

**REVISÃO TAXONÔMICA DA FAMÍLIA MYXINIDAE
RAFINESQUE, 1815 (MYXINIFORMES)**

Michael Maia Mincarone

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**REVISÃO TAXONÔMICA DA FAMÍLIA MYXINIDAE
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Michael Maia Mincarone

Orientador: Prof. Dr. Roberto E. Reis

TESE DE DOUTORADO

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Dedico este trabalho a meus avós Arídes e Otília
(*in memorian*), a meus pais Carlos e Terezinha, a
minha esposa Milena e a meu filho Isaac.

*Quando falares, cuida para que
tuas palavras sejam melhores que
o silêncio.*

Provérbio Indiano

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RESUMO

Este trabalho contém informações extensivamente revisadas sobre a taxonomia e distribuição dos peixes-bruxa. Ele inclui todas as espécies nominais da família Myxinidae, a qual compreende 2 subfamílias, 6 gêneros e 69 espécies. Informações sobre cada espécie incluem: nomes válidos e descrições originais; sinônimos; material examinado; características diagnósticas; tamanho máximo; distribuição e habitat; interesse pesqueiro; observações (quando necessário); e nomes vernaculares. Pela primeira vez são apresentadas chaves de identificação e mapas de distribuição para todos os gêneros e espécies, observando-se ampliações na distribuição de muitas delas. As subfamília Paramyxininae Berg, 1947 e Quadratinae Wisner, 1999 são consideradas sinônimos júnior de Eptatretinae Bonaparte, 1850. O gênero *Quadratus* Wisner, 1999 é considerado sinônimo júnior de *Paramyxine* Dean, 1904. Uma espécie de *Eptatretus* e duas de *Myxine* são sinonimizadas. Duas novas espécies são descritas: *Eptatretus lakeside* Mincarone & McCosker, 2004, do Arquipélago de Galápagos, e *Eptatretus goliath* Mincarone & Stewart, 2006, da Nova Zelândia. A inclinação da curva acumulativa de diversidade temporal indica que o número de espécies de Myxinidae ainda está longe de ser conhecido. Cruzeiros de pesquisa direcionados a regiões pouco exploradas e o uso de novas tecnologias de coleta poderão revelar espécies ainda não descritas.

APRESENTAÇÃO

Esta tese é constituída de dois artigos científicos e de um livro, e cada um deles corresponde a um capítulo. Este trabalho é fruto de um projeto inicial que tinha como foco principal o conhecimento taxonômico sobre as espécies de peixe-bruxa do Brasil, sobre as quais nada havia sido publicado até então. Primeiramente, duas novas espécies foram identificadas e descritas: *Eptatretus menezesi* Mincarone, 2000 e *Myxine sotoi* Mincarone, 2001, ambas do talude continental brasileiro. Outras três espécies nominais foram também reportadas em águas brasileiras, quais sejam *Eptatretus multidens* Fernholm & Hubbs, 1981, da costa nordeste, *Myxine australis* Jenyns, 1842 e *Nemamyxine krefftii* McMillan & Wisner, 1982, ambas da plataforma continental do Rio Grande do Sul (Mincarone, 2001a, 2001b; Mincarone & Sampaio, 2004).

Após esta primeira fase do estudo e no âmbito do Programa de Doutorado em Zoologia da PUCRS, o projeto foi ampliado para contemplar uma revisão taxonômica compreendendo todas as espécies de Myxinidae. No decorrer deste trabalho, duas novas espécies foram identificadas: *Eptatretus lakeside* Mincarone & McCosker, 2004, do Arquipélago de Galápagos, publicada no *Proceedings of the California Academy of Sciences*, e mais recentemente, *Eptatretus goliath* Mincarone & Stewart, 2006, da Nova Zelândia, publicada na revista *Copeia*. Estes artigos constituem, respectivamente, o Capítulo I e II da presente tese.

Em junho de 2004, o autor foi convidado pela *Food and Agriculture Organization of the United Nations* (FAO) a publicar um catálogo sobre a família Myxinidae no seriado *FAO Species Catalogue for Fishery Purposes*, o que, em parte, coincidia com os objetivos da tese em si. Este catálogo constitui o Capítulo III da tese e segue as normas editoriais estipuladas pela FAO.

