  
Plain Sculpin

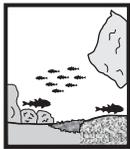
**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Plain Sculpin (*Myoxocephalus jaok*).



**Habitats and Life History**

**Eggs**—Size: 1.9–2.4 mm [14, 15]. Time to hatching: Unknown. Habitat: Benthic and adhesive [14].

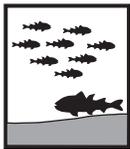
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: 1.3–2.0 cm SL [13, 16]. Days to juvenile transformation: About two months in Peter the Great Bay [15]. Habitat: Pelagic [12].

**Juveniles**—Age and size: Unknown. Habitat: Benthic [1, 6].

**Adults**—Age and size at first maturity: Few males mature at 3 years and most by 6 years. Females mature later, some as early as 5 years and most by 8 years [14, 15]. Maximum age: At least 15 years in Sea of Japan and western Pacific Ocean. Females may live longer than males [14, 15]. Maximum size: 70 cm TL [17]. Females grow faster than males [14, 15]. Habitat: Benthic [1, 6].

**Substrate**—Sand and mud bottoms [1].

**Physical/chemical**—Temperature: -1.9–13.1 °C [2]. Off Kamchatka Peninsula, most common at 2–4 °C [17]. Salinity: Marine waters [18–20].



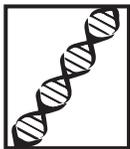
**Behavior**

**Diel**—Unknown.

**Seasonal**—Young-of-the-year settle into shallow nearshore waters as early as May [13]. Some adults occupy shallower shelf waters in summer and retreat to continental slope during winter [17, 21].

**Reproductive**—Females lay eggs in shallow waters on plants and mussel clusters. Males guard nests until the ova hatch [14]. Schooling: Unknown.

**Feeding**—Off Kamchatka Peninsula, fish feed most heavily during summer months [22].



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Separate sexes; oviparous [23].

**Spawning season**—December–March [14, 15, 24].

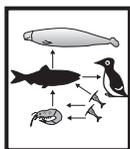
**Fecundity**—From 25,411–147,029 eggs, however it is unclear if all eggs are deposited at one time [14].



### Food and Feeding

**Food items**—A wide range of benthic and water column prey. Fishes and crabs often are most important prey, but in eastern Bering Sea, shrimps, hermit crabs, brittle stars, polychaetes, clams, squids, copepods, mysids, gammarid amphipods, and euphausiids also are consumed [22, 25, 26].

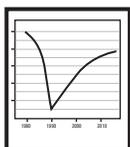
**Trophic level**—4.2 standard error 0.73 [27].



### Biological Interactions

**Predators**—Mostly unknown. Great Sculpins [22] and probably river otters [28].

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.



### Resilience

Low, minimum population doubling time: 4.5–14 years (assuming fecundity = 10–100) [27].



### Traditional and Cultural Importance

*Historically, this species was caught as a food fish in the northeastern Bering Sea and southeastern U.S. Chukchi Sea* [29]. Like other nearshore species, they were taken mainly by elderly men and women who were not able to go great distances to procure other food [30].



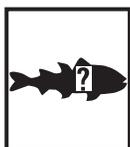
### Commercial Fisheries

Currently, Plain Sculpin are not commercially harvested.



### Potential Effects of Climate Change

A predominantly Boreal Pacific species that appears to be common in the eastern Bering Sea but uncommon in the Chukchi Sea. Plain Sculpin could be expected to increase in abundance in the Chukchi Sea and perhaps to expand their range into the Beaufort Sea.



### Areas for Future Research [B]

Little is known about the biology and ecology of this species from the region. Research needs include:

- (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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## Great Sculpin (*Myoxocephalus polyacanthocephalus*) (Pallas, 1814)

### Family Cottidae

**Note:** Except for geographic range data, all information is from areas outside of the study area.

**Colloquial Name:** None within U.S. Chukchi and Beaufort Seas.

**Ecological Role:** Minor role. Great Sculpin are rare within the U.S. Chukchi Sea and absent from the Beaufort Sea.

**Physical Description/Attributes:** Brown or gray with three darker saddles. Belly and lower sides have small white spots, and fins are barred and spotted. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 482) [1]. Swim bladder absent [1]. Antifreeze glycoproteins in blood serum: Unknown. Unlike that of Arctic and shorthorn sculpins, blood serum is clear, rather than blue or green [2].

**Ranges:** One record from northeastern Chukchi Sea near Icy Cape at 70°20'N, 163°06'W [3]. Elsewhere in Alaska, throughout Bering Sea, Aleutian Islands and entire southeastern coast. Worldwide, in western Pacific Ocean, Gulf of Andyr to sea of Okhotsk Sea and eastern Sea of Japan and in eastern Pacific Ocean to southern Puget Sound, Washington [4–7].

**Relative Abundance:** Rare in eastern U.S. Chukchi Sea [3, 9, 10]. Elsewhere in Alaska, uncommon in northern most Bering Sea [10, 11] and common along Aleutian Islands, in eastern Bering Sea, and to at least southeastern Alaska [6, 7]. Worldwide, common in Sea of Japan eastwards along eastern Kuril Island and Kamchatka Peninsula, Russia [4, 5].



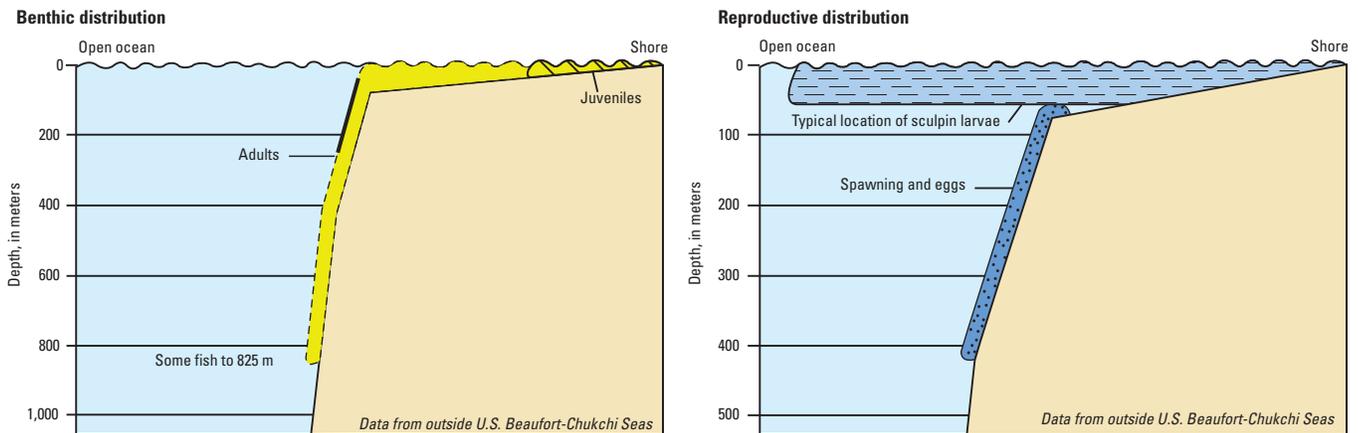
Great Sculpin (*Myoxocephalus polyacanthocephalus*)  
146 mm, Semidi Islands, western Gulf of Alaska, 2007.  
Photograph by C.W. Mecklenburg, Point Stephens Research.



Geographic distribution of Great Sculpin (*Myoxocephalus polyacanthocephalus*) within Arctic Outer Continental Shelf Planning Areas [8] based on review of published literature and specimens from historical and recent collections [1, 3, 9].

**Depth Range:** Intertidal to 825 m, primarily 20–250 m [12–17]. Adults occasionally taken in subtidal nearshore waters [18]. Larvae are found over coastal and continental shelf waters [19]. Juveniles usually 20 m or less [7, 20]. Spawning occurs on lower continental shelf and upper continental slope [4, 21]. Found spawning on slope at depths of 415 m off Sakhalin Island, Russia [21].

*Myoxocephalus polyacanthocephalus*  
Great Sculpin



Benthic and reproductive distribution of Great Sculpin (*Myoxocephalus polyacanthocephalus*).



### Habitats and Life History

**Eggs**—Size: Unknown. Time to hatching: Unknown. Habitat: Benthic and adhesive [4].

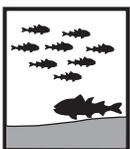
**Larvae**—Size at hatching: As small as 1.1 cm SL [22]. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Pelagic [19, 23].

**Juveniles**—Age and size: Unknown. Habitat: Benthic, neritic [20, 24], complex habitats such as rocks, cobbles, eelgrass, and other aquatic plants, and over soft sea floors [5–7, 20, 25, 26].

