CAFF
Conservation of Arctic Flora and Fauna

CIRCUMPOLAR BIODIVERSITY MONITORING PROGRAM

February 2018

Marine Fishes of the Arctic Region
Volume I

C. W. Mecklenburg, A. Lynghammar, E. Johannesen, I. Byrkjedal, J. S. Christiansen, A. V. Dolgov, O. V. Karamushko, T. A. Mecklenburg, P. R. Møller, D. Steinke, R. M. Wienerroither

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NORWEGIAN MINISTRY OF FOREIGN AFFAIRS

Arctic Biodiversity Congress
9th-12th October 2018, Rovaniemi, Finland

ARCTIC COUNCIL

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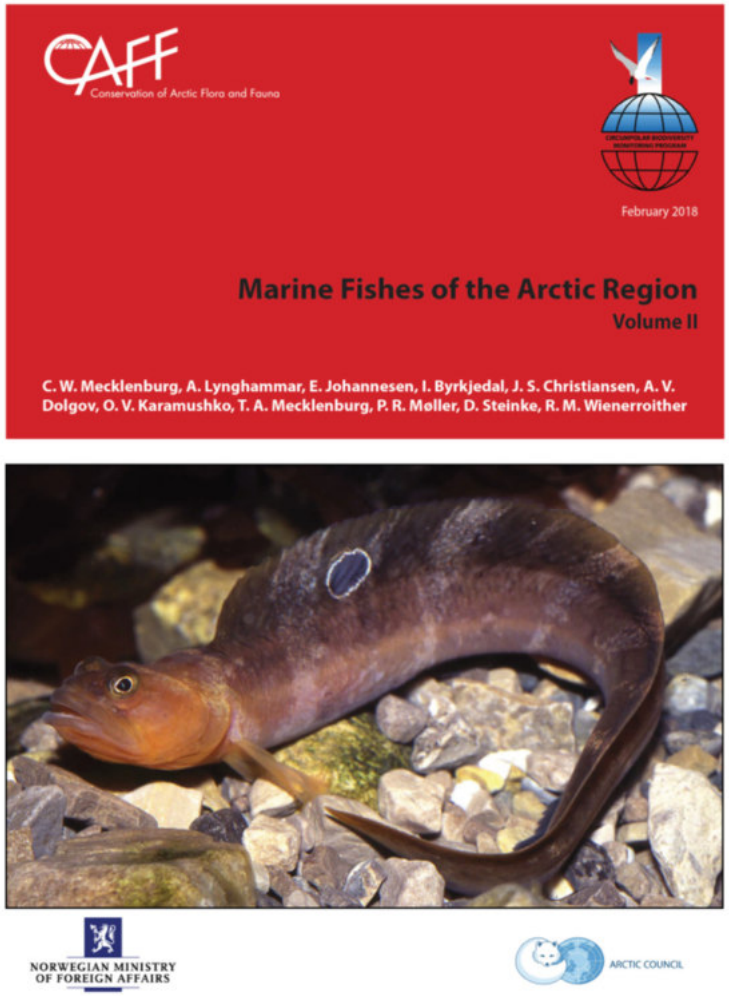
Marine Fishes of the Arctic Region



What is it?

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NORWEGIAN MINISTRY OF FOREIGN AFFAIRS

ARCTIC COUNCIL

- Outcome of a three year project (Dec.2014- Feb.2018) funded by the Norwegian Ministry of Foreign Affairs

- Synthesize years of research around the Arctic by the project participants

- **First comprehensive and unified treatment of the marine fish fauna in the whole Panarctic region**

- Information on 229 species of marine fish

- Totally 749 pages organized in two volumes (pdfs)

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ATLAS

February 2018

Marine Fishes of the Arctic Region

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Cottidae — Sculpins

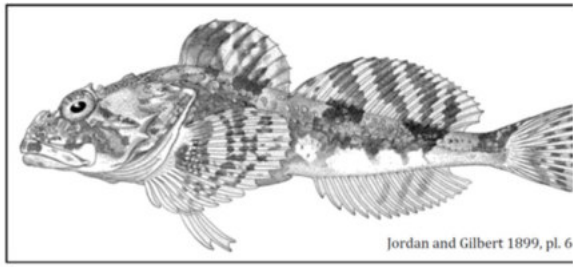
Myoxocephalus scorpius (Linnaeus, 1758) shorthorn sculpin

Zoogeography: Arctic–Boreal

Distribution: Circumpolar.

In all Arctic seas and southward to southern England, Bay of Biscay, Sea of Okhotsk off southern Kamchatka, Commander and Aleutian Islands Gulf of Alaska to northern British Columbia.

The most widespread and abundant sculpin in Arctic, especially on the inner and middle are the continental shelves. The northernmost rec include a 43-mm TL specimen taken north of S bergen at 81°20'N, 15°32'E, in 2015 (MNHN fiel BPS-3257). Recorded in Canada at least to S Fjord, Ellesmere Island, at 80°09'N, 86°00'W (Hu et al. 1984; CMNFI 1960-0445C, CMNFI 1962-04 Distribution farther north off Canada, to the extr tip of Ellesmere Island, and northernmost Green is assumed. Other sculpins and snailfishes have recorded there (e.g., *Icelus bicornis, M. quadricc Liparis fabricii, L. tunicatus*; Hunter et al. 1984) *M. scorpius* would logically also be present. Reco northward off eastern Greenland as far nort Sabine Island, 74°30'N, 19°45'W (Jensen 1904a), and in Baffin Bay recently to 76°23'N (Jørgensen et al. 2011) corded from the New Siberian Islands at 76°06'N, 153°06'E (Andriashev 1954; ZIN 20674). In the Chukchi Sea, r to 72°17'N, 165°10'W (UAM 1287).



Jordan and Gilbert 1899, pl. 6

Common in Bering, Chukchi, and Beaufort Seas (e.g., Barsukov 1958, Alverson and Wilimovsky 1966, Mecklenburg et al. 2002, Rand and Logerwell 2011). The 4th most abundant of 62 identified species in recent Chukchi Sea bottom trawl collections (Mecklenburg and Steinke 2015). Common across Arctic North America (Walters 1953a, 1955), throughout the Canadian high Arctic archipelago to Hudson and James Bays (Vladykov 1933, Morin et al. 1980, Morin and Dodson 1986) and southward to Labrador (Backus 1957, Ellis 1 Hunter et al. 1984, Scott and Scott 1988) and the Gulf of St. Lawrence (Nozères et al. 2010). The most common fi inshore waters of Ungava Bay (Dunbar and Hildebrand 1952). Common along the entire coastline of the Gulf of M (Klein-MacPhee 2002f). Common around Greenland (Møller et al. 2010); the most common shore sculpin in north Greenland (Nichols 1918). Occasionally taken around Jan Mayen Island (Wienerroither et al. 2011b). Common ar Iceland (Sæmundsson 1949, Jónsson and Pálsson 2013), the Faroe Islands, along the coast of Norway (Pethon 2 and in the Barents Sea (Byrkjedal and Høines 2007; Wienerroither et al. 2011a, 2013). The most abundant identified fish species in trammel and fyke nets, composing 74.9% of total specimens caught, in 2012 and 201 Kongsfjorden, Spitsbergen (Brand and Fischer 2016). Found also in the Kara, Laptev, and East Siberian Seas (Es 1940, 1952; Andriashev 1948, 1954; Borkin et al. 2008; Neyelov 2008; Dolgov 2013; Heldal et al. 2017).