O Catálogo contém informações taxonômicas e distribucionais atualizadas e extensivamente revisadas sobre todas as espécies nominais de Myxinidae, incluindo sinonímias e novos arranjos nomenclaturais. O trabalho é direcionado principalmente àqueles interessados na sistemática, diversidade e distribuição dos myxinídeos, bem como nos poucos dados disponíveis sobre biologia e pesca. Apesar de muitas espécies de Myxinidae formarem densas populações e serem abundantes em seus habitats, o processo de identificação frequentemente apresenta grande dificuldade. Esta se deve principalmente ao pequeno número de caracteres diagnósticos e a grande variabilidade

morfológica intra-específica, o que explica o grande número de citações na literatura em nível de gênero ou família. Para facilitar o processo de identificação, pela primeira vez são apresentadas chaves para todos os gêneros e espécies. Da mesma forma, mapas distribucionais de todas as espécies tratadas são ilustrados no Catálogo.

A metodologia de medidas e contagens, incluindo nomenclatura das estruturas anatômicas e termos técnicos utilizados foram compilados de Fernholm & Hubbs (1981), McMillan & Wisner (1984), Wisner & McMillan (1995), e Mok (2001). Alguns termos foram modificados ou ganharam novo significado, mas todos são apresentados na forma de glossário.

Para cada espécie são apresentadas as seguintes informações: nome científico, material examinado, ilustração da espécie (quando disponível), caracteres diagnósticos, tamanho, distribuição e habitat, mapas de distribuição, interesse pesqueiro, observações, e nomes vernaculares. A lista de referências bibliográficas apresentada no final do Catálogo é fruto de uma extensa consulta em bibliotecas do Brasil e exterior, incluindo as bibliotecas do *National Museum of Natural History* (Washington, DC) e da *California Academy of Sciences* (San Francisco, CA), uma das mais completas bibliotecas de ictiologia do mundo.

Os resultados obtidos através da revisão taxonômica, foram, tanto quanto possível, incorporados ao formato e padrão editorial previstos pelos editores da FAO. Entretanto, o formato do catálogo, ainda que contemple os dados necessários para o seu propósito, exclui alguns aspectos importantes que fazem parte da construção desta tese, como, por exemplo, as conclusões gerais deste estudo. Com a finalidade de suprir esta carência, o Capítulo IV traz um apanhado sobre os principais resultados e conclusões.

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CAPÍTULO I

***Eptatretus lakeside* sp. nov., a new species of five-gilled hagfish
(Myxinidae) from the Galápagos Islands**

Michael M. Mincarone

&

John E. McCosker

Reprinted from the
Proceedings of the California Academy of Sciences
Volume 55, No. 5, pp. 162–168. April 22, 2004

***Eptatretus lakeside* sp. nov., a New Species of
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***Eptatretus lakeside* sp. nov., a New Species of Five-Gilled Hagfish (Myxinidae) from the Galápagos Islands**

Michael M. Mincarone¹ and John E. McCosker²

¹ *Museu Oceanográfico do Vale do Itajaí, Univali, CP 360, Itajaí, SC, Brazil, 88302-202. Email: mincarone@bc.univali.br;* ² *California Academy of Sciences, Golden Gate Park, San Francisco, California 94118-4599. Email: jmccosker@calacademy.org.*

We describe *Eptatretus lakeside* sp. nov. from a deepwater (762 m) specimen trapped off Fernandina Island, Galápagos Islands. The new species differs from all known *Eptatretus* in having: five pairs of gill pouches; 3-cusp multicusps in anterior and posterior rows; 6 unicusps in each anterior and posterior row; 36 total cusps; 19 tail pores; 88 total pores; palatine tooth triangular; and body coloration pinkish-orange. A key to the species of Galápagos hagfishes is provided.

The myxinoid fauna of the Galápagos Archipelago was unknown until 1995 when the California Academy of Sciences (CAS) / Harbor Branch Oceanographic Institute (HBOI) expedition made numerous deepwater collections using the submersible *Johnson Sea-Link*. During that cruise, three species of *Eptatretus*, *E. grouseri*, *E. mccoskeri*, and *E. wisneri* were trapped and all were described as new (McMillan 1999). A subsequent expedition in 1998 involving CAS, HBOI, and the National Museum of Natural History (USNM), again using the submersible *Johnson Sea-Link*, captured additional specimens of hagfishes, including a single remarkable specimen of *Eptatretus*, which is described herein as new.