**Adults**—Age and size at first maturity: In Sea of Okhotsk, males first mature at 5 years (33–34 cm TL), fifty percent at 6 years (40 cm TL), and all at 8 years (50 cm TL). Females mature when older and larger, first at 7 years (49–50 cm), fifty percent at 8 years (55 cm) and all at 9 years (65 cm TL). Maximum age: 16 years, off North America [27]. Maximum size: 76 cm TL [1] and more than 9 kg [12, 28]. Habitat: Benthic, neritic to oceanic [12–14, 16, 17]. Complex habitats, such as rocks, cobbles, eelgrass, and other aquatic plants as well as soft sea floors [5–7, 20, 25, 26].

**Substrate**—Rocks, cobbles, eelgrass, other aquatic plants and soft sea floors [5–7, 20, 25, 26].

**Physical/chemical**—Temperature: -0.5–12 °C, most abundant in 8 °C or less [4, 7, 12, 29, 30]. In Sea of Okhotsk spawning occurs between 0.8 and 1.9 °C [4, 21]. Salinity: Marine, or slightly estuarine waters [4, 7, 12, 29, 30].



### Behavior

**Diel**—Unknown.

**Seasonal**—Beginning in May, young-of-the-year recruit from plankton to intertidal and shallow subtidal waters [23, 31]. In western Pacific Ocean and Sea of Japan, adults migrate into deeper waters in winter [15, 21].

**Reproductive**—Sea of Okhotsk fish spawn over cobble sea floors [4, 21].

**Schooling**—Little is known although adults have been noted forming dense aggregations in Sea of Okhotsk [4].

**Feeding behavior**—In western Pacific Ocean, feeding is heavier during summer [28, 29].



### Populations or Stocks

There have been no studies.

**Reproduction**

**Mode**—Unknown.

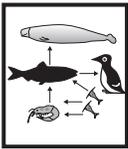
**Spawning season**—January–February in Sea of Okhotsk [4].

**Fecundity**—48,000–423,000 adhesive and yellowish-orange to red eggs [4, 21].

**Food and Feeding**

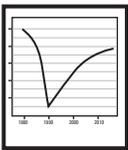
**Food items**—In eastern Bering Sea, a wide range of benthic and epibenthic prey. Fishes (for example, Capelin, Pacific Cod, Walleye Pollock, snailfishes, and flatfishes) and crabs are most important, followed by polychaetes, clams, octopi, mysids, gammarid and caprellid amphipods, isopods, euphausiids, shrimps, hermit crabs, brittle stars, and echiuroids [31–33]. Under certain circumstances, adults prey on eggs of conspecifics [28]. Smaller fish feed primarily on invertebrates and larger individuals on fishes [29, 34, 35].

**Trophic level**—4.1 standard error 0.67 [36].

**Biological Interactions**

**Predators**—In northeastern Pacific Ocean and Bering Sea, a wide range including other Great Sculpin, Pacific Cod, Pacific Halibut, Pink Salmon, Red Irish Lord, Rock Greenling, Walleye Pollock, Pigeon Guillemot, mink, harbor seals, and Steller sea lions [26, 35, 37–41].

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.

**Resilience**

Low, minimum population doubling time: 4.5–14 years ( $t_m = 6-8$ ;  $t_{max} = 9-13$ ;  $K = 0.08-0.21$ ; Fecundity = 2,000–10,000) [36].

**Traditional and Cultural Importance**

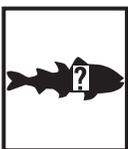
Historically, Great Sculpin were an important subsistence fish in Alaskan waters [42]. Currently, they are an unmarketed bycatch in Russian trawl fisheries [43].

**Commercial Fisheries**

Currently, Plain Sculpin are not commercially harvested.

**Potential Effects of Climate Change**

A Boreal Pacific species [9], Great Sculpin would be expected to increase in abundance in the U.S. Chukchi Sea and possibly expand their range into the Beaufort Sea.

**Areas for Future Research [B]**

Little is known about the biology and ecology of this species from the region. Research needs include:

- (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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**Fourhorn Sculpin (*Myoxocephalus quadricornis*)**

(Linnaeus, 1758)

## Family Cottidae

**Colloquial Names:** Iñupiat: Kanaiook [1]; Kanayuq [2].**Ecological Role:** This species is ubiquitous in the shallow nearshore waters of the U.S. Beaufort and Chukchi Seas. Found in the nearshore throughout the year, it is consumed by a wide variety of fishes, birds, and mammals.**Physical Description/Attributes:** Dark gray on backs and sides and lighter on belly. Saddles on the back and bars on the fins. Elongate, tapering body with dorsally compressed head. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 477) [3]. Swim bladder: Absent [3]. Antifreeze glycoproteins in blood serum: Unknown.**Ranges:** In shallow waters of the U.S. Chukchi and Beaufort Seas. Elsewhere, Arctic; Circumpolar; southward to Gulf of Anadyr, St. Lawrence Island, and northern Bristol Bay, Bering Sea, and to northern Greenland and Baltic Sea in the Atlantic [4].**Relative Abundance:** Common throughout shallow waters of U.S. Beaufort Sea [7–9] and Chukchi Sea to Point Lay [10, 11]. Abundance south of Point Lay is unknown. Extremely abundant in shallow waters in Canadian Beaufort Sea eastwards to Tuktoyaktuk Peninsula, Canada [9, 12, 13].

Fourhorn Sculpin (*Myoxocephalus quadricornis*)  
 Photograph by Doyne W. Kessler, National Marine Fisheries Service.

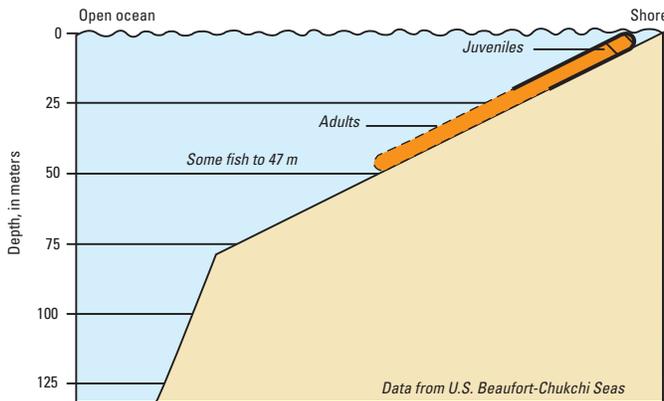


Geographic distribution of Fourhorn Sculpin (*Myoxocephalus quadricornis*) within Arctic Outer Continental Shelf Planning Areas [5] based on review of published literature and specimens from historical and recent collections [3, 4, 6].

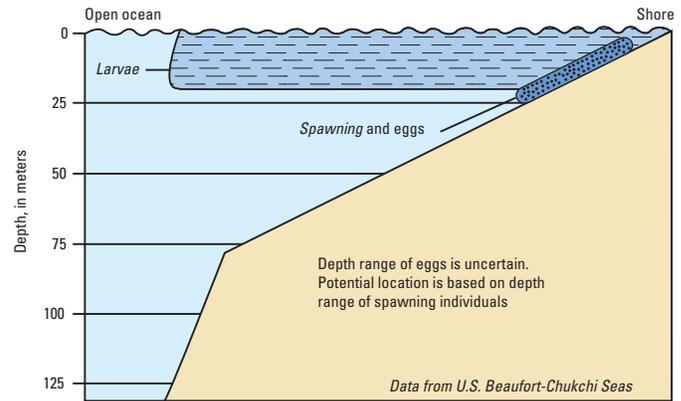
**Depth Range:** *Intertidal to 47 m, mainly 15–20 m or less* [10, 14]. Elsewhere, in Baltic Sea common to at least 40 m [15]. *Spawning occurs nearshore as shallow as 4 m* [16–18]. In northeast Pacific Ocean, larvae are pelagic in coastal and continental shelf waters [19]. *Juveniles are found in very shallow waters, often 1 m or less* [16].

*Myoxocephalus quadricornis*  
Fourhorn Sculpin

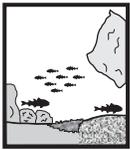
**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Fourhorn Sculpin (*Myoxocephalus quadricornis*).



**Habitats and Life History**

**Eggs**—Size: 1.5–2.9 mm [15, 20, 21]. Color can be green, yellow, or brown according to type of prey eaten by females [22]. Time to hatching: Baltic Sea eggs hatched in 97 days at 1.5 °C and 55 days at 4.7 °C, and no eggs hatched at 10.5 °C [23]. Habitat: Benthic and adhesive [15, 20, 21].

**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: 10–12 mm FL [16, 17, 24–28]. Days to juvenile transformation: Unknown. Habitat: Pelagic in coastal and continental shelf waters [19].