Southward to Welcome Harbour, British Columbia in the eastern Pacific (Peden and Wilson 1976; Mecklenburg 2002, 2016); southern Kamchatka in the western Pacific (Parin et al. 2014); southern New England and to New Je as a stray in the western Atlantic (Klein-MacPhee 2002f); and Bay of Biscay in the eastern Atlantic (Fedorov 1986).

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GUIDE

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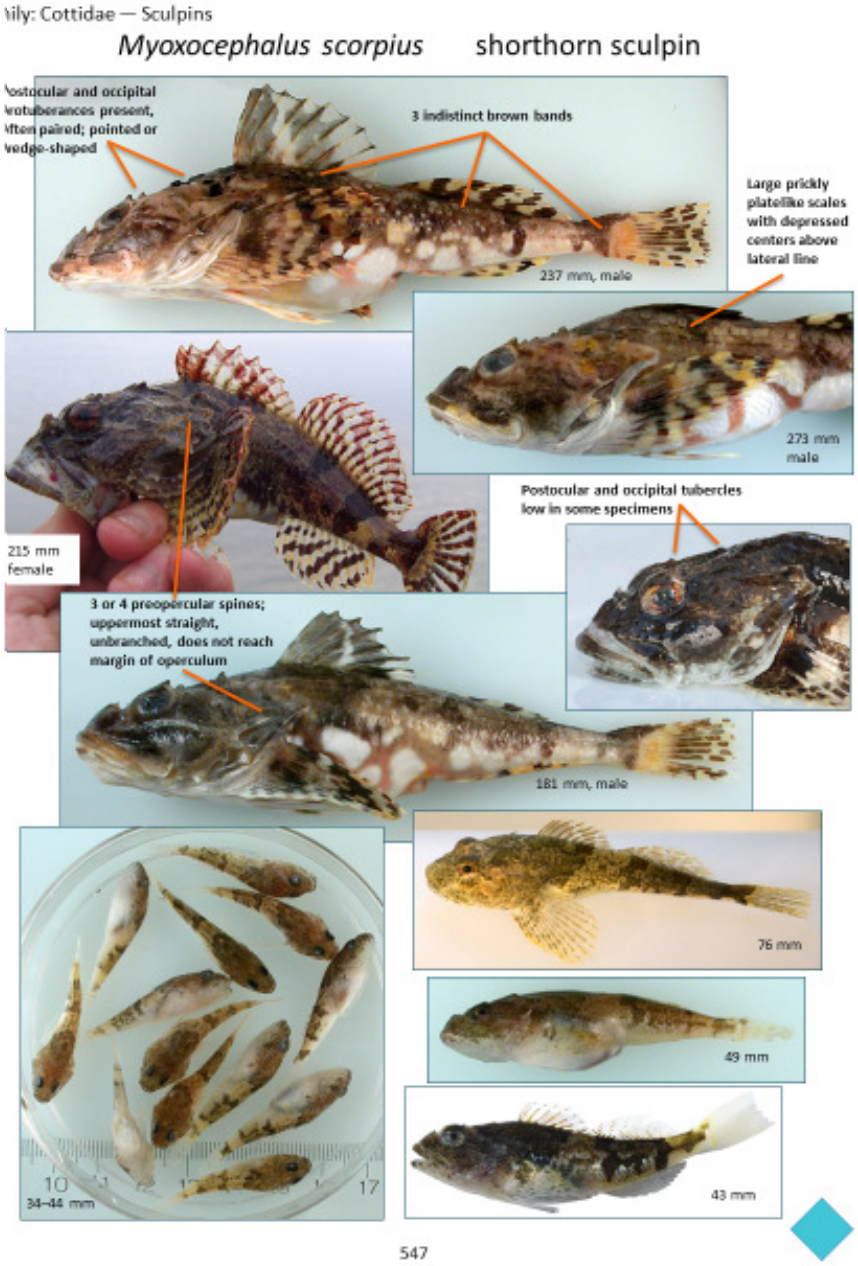

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- Pdf's of the atlas and guide freely available:

https://www.caff.is/marine/marine-monitoring-publications/marine-fishes-of-the-arctic-region

- 11 authors from five countries:
  - USA : CW Mecklenburg – lead author

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    TA Mecklenburg
  - Canada: D. Steinke
  - Russia: OV Karamushko, AV Dolgov
  - Denmark/Greenland: PR Møller
  - Norway: A Lynghammar, JS Christiansen
    R Wienerroither, I Byrkjedal,
    E Johannesen)

Why was it made?

Volume I

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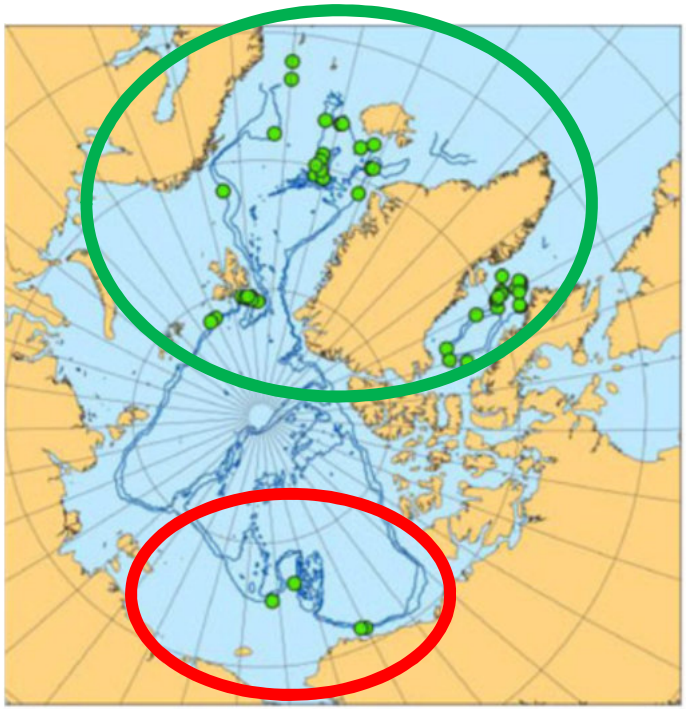
- Fill **knowledge gaps** on marine fishes identified in the Arctic Biodiversity Assessment (2013)