Hagfishes are rare in the eastern tropical Pacific but abundant in the temperate and subtemperate eastern Pacific. In fact, the extensive deepwater collections off Central America and the Galápagos made by the U.S. Fish Commission Steamer *Albatross* in 1891 (Garman 1899) resulted in but one hagfish specimen. It was captured over a rocky bottom in 730 fathoms (1335 m) in the southern end of the Gulf of Panama and described as *Myxine circifrons* Garman, 1899. In contrast to the *Albatross*, the successful capture of hagfishes by the recent expeditions can be explained by the difficulty that the *Albatross* expedition had in trawling over unusually rocky terrain, and by the undeniable benefits provided by manned submersibles in exploring and collecting in complex deepwater habitats.

Currently, there are 30 recognized species of *Eptatretus*, 12 of which are known from the eastern Pacific (McMillan and Wisner 1984; Wisner and McMillan 1988, 1990; McMillan 1999). Undoubtedly more species remain to be discovered.

MATERIALS AND METHODS

The type of the new species as well as the holotypes of all other hagfishes from the Galápagos Islands are deposited in the Department of Ichthyology of the California Academy of Sciences (CAS), San Francisco. Other type specimens examined are deposited in the Scripps Institution of Oceanography (SIO), La Jolla, and National Museum of Natural History (USNM), Washington, D.C.

Methods of measuring and counting follow those of Fernholm and Hubbs (1981) and McMillan and Wisner (1984). The names of anatomical structures follow Wisner and McMillan (1995) and Mok (2001). Length of the specimens (in mm) is given as total length (TL), the distance from the front of the rostrum to the end of the caudal finfold. All other measurements are given in percentage of TL. Counts of gill pouches (GP), gill apertures (GA), and cusps are taken for both sides, whereas slime pore counts are from the left side. Measurements and counts are given in Table 1 and compared with data of all other *Eptatretus* species previously known from the Galápagos Islands. We provide drawings from the anterior and posterior sets of cusps, including the palatine tooth, which are not usually useful characters to identify hagfish species, but in this case they aid in distinguishing species. We provide a key to the *Eptatretus* species from the Galápagos Islands, which was modified from McMillan (1999).

***Eptatretus lakeside* Mincarone and McCosker, sp. nov.**

(Figs. 1, 3; Table 1)

MATERIAL EXAMINED.— Holotype: CAS 201880 (field number JM-155), an immature female, 275 mm TL, from off Cabo Douglas, NW Fernandina Island, Galápagos Islands, 00°17'30"S, 91°39'36"W, 762 m depth, collected on 17 July 1998 by David Pawson and Godfrey Merlen, using a baited metallic minnow trap, deployed while aboard the submersible R/V *Johnson Sea-Link* (JSL Dive 3101).

DIAGNOSIS.— *Eptatretus lakeside* can be distinguished from its congeners by a combination of the following characters: five pairs of gill pouches; 3-cusp multicusps in anterior and posterior rows; 6 unicusps in each anterior and posterior rows; 36 total cusps; 19 tail pores; 88 total pores; palatine tooth triangular; and body coloration pinkish-orange.

DESCRIPTION OF THE HOLOTYPE.— Body subcylindrical and slender, slightly deeper than wide at prebranchial, branchial, and trunk regions and strongly compressed at tail. Rostrum bluntly rounded; nasopharyngeal duct cylindrical, tube-like, slightly projecting. One pair of conspicuous nasal-sinus papillae on the inner dorsal surface of the nasal sinus. Three pairs of barbels on the head, the first two pairs about equal in size and adjacent to the nasopharyngeal duct; the third pair is immediately adjacent to the oral cavity. Ventral finfold (VFF) conspicuous, 2 mm high, beginning 25 mm behind the last gill aperture and extending backward to the cloaca. Caudal finfold quite thin and rounded, extending around tail to dorsal surface, ending about over cloaca.

Total length 275 mm; prebranchial length 68 mm; branchial length 17 mm; trunk length 145 mm; tail length 50 mm; body width at prebranchial region 14 mm; body depth at mid-trunk including VFF 20 mm; body depth excluding VFF 18 mm; body depth over cloaca 15 mm; tail depth 17 mm. Three-cusp multicusps in anterior and posterior rows of cusps; 6 unicusps in each anterior and posterior row; total cusps 36. Cusps long, slender, and pointed; palatine tooth triangular (Fig. 3). A segmentally arranged row of slime pores on each side, extending from beyond head to behind cloaca. Prebranchial pores 15; branchial pores 4; trunk pores 50; tail pores 19; total pores 88. Four branchial pores are intercalated with five gill apertures on both sides. No slime pore associated with the pharyngocutaneous duct. Five pairs of gill pouches corresponding to five pairs of gill apertures. Last branchial duct confluent with the pharyngocutaneous duct on the left side. First pair of gill pouches lies posterior to end of dental muscle; ventral aorta branches at the second gill pouch.