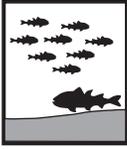
**Juveniles**—Age and size: 10–12 mm to 100–250 mm FL [12, 16, 17, 24–30]. Habitat: Same as adults.

**Adults**—Age and size at first maturity: Varies with location. *In Simpson Lagoon (near Colville River), males matured between 2–4 years and females between 4–6 years* [16]. On Yukon Coast a few of both sexes were mature at 5 years, all males at 7 years, and all females at 10 years [29]. Generally, few fish mature at 100 mm FL and all by 250 mm FL [12, 16, 17, 25, 29, 30]. Growth rates are variable between locations and females tend to grow larger at age than males [12, 18, 29]. A comparison of growth rates at two Baltic Sea locations indicated that growth was faster at higher ambient temperatures [31]. Maximum age: 16 years [17] and females may live longer [12, 18, 29]. Maximum size: 36.5 cm TL [3]. Habitat: *Benthic habitats in protected, nearshore waters of river mouths, bay and inlets, and along open coasts* [7, 29]. Occasionally, travels upstream in rivers and occupies lakes; reported in Mackenzie River as far upstream as 193 km, in Meade River as far upstream as 129 to 145 km [14] and in deep, cold Scandinavian lakes [32]. Eelgrass [33].

**Substrate**—Mud sea floors [23, 34, 35].

**Physical/chemical**—*In U.S. Beaufort Sea, most abundant in colder, more saline marine waters* [36, 37].

Temperature: *In Alaskan and Canadian waters fish have been found at water temperatures between -2.0 and 15 °C* [14, 38]. *Spawning occurs often at temperatures of less than 0 °C* [16–18]. In Baltic Sea, upper lethal temperatures are between 17.5 to 25.5 °C [39]. Salinity: *Fresh waters to 32 ppt* [16, 27]. In a saline lake on Cornwallis Island, Canadian Arctic, fish survive in hypersaline conditions of as much as 36 ppt [40].



### Behavior

**Diel**—Only limited coastal movements occur aside from seasonal, ice-related, inshore-offshore excursions [16, 41, 42]. At night, small individuals may rise up into water column to feed [43].

**Seasonal**—In U.S. Beaufort Sea, fish over winter along shallow, bottom ice-free coastlines [12, 13, 16, 18, 25, 44] and river deltas (for example, Colville and Sagavanirktok) [13, 45, 46]. In June and early July, after inshore bottom ice melts, migrations occur from just offshore into shallow waters [16, 28]. Young-of-the-year recruit to very shallow waters from June to August [16, 17, 24–28].

**Reproductive**—Females spawn annually [16] and may spawn more than one batch per season [30]. In Baltic Sea, males become territorial a few months before spawning and prepare nests by digging holes in mud sea floors. Females lay eggs in these depressions and males guard eggs until they hatch by lying on or next to eggs and fanning them with pectoral fins. Along with raising and opening fins, guarding males also make warning sounds and bite intruders. In aquaria, harassed males will move eggs to another location by pushing them, tucking them into the angle between head and pectoral fin, or taking eggs into their mouths [23, 34, 35].

**Schooling**—Probably does not school.

**Feeding**—Smaller fish prey primarily on invertebrates, whereas larger ones add fishes to their diets [29].



**Populations or Stocks:** There have been no studies, although genetic research in the Canadian Arctic suggests little population structure in this region [47].



### Reproduction

**Mode**—Though described as having external fertilization, a number of females containing fertilized eggs have been found [23].

**Spawning season**—January–March in U.S. Beaufort Sea, [12, 17, 18] and occasionally during summer months [30].

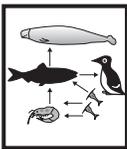
**Fecundity**—792–6,150 [15, 48] or as much as 18,000 eggs [49].



### Food and Feeding

**Food items**—Benthic and epibenthic organisms. Dominant prey are crustaceans, primarily isopods and amphipods, and fishes (for example, Fourhorn Sculpin, Saffron Cod, and Arctic Cod). Other prey include polychaetes, insects, ascidians, fish eggs, clams, plant material, copepods, and shrimps [10, 11, 13, 17, 50].

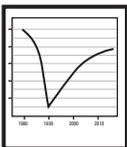
**Trophic level**—3.7 standard error 0.59 [51].



### Biological Interactions

**Predators**—A wide range of fishes, such as Arctic Cisco, Arctic Sculpin, Dolly Varden, Fourhorn Sculpin, Pacific Herring, Arctic Smelt, Saffron Cod, Shorthorn Sculpin, various eelpouts, as well as grebes, herons, loons, mergansers, Mew Gulls, Thick-billed Murres, ringed and probably bearded seals, and polar bears [10, 18, 27, 29, 40, 52–55].

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.



### Resilience

Low, minimum population doubling time: 4.5–14 years ( $t_m=3-5$ ;  $t_{max}=14$ ; Fecundity=792) [51].



### Traditional and Cultural Importance

Generally, although they are widely taken as bycatch in a number of Canadian Arctic subsistence fisheries, Fourhorn Sculpin only are occasionally consumed [11, 56, 57]. In the past, particularly during times of poor fishing, they were more often targeted and eaten [1, 58]. Hudson Bay Inuits reportedly catch and consume in moderate numbers [59].



### Commercial Fisheries

Currently, Fourhorn Sculpin are not commercially harvested.



### Potential Effects of Climate Change

It is unclear what effects climate change will have on this species. This species appears to be somewhat eurythermal, implying that it would not be negatively affected by warming temperatures. However, its apparent rarity south of the Bering Strait suggests (1) physiological adaptation to colder water or (2) a competitive advantage for cold-temperate species, or both. If these assumptions are true, climate change effects might include a northerly shift in the distribution of the species and increased interactions with other marine species.



### Areas for Future Research [A]

The Fourhorn Sculpin is one of the more dominant species in the U.S. Beaufort Sea nearshore, as it is relatively well-studied in coastal monitoring programs. It is a potential indicator species and, as such, information needs include: (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) seasonal and ontogenetic movements, and (5) population dynamics.

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## Arctic Sculpin (*Myoxocephalus scorpioides*)

(Fabricius, 1780)

### Family Cottidae

**Colloquial Name:** Iñupiat: *Tivaqiq* (Coronation Gulf) [1].

**Ecological Role:** Largely unknown. However, Arctic Sculpin are unlikely to represent a significant prey resource to other fish, birds, or mammals.

**Physical Description/Attributes:** Purplish-blue or blackish body with dark bands, white mottling and spots, and with barred and spotted fins. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 479) [2]. Swim bladder: Absent [2]. Antifreeze glycoproteins in blood serum: Unknown. Blood serum is green to blue-green in color, likely caused by biliverdin build-up [3].

**Range:** Along coasts of U.S. Chukchi and Beaufort Seas. Elsewhere in Alaska, in Bering Sea south to Norton Sound and St. Lawrence Island. Worldwide, in western Bering Sea south to Gulf of Anadyr; from East Siberian Sea and along Arctic Canadian coast eastward to Greenland and Gulf of St. Lawrence in the Atlantic [4–7].

**Relative Abundance:** Uncommon in U.S. Chukchi and Beaufort Seas [4]. Reported as common in Canadian Arctic Ocean but likely misidentified, confused with the more numerous *M. scorpius* [4].



Arctic Sculpin (*Myoxocephalus scorpioides*). Photograph by Andrey Vinnikov, Chukotka Branch, Pacific Research Institute of Fisheries and Oceanography.

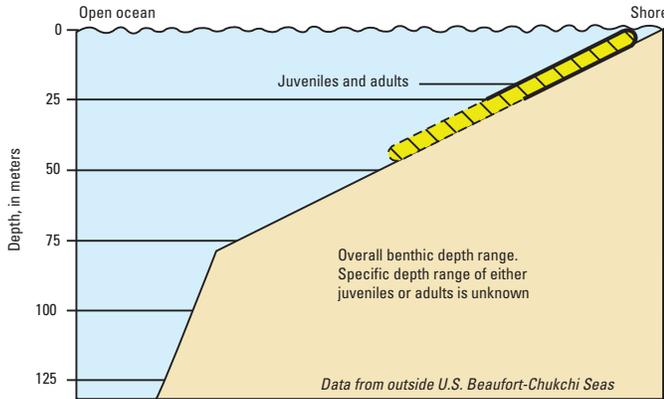


Geographic distribution of Arctic Sculpin (*Myoxocephalus scorpioides*) within Arctic Outer Continental Shelf Planning Areas [8] based on review of published literature and specimens from historical and recent collections [4, 9].