- Need of overall view of the **whole panarctic region**



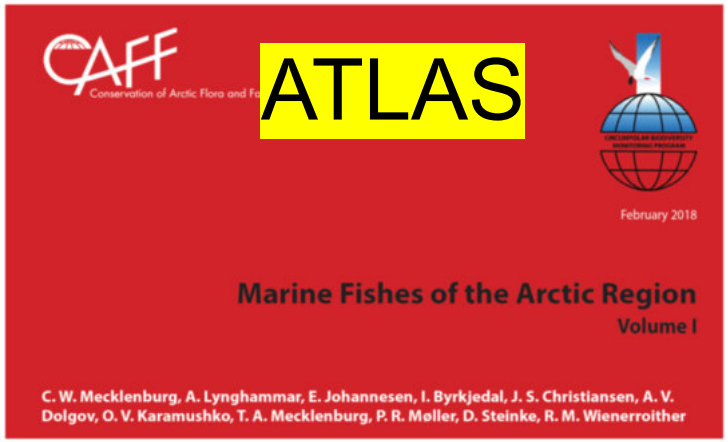
from Mecklenburg et al 2014

Example: *Lycodes adolfi*

- Knowledge on distribution and species identity is needed to assess changes caused by **warming**

Distribution shifts

=> Baseline distributions



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New areas open to investigation

=> Identification tools

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How was it made?

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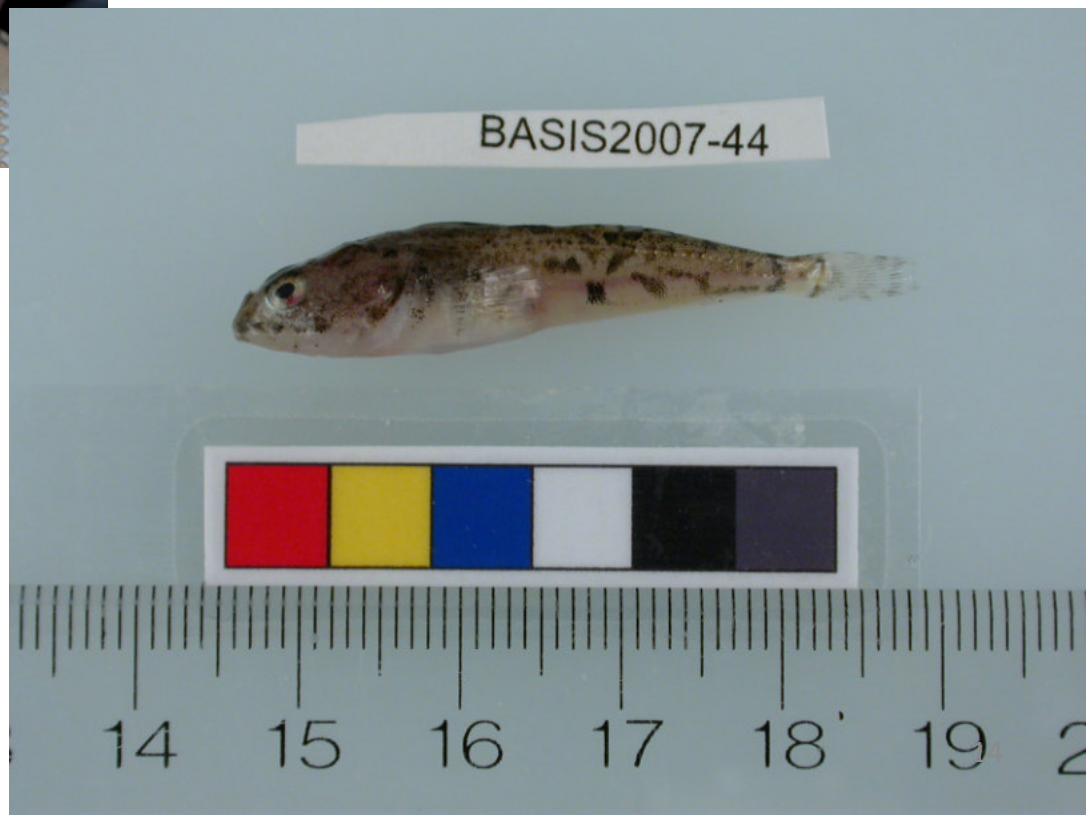
- Extensive **literature** search and **review:**
  - Finding the primary source of information
    => detective work!

- Validating and **evaluating information** from:
  - literature
  - data bases
  - collections
    => including checking museum specimens

- Collecting and using **barcoding** information:

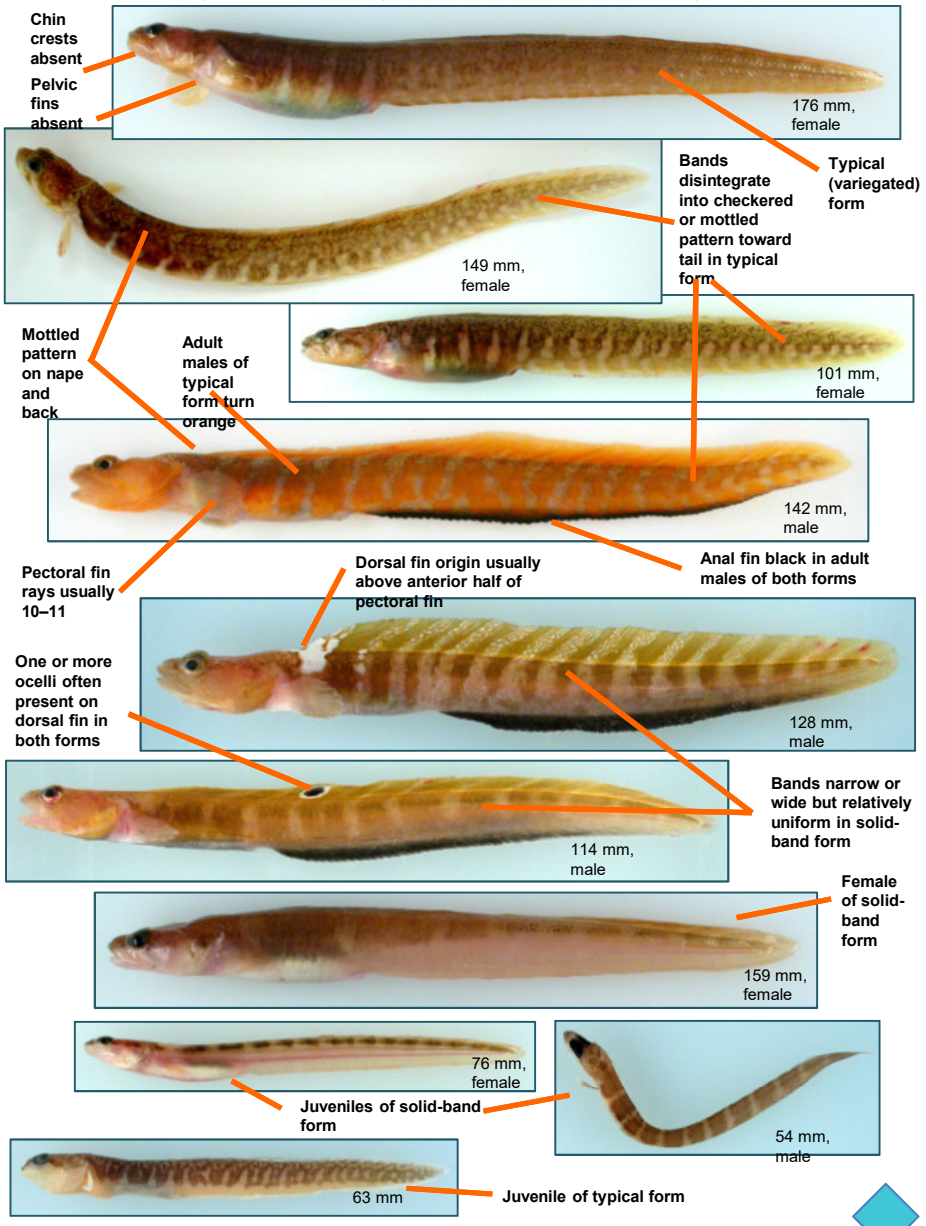


Taking photos for the guide:

Photo - Simonetta Corsolini

Family: Zoarcidae —
Eelpouts

Gymnelus hemifasciatus halfbarred pout



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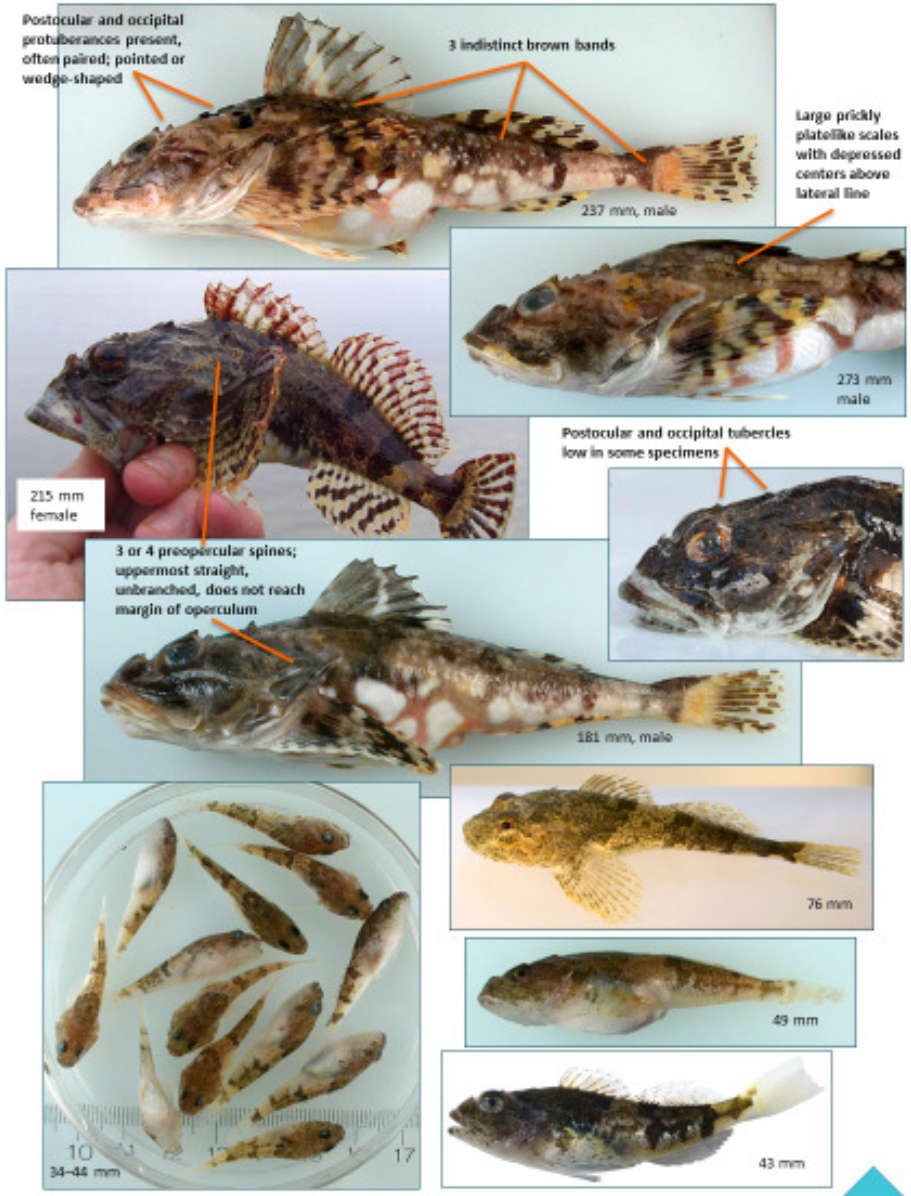
Family: Cottidae — Sculpins