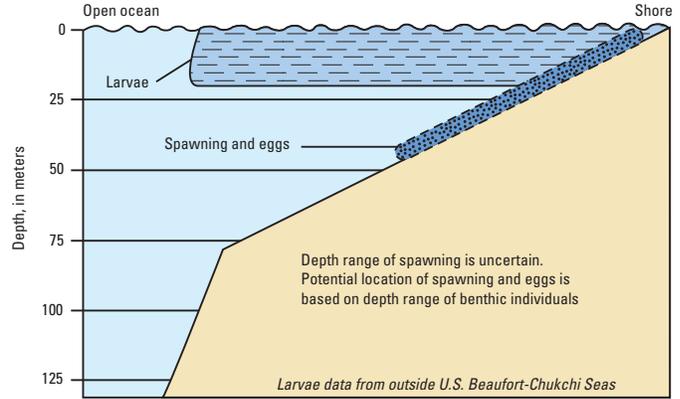
**Depth Range:** Shallow nearshore to depth of 40 m off Alaska [2, 21] and to 40 m elsewhere [10]. Larval *Myoxocephalus* spp. live in coastal and continental shelf waters [11].

*Myoxocephalus scorpioides*  
Arctic Sculpin

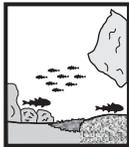
**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Arctic Sculpin (*Myoxocephalus scorpioides*).



**Habitats and Life History**

**Eggs**—Size: Unknown. Time to hatching: Unknown. Habitat: Likely benthic, based on other members of this family [2].

**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Pelagic [11].

**Juveniles**—Age and size: Unknown. Habitat: Benthic [12].

**Adults**—Age and size at first maturity: Unknown. Maximum age: Unknown. Maximum size: 23.8 cm TL [2]. Habitat: Benthic [11, 12].

**Substrate**—Rock and algae [13].

**Physical/chemical**—Temperature: Below 0 to 8 °C or higher [14]. Salinity: Marine and estuarine waters as low as 6 ppt [7, 14–17].



**Behavior**

**Diel**—Unknown.

**Seasonal**—Unknown.

**Reproductive**—Unknown. **Schooling**—Unknown.

**Feeding**—Unknown.



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Unknown.

**Spawning season**—Autumn, in Russian Arctic Ocean [14].

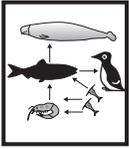
**Fecundity**—Unknown.



### Food and Feeding

**Food items**—Amphipods [12, 14].

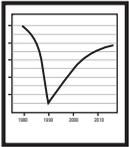
**Trophic level**—3.39 standard error 0.52 [18].



### Biological Interactions

**Predators**—Black Guillemots and possibly bearded seals in Canadian Arctic Ocean [19, 20].

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.



### Resilience

Medium, minimum population doubling time: 1.4–4.4 years (Preliminary *K* or Fecundity) [18].



### Traditional and Cultural Importance

None reported. Not commonly caught and retained in subsistence fisheries [12].



### Commercial Fisheries

Currently, Arctic Sculpin are not commercially harvested.



### Potential Effects of Climate Change

The Arctic Sculpin is an endemic species that lives in shallow waters close to shore. A distributional shift to the north, in this case contraction from the northern Bering Sea, and increased species abundance in coastal waters are likely outcomes of climate warming.



### Areas for Future Research [B]

Little is known about the biology and ecology of this species from the region. Research needs include:

- (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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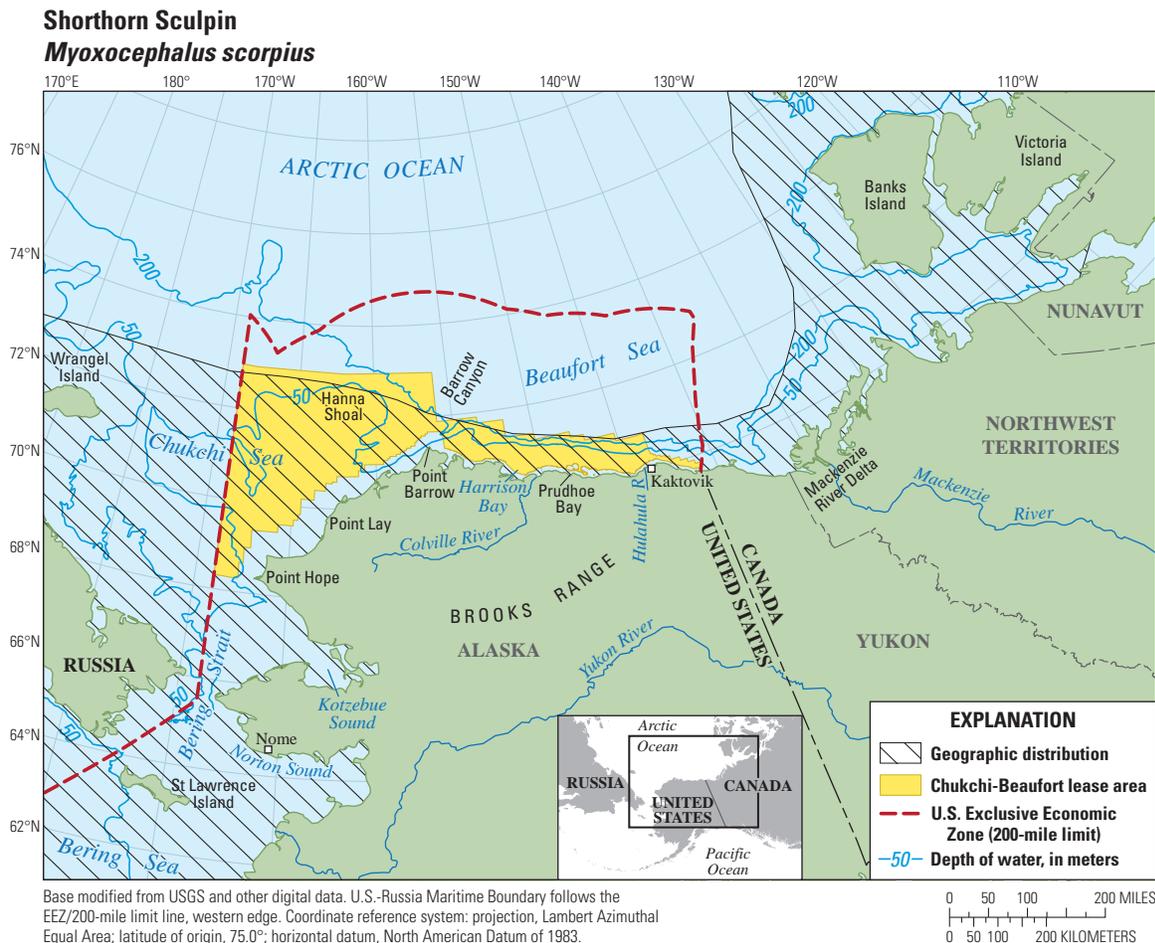
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**Shorthorn Sculpin (*Myoxocephalus scorpius*)**

(Linnaeus, 1758)

## Family Cottidae

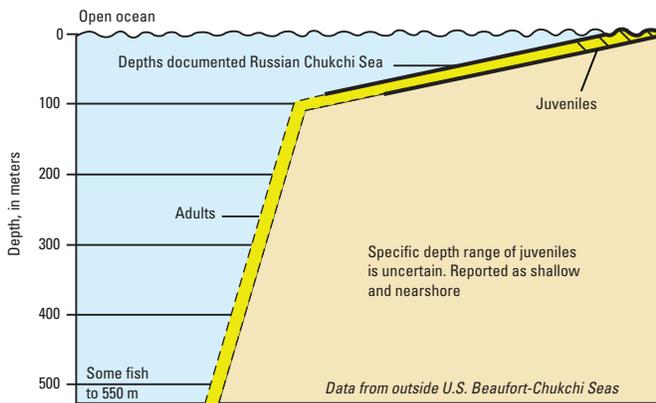
**Colloquial Name:** *None within U.S. Chukchi and Beaufort Seas.***Ecological Role:** Shorthorn Sculpin is one of the most common benthic species in the shallower waters of the U.S. Chukchi Sea and is common in the Beaufort Sea. Although research is lacking, available information implies that this species is likely of moderate ecological importance as prey for some marine mammals and sea birds.**Physical Description/Attributes:** Body variably colored from black to greenish brown to pale olive with yellow and orange tinges and dark mottling. Belly is white, red (particularly in males), yellow, orange, or brown. Fins are brown, green, or yellow, with paler spots and bars [1–3]. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 478) [3]. Swim bladder: Absent [3]. Antifreeze glycoproteins in blood serum: Present [4, 5]. Blood serum is colored blue-green, likely due to biliverdin build-up [6].**Ranges:** *U.S. Chukchi and Beaufort Seas.* Elsewhere in Alaska, southward through Bering Sea and Commander–Aleutian Islands chain and all southeastern Gulf of Alaska. Worldwide, circumpolar; southward to Gulf of Maine, Bay of Biscay, southwestern Kamchatka Peninsula, Russia, and northern British Columbia, Canada [7].**Relative Abundance:** *Common throughout much of the Chukchi Sea [10] (to at least 71°55'N, 175°18'W [11]), and in U.S. Beaufort Sea [12–14]. Common in eastern Bering Sea and Norton Sound [15, 16] along with James Bay, Hudson Bay, and Hudson Strait, Canada [17].*Shorthorn Sculpin (*Myoxocephalus scorpius*) 237 mm, Bering Strait, 2006. Photograph by C.W. Mecklenburg, Point Stephens Research.

Geographic distribution of Shorthorn Sculpin (*Myoxocephalus scorpius*) within Arctic Outer Continental Shelf Planning Areas [8] based on review of published literature and specimens from historical and recent collections [3, 7, 9].

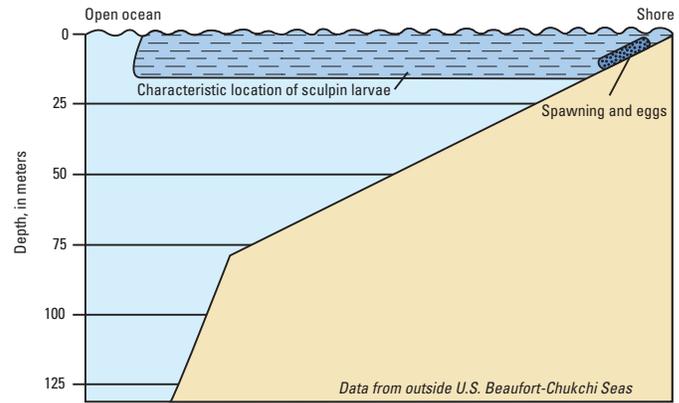
**Depth Range:** In Russian Chukchi Sea to at least 84 m [10, 11, 13]. Overall, intertidal (juveniles) [18] to 550 m, mainly less than 70 m [3]. Off Newfoundland, adults have been observed at less than 3 m [19]. Spawning occurs between 3 and 11 m [2, 20]. Larval *Myoxocephalus* spp. live in coastal and continental shelf waters [21].

*Myoxocephalus scorpius*  
Shorthorn Sculpin

#### Benthic distribution



#### Reproductive distribution



Benthic and reproductive distribution of Shorthorn Sculpin (*Myoxocephalus scorpius*).



#### Habitats and Life History

**Eggs**—Size: 1.8–2.5 mm [22]. Time to hatching: 7–8 weeks at 3.3 °C [23] and less than 3 months at -1.5–0 °C [2, 20]. Habitat: Benthic and adhesive, in crevices of boulders and other rocky formations [2, 20].

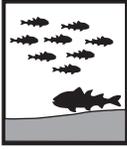
**Larvae**—Size at hatching: 6.0–8.8 mm [23]. Size at juvenile transformation: 1.0–2.0 cm TL, [24, 25]. Days to juvenile transformation: Unknown. Habitat: Pelagic, in coastal and continental shelf waters [21].

**Juveniles**—Age and size: 1–2 to 21–39 cm TL [24, 25]. Age unknown. Habitat: Young juveniles are pelagic and neritic [21], and older juveniles are benthic and neritic [3].

**Adults**—Age and size at first maturity: Off Newfoundland, a few of both sexes mature at 3 years (21 cm TL), all males at 6 years (30 cm TL); 60 percent of females at 6 years (34–35 cm TL), and all by 8 years (39 cm TL). Females grow larger than males and males mature at a slightly younger age and smaller size [2, 19, 20]. In European waters, males mature at 1 year (8–14 cm TL) and all females at 3 years (20 cm) [26]. In Russian Arctic Ocean, both sexes mature at 2–4 years and 15 cm TL (males) and 20 cm (females) long TL [25]. Egg development within female may take as long as 2.5 years in Newfoundland waters [20] and 1 year in European waters [27]. Generally, Newfoundland fish live much longer, grow more slowly, and mature later in life than do those across the Atlantic Ocean [19, 20, 28]. Based on Baltic Sea research, fish on both sides of the Atlantic Ocean appear to weigh about the same at length with females heavier at length than males [27]. Maximum age: 15 years [2] (rarely more than 6 years in Europe) [26]. Maximum size: 60 cm TL [3] and 1.1 kg [29]. Habitat: Benthic, mainly shallow shelf waters [3, 25, 30].

**Substrate**—A wide range, including sand, mud, boulder, cobble, and algal beds [2, 11, 12, 31].

**Physical/chemical**—Temperature: -1.8–18.9 °C [11, 32], most commonly less than 0 °C [25]. Salinity: From 5 ppt to full sea water [25, 32, 33].

**Behavior**

**Diel**—Off Newfoundland, juveniles move into shallower waters (less than 1–2 m) at night. [34].

**Seasonal**—Young-of-the-year recruit to shallow, often estuarine, waters [1] and some stay nearshore year round [13]. Off Newfoundland, seasonal inshore-offshore movements of juveniles (shallow in summer and deeper depths in winter) have been reported [20].

**Reproductive**—Spawning occurs in shallow waters. Adhesive eggs are laid in crevices of boulders and other rocky formations. Nests are 1–4 m apart and may contain clutches of more than one female. Males aggressively guard eggs until hatching. After spawning, females move into deep waters (likely deeper than 100 m) and return in April and May after eggs hatch [2, 20].

**Schooling**—Unknown.

**Feeding**—Semi-sedentary, lies in wait for prey [7]. When drifting ice darkens the waters, diets shifts from drabber benthic prey to brightly colored midwater amphipods [35]. Females feed less just before and after spawning [2].

**Populations or Stocks**

There have been no studies.

**Reproduction**

**Mode**—Unknown.

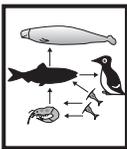
**Spawning season**—November and December in Newfoundland [2, 20] and as late as March in Europe [23].

**Fecundity**—4,205–60,976 (as few as 1,200 in Norway) [23], pink, orange, or red colored eggs [20, 23].

**Food and Feeding**

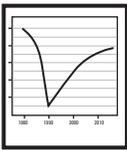
**Food items**—A diverse array of vertebrate and invertebrate prey. In Newfoundland, the Canadian Arctic Ocean, eastern and western Bering Sea, and Norway, fishes and crabs are often most important in the diet, although many other crustaceans (for example, isopods, amphipods, and shrimps), polychaetes, snails, sea urchins, brittle stars, and sea cucumbers also are consumed [2, 23, 35–37].

**Trophic level**—3.9 standard error 0.40 [38].

**Biological Interactions**

**Predators**—*Ringed seals* in U.S. Chukchi Sea [39]. Black Guillemots, Thick-billed Murres, and bearded seals in Canadian Arctic Ocean [40–42]. River otters in southeastern Alaska [43].

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.

**Resilience**

Medium, minimum population doubling time: 1.4–4.4 years ( $t_m=2$ ; Fecundity=2,742) [38].

**Traditional and Cultural Importance**

*Seem to have relatively little importance in the U.S. Chukchi and Beaufort Seas.* Historically, this was a fairly important species to the Inuits of the Canadian Arctic where it is frequently used as food if other sources are in short supply and used as dog-feed [1].



### Commercial Fisheries

Currently, Shorthorn Sculpin are not commercially harvested.



### Potential Effects of Climate Change

The Shorthorn Sculpin reproduces and is common in Arctic and Boreal waters [7] and the possible effects of warming on its distribution are difficult to predict. This species has already reestablished the circumpolar distribution it had in pre-Wisconsinan glacial and Bering Land Bridge times [7].



### Areas for Future Research [B]

Although there has been substantial life history work conducted off Newfoundland [2, 19, 20] and in European waters [23, 26, 27] little is known about the ecology and life history of this species in the study area. Research needs include: (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators. The distribution of the species in regional habitats suggests its potential suitability as an indicator species for monitoring changes associated with global warming.

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**Hairhead Sculpin (*Trichocottus brashnikovi*)**

Soldatov &amp; Pavlenko, 1915

**Family Cottidae**

**Note:** Except for physical description, relative abundance, and geographic range data, all information is from areas outside of the study area.

**Colloquial Name:** None within U.S. Chukchi and Beaufort Seas.

**Ecological Role:** Largely unknown. However, Hairhead Sculpin are unlikely to represent a significant prey resource to higher level organisms except for the possibility of greater importance in the southeastern Chukchi Sea.