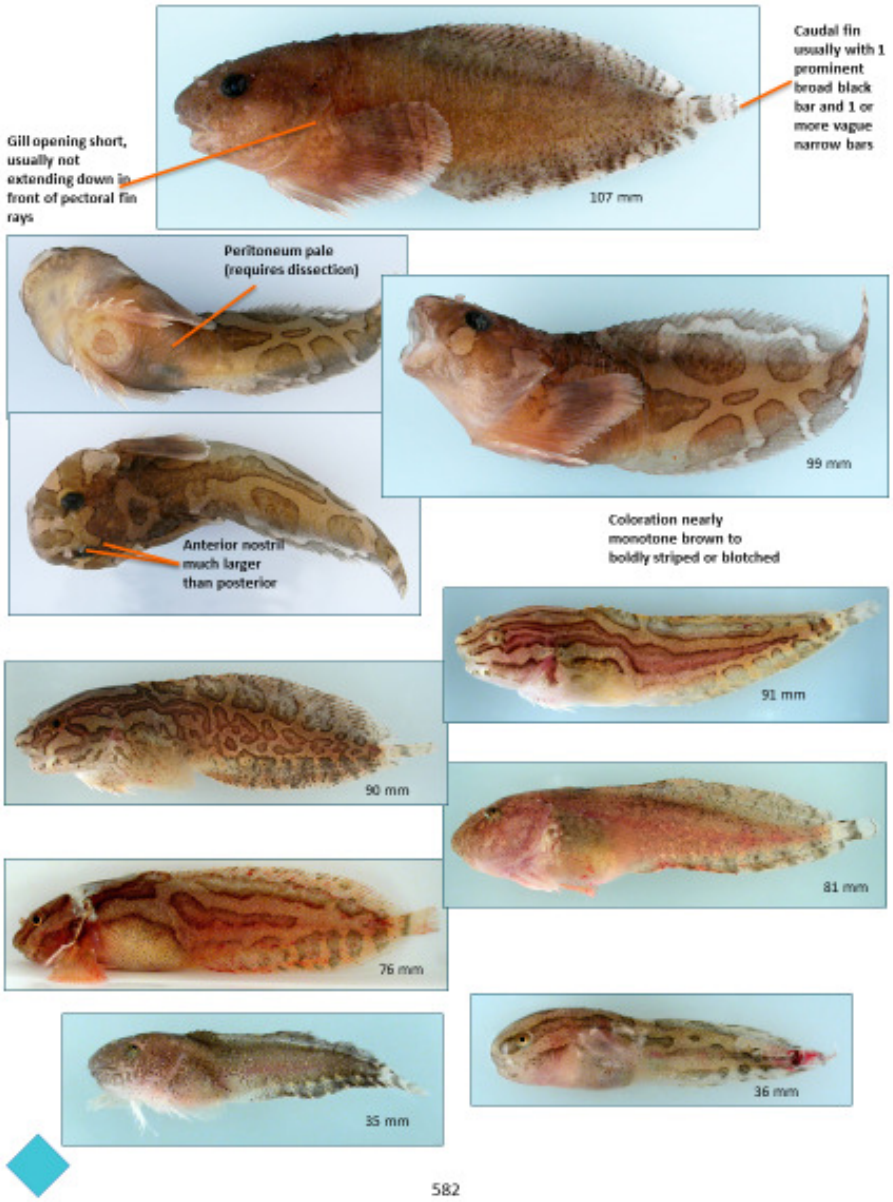
Myoxocephalus scorpius shorthorn sculpin



547

Family: Liparidae — Snailfishes

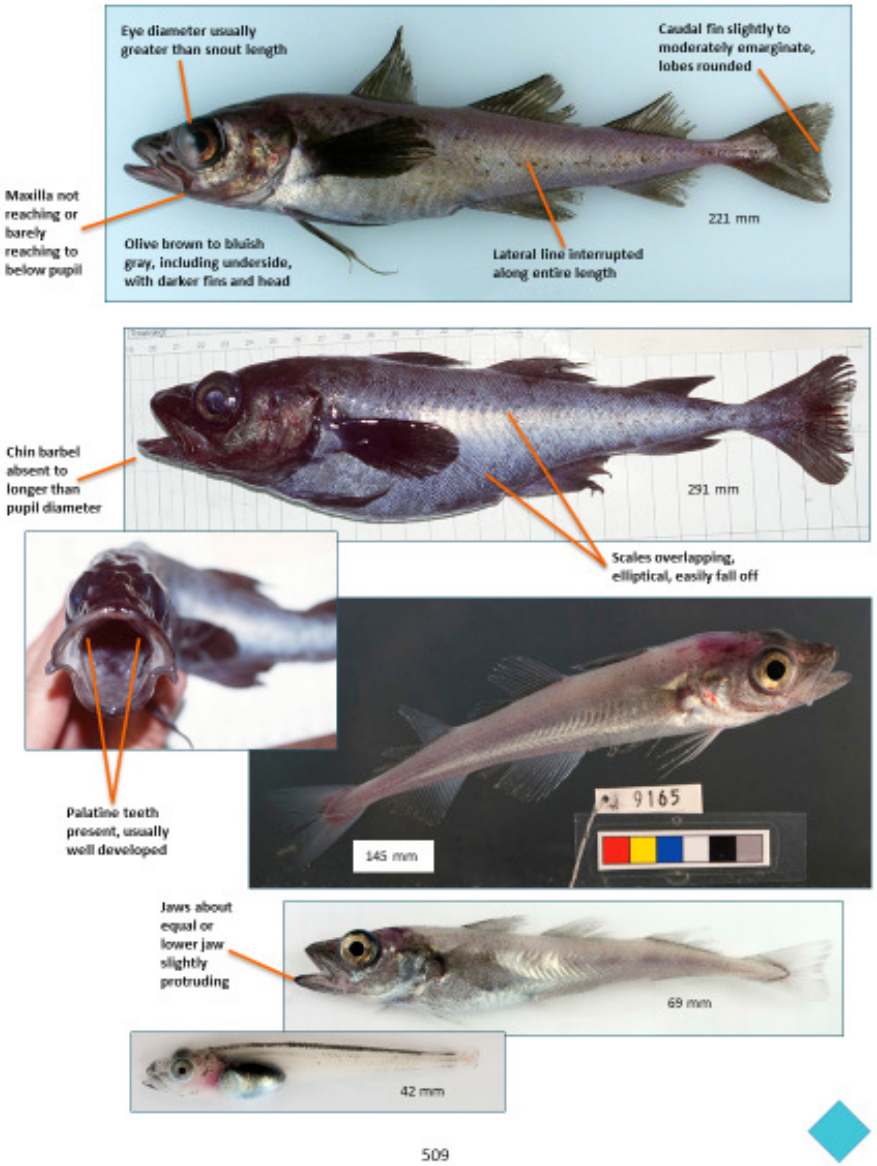
Liparis tunicatus kelp snailfish



582

Family: Gadidae — Cods

Arctogadus glacialis



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What next?

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- Atlas&guide **available** since 14.02.2018
  - Vol 1: 4812 downloads
  - Vol 2: 1679 downloads

- **Increased knowledge -** comprehensive, well referenced, compiled information

  "Definite treatment" .."authoritative volumes" (Eastman 2018 Polar Biology)

- **Improved species identification** and data quality

  => Better information on distributions and habitat use

- **Stimulate research**
  - Climate change impacts
  - Fish taxomomy

Mallotus capelin

Osmeridae — Smelts

Mallotus villosus (Müller, 1776) Atlantic capelin

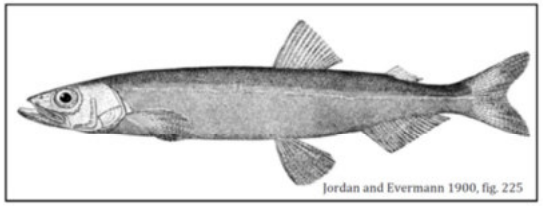
Zoogeography: Arctic–Boreal

Distribution: North Atlantic and adjacent Arctic.

Foxe Basin and Hudson Bay to Davis Strait, Gulf of St. Lawrence, and waters off Labrador, Newfoundland, and Nova Scotia; Greenland, Iceland, Jan Mayen, coasts of Norway to Svalbard, Franz Josef Land, Barents Sea, White Sea, and western Kara Sea.

Capelin in the western North Atlantic are a different, unnamed species, *Mallotus* sp., from the eastern Atlantic population which bears the name *M. villosus* (Mecklenburg and Steinke 2015). Their ranges overlap in the western Atlantic. The two species are not separated in this account because their distributions and morphological differences have not been completely resolved.

In Canadian waters, mainly distributed in Foxe Basin, Hudson Bay, Ungava Bay, Hudson Strait (Hunter et al. 1984), Davis Strait, along the coast and offshore banks of Newfoundland and Labrador and in the Gulf of St. Lawrence (Backus 1957, Scott and Scott 1988, Vilhjálmsson 1994, Frank et al 1996, Nozères e al. 2010). Common in some years on the Newfoundl6nd banks and Flemish Cap (Vázquez et al. 2013). Range extends southward to the Bay of Fundy and Gulf of Maine where they are found sporadically, and rarely to Cape Cod (Klein–MacPhee 2002b).



Jordan and Evermann 1900, fig. 225

Abundant in Greenland waters (Friis–Rødel and Kanneworff 2002, Møller et al. 2010). Recorded northward on the west coast to the harbor at Thule, about 76°30'N, and on the east coast to Scoresby Sound, about 70°N (Jensen 1948). Taken far offshore in the Greenland Sea at 76°08'N, 5°29'W in 2015 (Christiansen et al. 2016), and in 2017 found farther north, to 79°17'N, 7°13'W (TUNU, unpubl.). Abundant around Iceland (Vilhjálmsson 1994, Jónsson and Pálsson 2013). Common on the Greenland–Iceland Ridge, between Greenland, Jan Mayen, and Iceland (Anonymous 1987), and around Jan Mayen (Wienerroither et al. 2011b). They are frequent visitors to the Faroe Islands, but not spawning there; small numbers of 0- and 1-group capelin regularly drift from Iceland to the Faroe Islands (Jákupsstovu and Reinert 2002). Fjord populations in northern Norway. Along the Norwegian coast south to Trøndelag, about 63°N (Collett 1903, Pethon 2005). Anecdotes on huge spawning concentrations in the Trondheimsfjord, about 63°N, in the early 1900s (J. Mork, pers. comm. to E. Johannesen). Rare records of larvae drifted from Iceland into the Norwegian Sea by the east Icelandic current (Bjørke and Sæthre 1994, not shown on map). Two records in the Oslofjord (about 59°N), Norway from the 1880s (NHMO 3380, 3381).

Widespread and abundant in the Barents Sea, recently recorded north to about 82°N (Prokorova 2013). Common in the White Sea and eastward to the western part of the Kara Sea, including Kara and Baydaratskaya Bays and northward to about 82°N between Franz Josef Land and Severnaya Zemlya (Andriashev 1954; Borkin et al. 2008; Semushin and Novoselov 2009; Dolgov 2013; PINRO, unpubl. data). Distribution farther east, into the Laptev Sea, is uncertain and could overlap with *M. catervarius*. A record from Cape Mastakh near the Lena Delta was tentatively identified as

Osmeridae — Smelts

Mallotus catervarius (Pennant, 1784) Pacific capelin

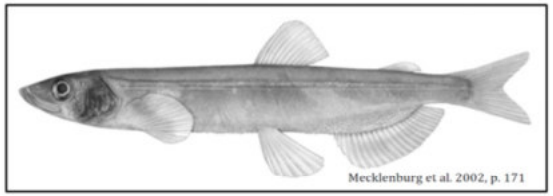
Zoogeography: Arctic–Boreal

Distribution: North Pacific and adjacent Arctic; also western Atlantic Arctic.

Laptev, East Siberian, Chukchi, and Beaufort Seas eastward to Davis Strait; southward through Bering Sea to Sea of Japan, Sea of Okhotsk, Commander and Aleutian Islands, and Gulf of Alaska to Strait of Juan de Fuca.

Documentation of the broad distribution in Alaskan waters was reviewed in Mecklenburg et al. (2002). Specimens recently collected and barcoded are from the Chukchi and Beaufort Seas to the Semidi Islands, Gulf of Alaska (e.g., Mecklenburg et al. 2011, 2016).

Recorded southeastward in the Gulf of Alaska to Bentinck Island, in the Strait of Juan de Fuca at the southern tip of Vancouver Island, British Columbia (Schultz 1937). In the western Pacific, widely distributed from near the border between Russia and Korea at the mouth of the Tumen River (Mori 1930) northward through the Seas of Japan and Okhotsk to southeastern Kamchatka and the Commander and Aleutian Islands (Fedorov et al. 2003). Also known off Hokkaido (Nakabo 2002).