**Physical Description/Attributes:** Head and body mottled reddish and blackish brown with vague dark saddles; numerous white spots make pattern indistinct; white underside, and white band around caudal peduncle [1]. Swim bladder: Absent [2]. Antifreeze glycoproteins in blood serum: Unknown.

**Range:** U.S. Chukchi Sea [3] and U.S. Beaufort Sea eastward at least to 72°N, 155°W, northeast of Dease Inlet [1]. Elsewhere in Alaska, in northeastern Bering Sea from Seward Peninsula south to St Lawrence Island. Worldwide, from western Bering Sea off Cape Navarin, Russia, south to Sea of Okhotsk and northern Sea of Japan [2].

**Relative Abundance:** Common, although perhaps not abundant, in U.S. Chukchi Sea and present but uncommon in U.S. Beaufort Sea [1, 3].



Hairhead Sculpin (*Trichocottus brashnikovi*) 164 mm TL, northeastern Bering Sea, 2006. Photograph by C.W. Mecklenburg, Point Stephens Research.

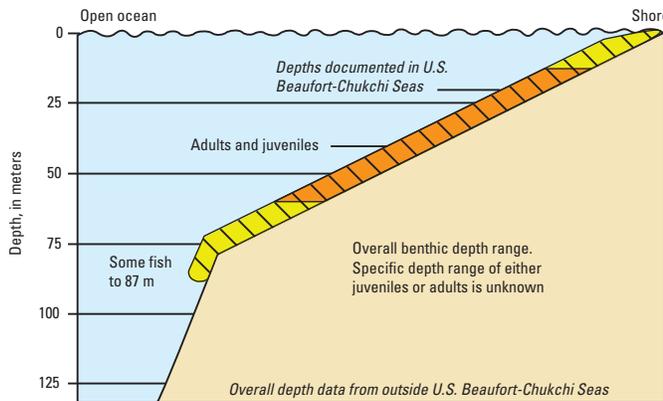


Geographic distribution of Hairhead Sculpin (*Trichocottus brashnikovi*), within Arctic Outer Continental Shelf Planning Areas [4] based on review of published literature and specimens from historical and recent collections [1-3].

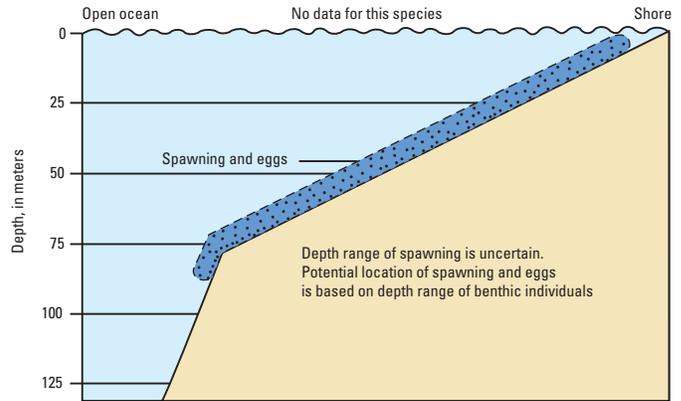
**Depth Range:** 7–87 m [2]. Documented in U.S. Chukchi and Beaufort Seas at 13–60 m [1, 3].

*Trichocottus brashnikovi*  
Hairhead Sculpin

**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Hairhead Sculpin (*Trichocottus brashnikovi*).



**Habitats and Life History**

**Eggs**—Size: Unknown. Time to hatching: Unknown. Habitat: Likely benthic, based other members of this family [2].

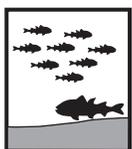
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Likely pelagic, based other members of this family [2].

**Juveniles**—Age and size: Unknown. Habitat: Benthic [2].

**Adults**—Age and size at first maturity: Unknown. Maximum age: Unknown. Maximum size: 22.5 cm [2]. Habitat: Benthic [2].

**Substrate**—Sandy bottoms [2].

**Physical/chemical**—Temperature: -1.2–6.5 °C [1]. Salinity: Marine [2].



**Behavior**

**Diel**—Unknown.

**Seasonal**—Unknown.

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—Unknown.



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Unknown.

**Spawning season**—Unknown.

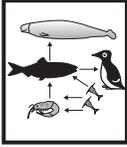
**Fecundity**—Unknown.



**Food and Feeding**

**Food items**—Unknown.

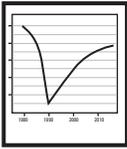
**Trophic level**—3.45 standard error 0.48 [5].



**Biological Interactions**

**Predators**—Unknown.

**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, other sculpins, poachers, and eelpouts.



**Resilience**

Medium, minimum population doubling time: 1.4–4.4 years (Preliminary *K* or Fecundity) [5].



**Traditional and Cultural Importance**

None reported.



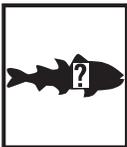
**Commercial Fisheries**

Currently, Hairhead Sculpin are not commercially harvested.



**Potential Effects of Climate Change**

As a Boreal Pacific species, a northerly shift in distribution and increased abundance are probable expectations of warming. The effects of increased abundance on biological interactions, especially competition with similar species, presently cannot be assessed.



**Areas for Future Research [B]**

Little is known about the biology and ecology of this species from the region. Research needs include:

- (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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**Bigeye Sculpin (*Triglops nybelini*)**

Jensen, 1944

**Family Cottidae**

**Colloquial Name:** *None within U.S. Chukchi and Beaufort Seas.*

**Ecological Role:** Largely unknown. However, the Bigeye Sculpin is an uncommon species and is unlikely to represent a significant prey resource to higher level organisms

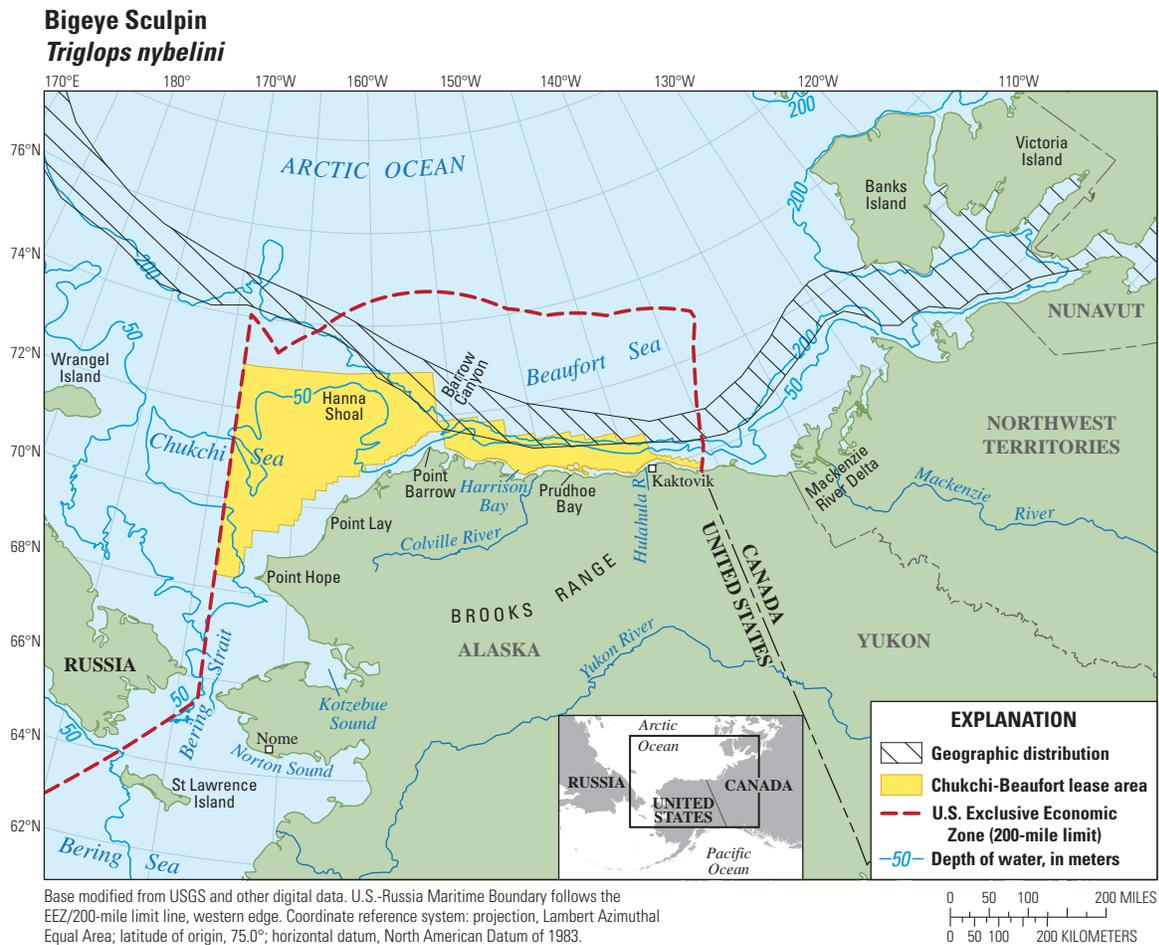
**Physical Description/Attributes:** Dark brown back without dark saddles, cream-colored belly and broken or complete black lines along sides. For specific diagnostic characteristics, see *Fishes of Alaska* (Mecklenburg and others, 2002, p. 426) [1]. Swim bladder: Absent [1]. Antifreeze glycoproteins in blood serum: Unknown.

**Ranges:** *U.S. Chukchi Sea slope and U.S. Beaufort Sea slope eastward to 149°W* [2]. Practically circumpolar in Arctic Ocean [3].

**Relative Abundance:** *Unknown, likely uncommon, especially at depths shallower than 200 m.*



Bigeye Sculpin (*Triglops nybelini*) 105 mm, Chukchi Borderland, 2009. Photograph by C.W. Mecklenburg, Point Stephens Research.

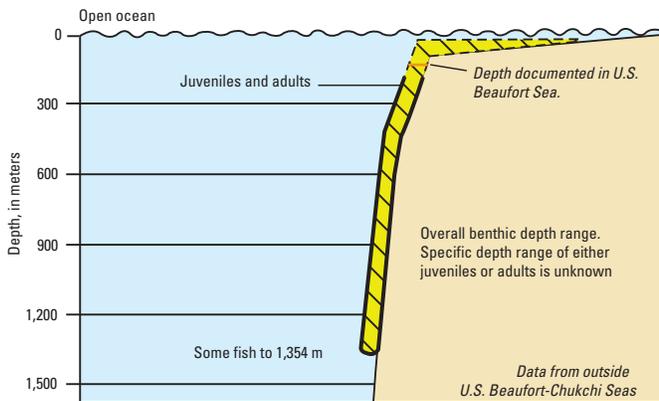


Geographic distribution of Bigeye Sculpin (*Triglops nybelini*) within Arctic Outer Continental Shelf Planning Areas [4] based on review of published literature and specimens from historical and recent collections [1-3].

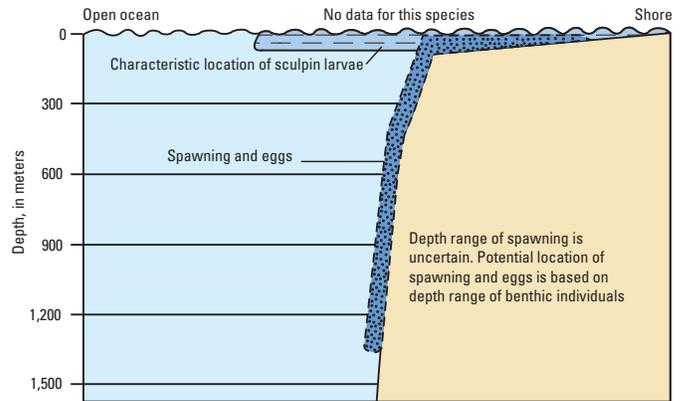
**Depth Range:** 9–1,354 m, usually deeper than 200 m [1, 3]. *As shallow as 101 m in U.S. Beaufort Sea* [2].

*Triglops nybelini*  
Bigeye Sculpin

**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Bigeye Sculpin (*Triglops nybelini*).



**Habitats and Life History**

**Eggs**—Size: 3 mm, almost ripe eggs in Kara Sea [5]. Time to hatching: Unknown. Habitat: Likely benthic, based on other members of this family [1, 5].

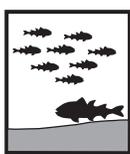
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: Unknown. Days to juvenile transformation: Unknown. Habitat: Likely pelagic, based on other members of this family [1, 5]. [1].

**Juveniles**—Age and size: Unknown. Habitat: Likely benthic, based on other members of this family [1, 5].

**Adults**—Age and size at first maturity: Starting at 3–4 years, at latest by 7 years, and 14 cm in the Barents Sea. [6]. Maximum age: Unknown. Maximum size: 17 cm TL [1]. Habitat: Likely benthic, based on other members of this family [1, 5].

**Substrate**—Soft sea floors [5, 7].

**Physical/chemical**—Temperature: -1.8 to -0.1 °C, in Russian Arctic Ocean [5]. Salinity: Marine [5, 7], prefers less than 34 ppt [6].



**Behavior**

**Diel**—Unknown. Seasonal—Unknown.

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—Unknown.



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Unknown.

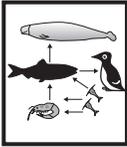
**Spawning season**—Probably summer and early autumn, off Europe and Asia [5, 6].

**Fecundity**—600–100 eggs [6]. Mature females contain more than one size class of eggs. In Kara Sea two females contained 307 and 600 eggs of the largest class size [5].



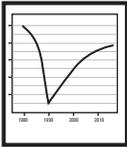
**Food and Feeding**

**Food items**—In Russian Arctic Ocean, zooplanktors such as euphausiids and calanoid copepods [5] and fish [6].  
**Trophic level**—3.29 standard error 0.41 [8].



**Biological Interactions**

**Predators**—In Hudson Bay, Thick-billed Murres and Black Guillemots [9].  
**Competitors**—Presumably a wide range of other zoobenthic feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.



**Resilience**

Medium, minimum population doubling time: 1.4–4.4 years (Preliminary *K* or Fecundity) [8].



**Traditional and Cultural Importance**

None reported.



**Commercial Fisheries**

Currently, Bigeye Sculpin are not commercially harvested.



**Potential Effects of Climate Change**

The Bigeye Sculpin is an endemic Arctic species [3]. A northerly shift in its distribution to colder and deeper offshore waters may be an outcome of climate warming.



**Areas for Future Research [B]**

Little is known about the biology and ecology of this species from the region. Research needs include:  
 (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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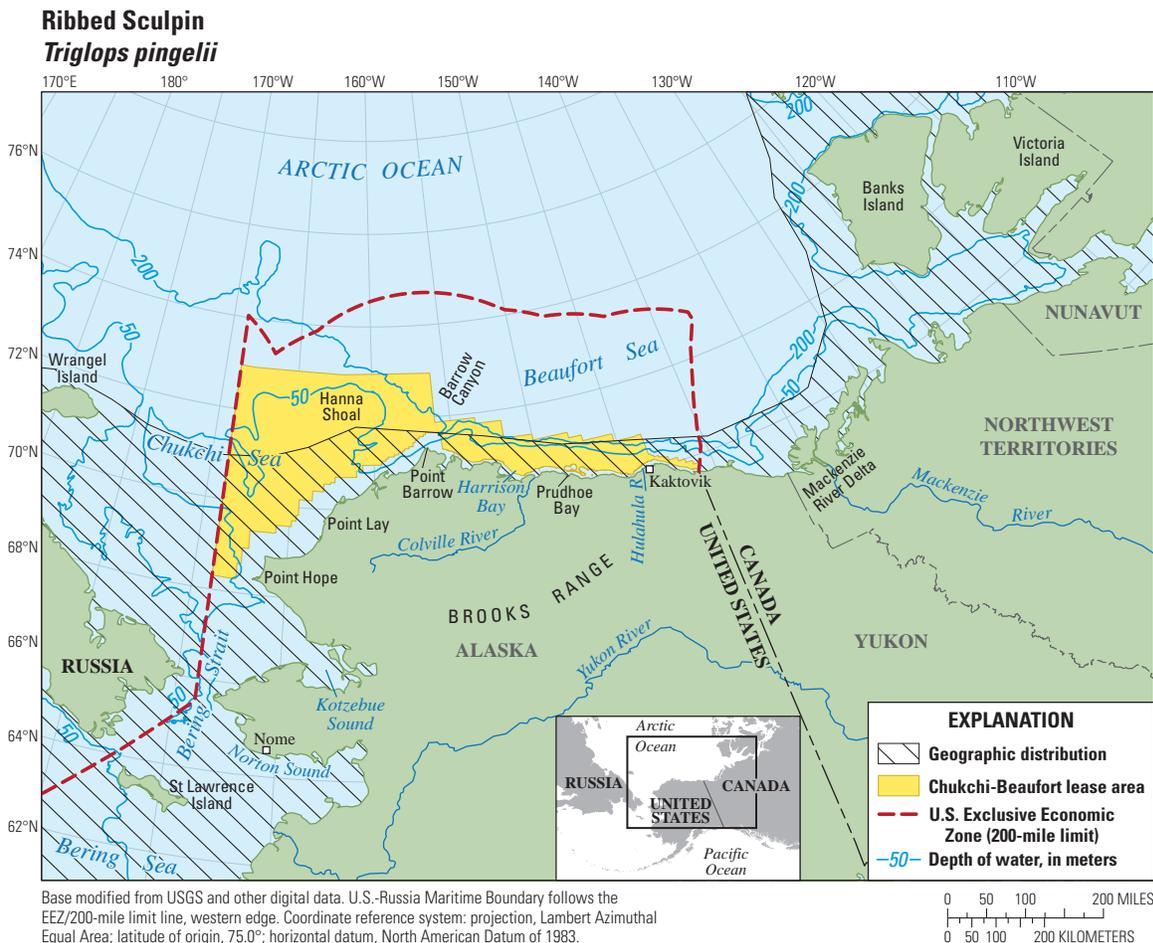
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**Ribbed Sculpin (*Triglops pingelii*)**