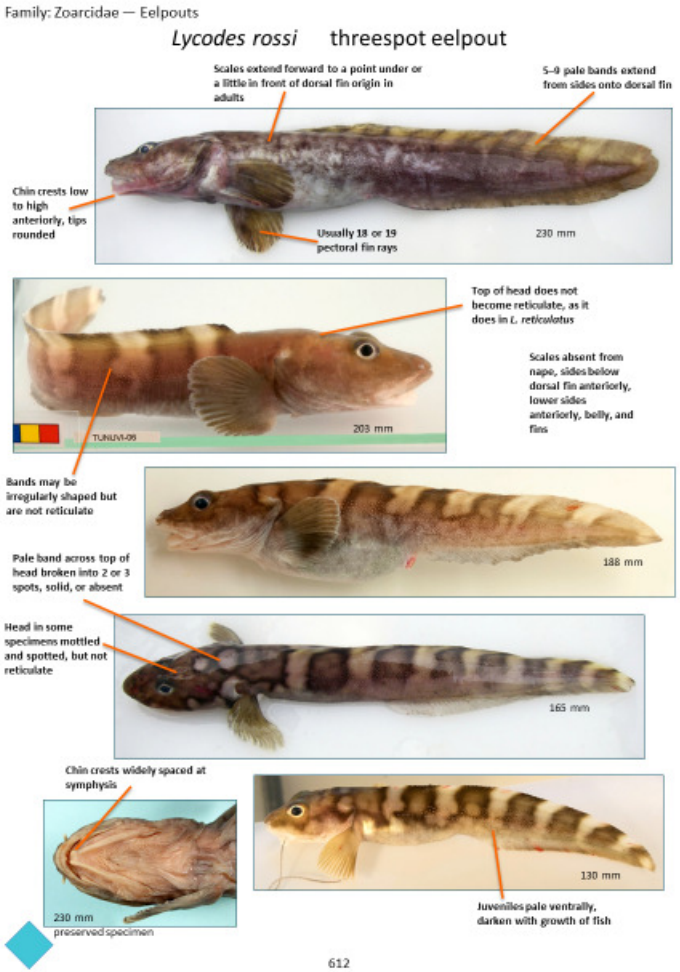
Mecklenburg et al. 2002, p. 171

Distribution extends eastward from the Alaskan Beaufort Sea into the Canadian Arctic at least as far as Coronation Gulf and Bathurst Inlet (Stergiou 1989). Distribution farther eastward across Arctic Canada and into the Atlantic is unclear due to possible sympatry with other *Mallotus* species (e.g., Dodson et al. 2007), the scarcity of *Mallotus* records from Arctic Canada, and the lack of molecular genetic data from Arctic Canada. The two dots on the distribution map in Davis Strait at the southern end of Baffin Island represent material from eastern Canada determined by molecular genetic sequencing: at Pangnirtung, about 60°09'N, 65°42'W, in the Arctic clade (mtDNA, cyt *b*) of Dodson et al. (2007); and in Davis Strait at 67°19'N, 62°23'W, in the *M. catervarius* clade (mtDNA, COI) of Mecklenburg and Steinke (2015).

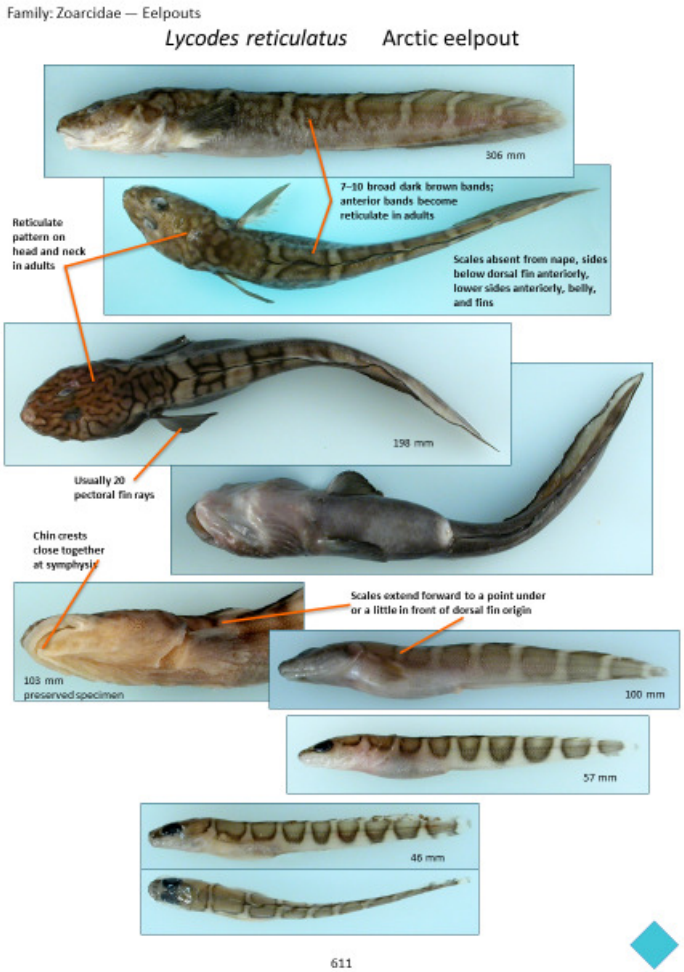
To the west of Alaska in Siberian seas, the distribution is also unclear. In 2012, caught in RUSALCA bottom trawls in the western Chukchi Sea off Wrangel Island (Mecklenburg et al. 2016). Reported to be present in the East Siberian and Laptev Seas (Parin et al. 2014) but few specific records were found in the literature cited for this distribution. A female with ripe eggs caught in 1945 at Cape Mastakh near the Lena River Delta was tentatively identified as *M. villosus socialis* (Berg 1948), a subspecies currently recognized in the synonymy of *M. catervarius*. Rare, recent records from the East Siberian Sea and Laptev Sea identified as *M. villosus* likely also pertain to *M. catervarius*: specimens taken in 2015 in the East Siberian Sea at about 71°30'N, 164°00'E (Glebov et al. 2016a); one in 2014 northwest of the New Siberian Islands at 78°04'N, 133°24'E, depth 240 m (Chernova et al. 2015); and one in 2015 in the north-central part of the Laptev Sea at about 76°30'N, 124°20'E (Glebov et al. 2016b).

Abundant in the Pacific Arctic. Walters (1955) reviewed the literature on spawning at Point Barrow, Alaska, and Barsukov (1958) reported large catches and described the breeding cycle and spawning behavior in 1955 at Provi-