(Reinhardt, 1837)

## Family Cottidae

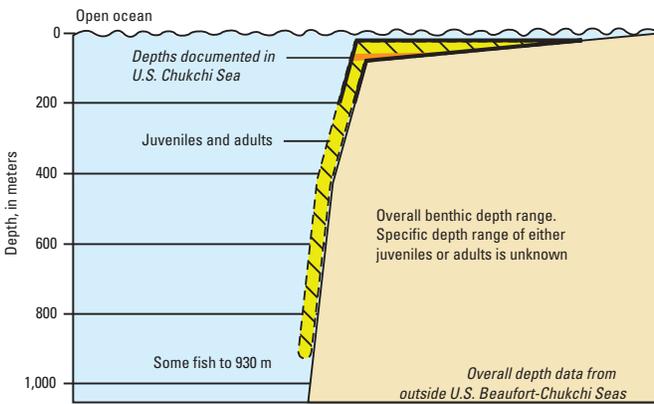
**Colloquial Name:** *None within U.S. Chukchi and Beaufort Seas.***Ecological Role:** Largely unknown. However, the Ribbed Sculpin is unlikely to represent a significant prey resource to higher level organisms and does not play a significant role in regional food webs.**Physical Description/Attributes:** Olive brown-back with vague blackish saddles, white belly, and dark spots or streaks on sides below lateral line. In males the dark streaks form a broken or continuous stripe. For specific diagnostic characteristics, see, *Fishes of Alaska* (Mecklenburg and others, 2002, p. 428) [1] Swim bladder: Absent [1]. Antifreeze glycoproteins in blood serum: Unknown.**Range:** *U.S. Beaufort and Chukchi Seas.* Elsewhere in Sea of Okhotsk, Bering Sea and Commander–Aleutian Islands chain and entire southeast coast [4]. Worldwide, circumpolar in Arctic Ocean; south to Sea of Japan, Puget Sound, Strait of Belle Isle, southern Greenland, Jan Mayen Island, Norway, and White Sea [2].**Relative Abundance:** *Common in U.S. Chukchi Sea* [1, 4–8] *but uncommon in U.S. Beaufort Sea.* Elsewhere, common in Canadian Beaufort Sea off Herschel Island [9] and from off western Kamchatka Peninsula, Russia, along Aleutian Islands, in central and eastern Bering Sea, and eastward to Kodiak Island region [10–12].Ribbed Sculpin (*Triglops pingelii*) 145 mm, U.S. Chukchi Sea. Photograph by C.W. Mecklenburg, Point Stephens Research.

Geographic distribution of Ribbed Sculpin (*Triglops pingelii*) within Arctic Outer Continental Shelf Planning Areas [3] based on review of published literature and specimens from historical and recent collections [1, 2, 4].

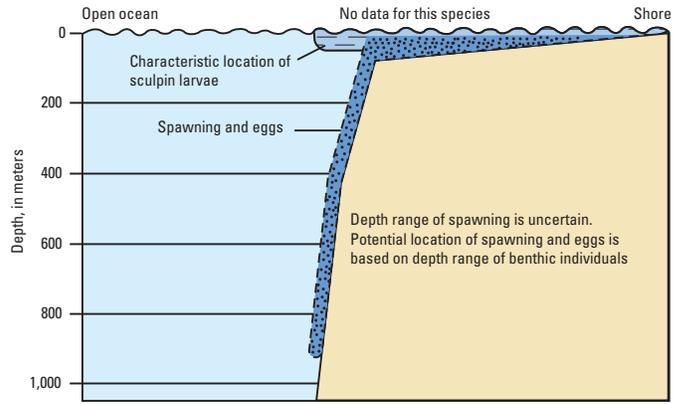
**Depth Range:** Documented in U.S. Chukchi Sea at 30–48 m [8]. Elsewhere, 4–930 m [13], typically less than 200 m [2].

*Triglops pingelii*  
Ribbed Sculpin

**Benthic distribution**



**Reproductive distribution**



Benthic and reproductive distribution of Ribbed Sculpin (*Triglops pingelii*).



**Habitats and Life History**

**Eggs**—Size: 2–3 mm, red in color [14–16]. Time to hatching: Unknown. Habitat: Benthic [14, 15].

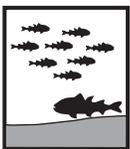
**Larvae**—Size at hatching: Unknown. Size at juvenile transformation: 35 mm TL [6]. Days to juvenile transformation: Unknown. Habitat: *Pelagic* [6].

**Juveniles**—Age and size: Unknown. Habitat: Benthic to epibenthic [11, 17].

**Adults**—Age and size at first maturity: 3–5 years at 7–9 cm [16]. Maximum age: 9 years [16]. Maximum size: 20.2 cm SL, about 23.3 cm TL; reported but not verifiable to 24.2 cm [1]. Females grow larger and are heavier at length [18]. Habitat: Benthic to epibenthic [11, 17].

**Substrate**—Soft sea floors and rocky bottoms [8, 17, 19].

**Physical/chemical**—Temperature: -1.5–10.5 °C [1, 8, 17, 19]. Salinity: Mainly marine [8, 15], also taken in brackish waters [20].



**Behavior**

**Diel**—Juveniles and adults have been captured in midwaters at night [17].

**Seasonal**—Unknown.

**Reproductive**—Unknown.

**Schooling**—Unknown.

**Feeding**—Fish have been observed feeding as much as 1 m above the bottom [19].



**Populations or Stocks**

There have been no studies.



**Reproduction**

**Mode**—Unknown.

**Spawning season**—In autumn off Kodiak Island, Alaska [21, 22].

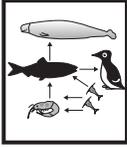
**Fecundity**—About 300–450 eggs [16].



### Food and Feeding

**Food items**—In southeastern Beaufort Sea and northwest Atlantic Ocean, primarily planktonic or epibenthic organisms such as amphipods, mysids, copepods, larval ascidians, euphausiids, and arrow worms [23].

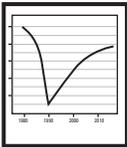
**Trophic level**—3.41 standard error 0.51 [24].



### Biological Interactions

**Predators**—Ringed seals and probably bearded seals in Canadian Arctic Ocean [25–27] as well as Thick-billed Murres during summer [28]. Great and Plain sculpins, Pacific Cod, Pacific Halibut, Pigeon Guillemots, Tufted Puffins, and Thick-billed Murres in Bering Sea, Gulf of Alaska, and off British Columbia, Canada and Kamchatka Peninsula, Russia [29–34].

**Competitors**—Presumably a wide range of other zoobenthos feeders such as Arctic Cod, Walleye Pollock, poachers, eelpouts, and other sculpins.



### Resilience

Medium, minimum population doubling time: 1.4–4.4 years (Preliminary *K* or Fecundity) [24].



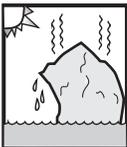
### Traditional and Cultural Importance

None reported.



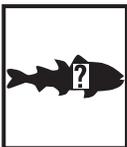
### Commercial Fisheries

Currently, Ribbed Sculpin are not commercially harvested.



### Potential Effects of Climate Change

The Ribbed Sculpin reproduces in Arctic and Boreal waters [2], so it is difficult to predict how climate warming might affect its distribution or abundance. A trend of increasing abundance with latitudinal change is hypothesized.



### Areas for Future Research [B]

Little is known about the biology and ecology of this species from the region. Research needs include:

- (1) depth and location of pelagic larvae, (2) depth, location, and timing of young-of-the-year benthic recruitment, (3) preferred depth ranges for juveniles and adults, (4) spawning season, (5) seasonal and ontogenetic movements, (6) population studies, (7) prey, and (8) predators.

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