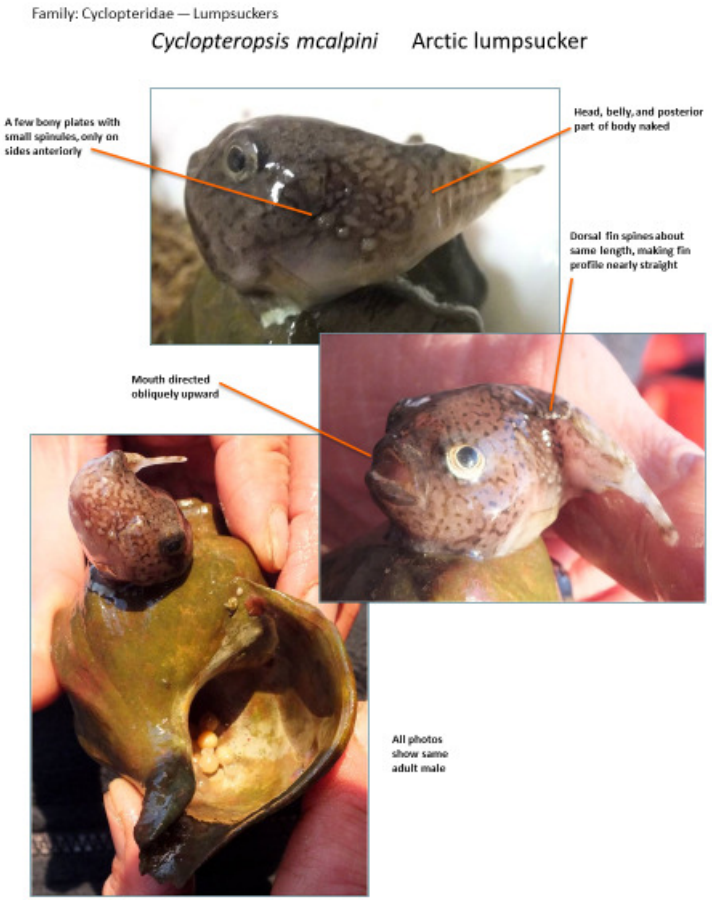
Lycodes rossi



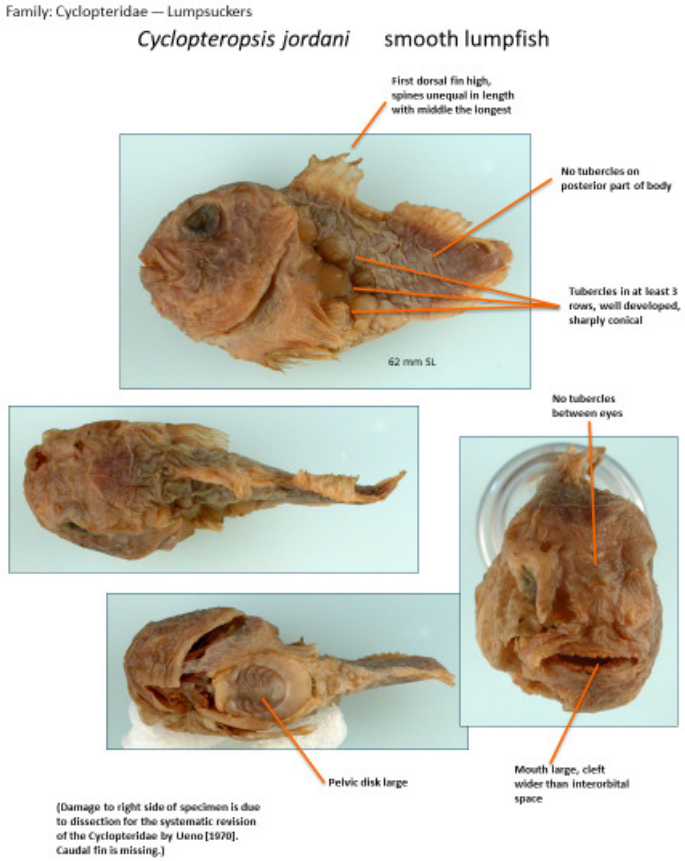
Lycodes reticulatus



Cyclopteropsis mcalpini



Cyclopteropsis jordani



THANK YOU!
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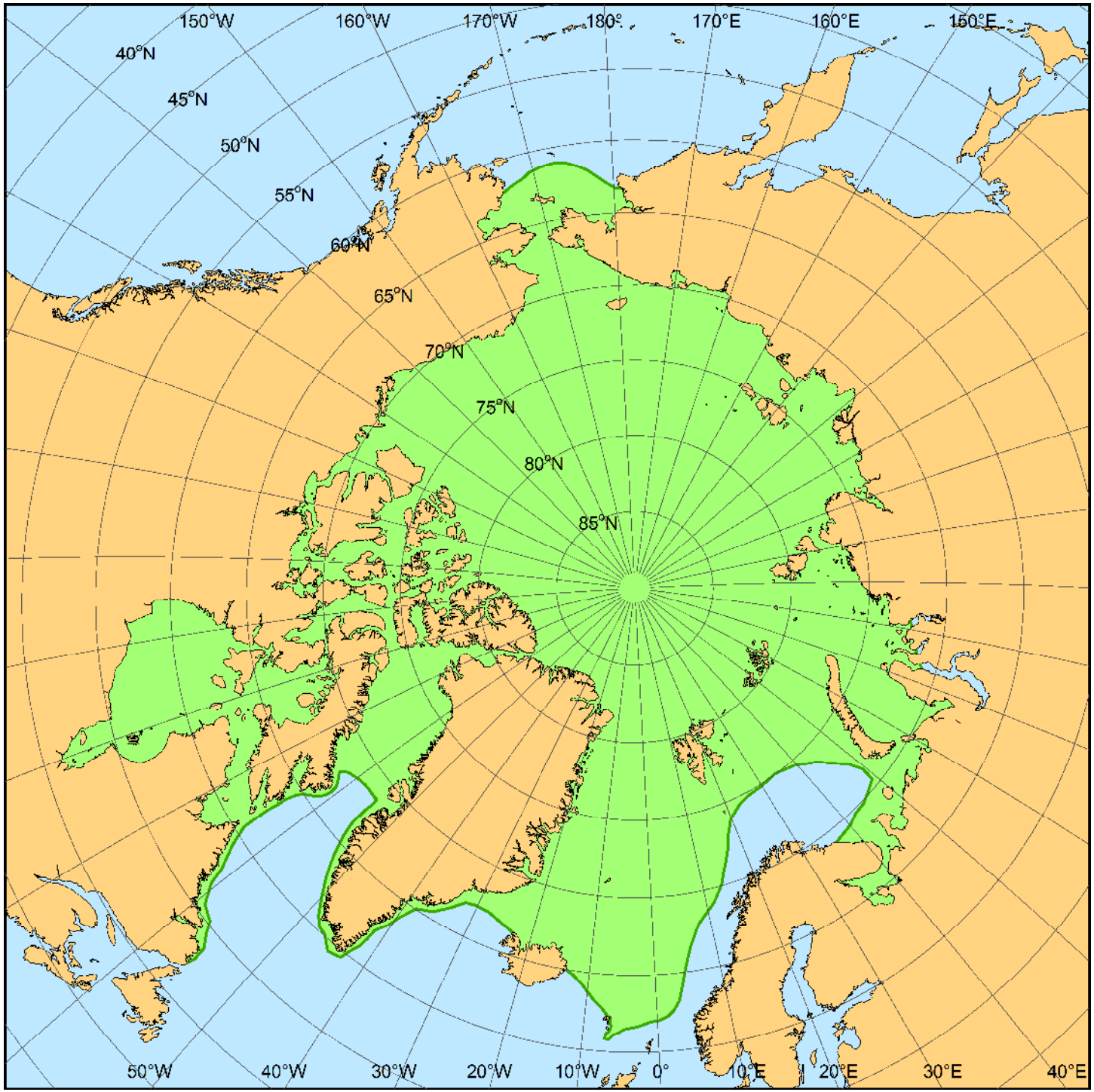
150°W
160°W
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