Body color in alcohol pinkish; barbels and face the same color as body; eyespots present but inconspicuous; ventral finfold pale; caudal finfold with a narrow pale margin. In life, the specimen was pinkish-orange.

DISTRIBUTION.— Known only from the Galápagos Islands.

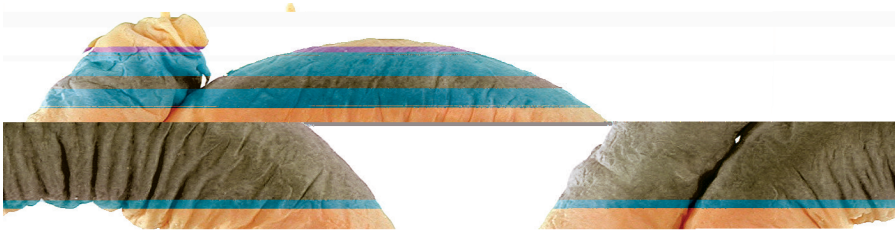


FIGURE 1. Dorsal view of preserved holotype of *Eptatretus lakeside* (CAS 201880; 275 mm TL).

ETYMOLOGY.— Named *lakeside*, a noun in apposition. We take great pleasure in honoring the Lakeside Foundation of California, which has generously supported the work of the senior author and many other foreign scholars.

Key to Galápagos Species of *Eptatretus*

- 1a. Five or six gill pouches and apertures on each side. 2
- 1b. Eight gill pouches and apertures on each side 3
- 2a. Body coloration pinkish-orange; 3/3 multicusp pattern; 36 total cusps; 88 total pores *Eptatretus lakeside*, new species
- 2b. Body coloration dark brown; 3/2 multicusp pattern; 44–48 total cusps; 71–79 total pores *Eptatretus grouseri* McMillan, 1999
- 3a. Prebranchial length 24–26 % of TL; 3/3 multicusp pattern; 48–51 total cusps; 14–15 prebranchial pores *Eptatretus mccoskeri* McMillan, 1999
- 3b. Prebranchial length 19–23 % of TL; 3/2 multicusp pattern; 44 total cusps; 9 prebranchial pores *Eptatretus wisneri* McMillan, 1999

COMPARISON.— Three five-gilled species of *Eptatretus* were previously known: *E. grouseri* McMillan, 1999 from the Galápagos Islands, *E. profundus* (Barnard, 1923) from South Africa, and *E. eos* Fernholm, 1991 from the Tasman Sea. All have a 3/2 multicusp pattern, whereas *E. lakeside* has 3/3. *Eptatretus lakeside* also differs from *E. grouseri* in the following characters, respectively:

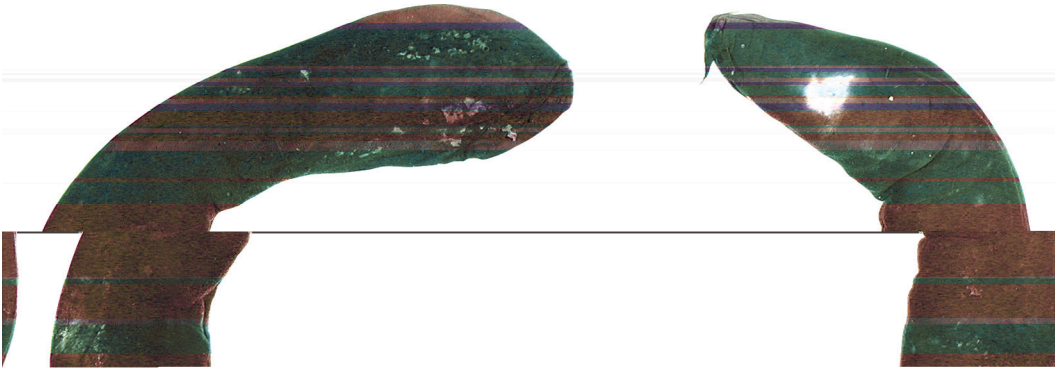


FIGURE 2. Left lateral view of preserved *Eptatretus grouseri* (CAS 201882; 420 mm TL).

number of unicusps on each row (6 vs. 8–10); total cusps (36 vs. 44–48); tail pores (88 vs. 71–79); shape of palatine tooth (triangular and depressed vs. conic [Fig. 3]); and its body coloration (pinkish-orange [Fig. 1] vs. dark brown [Fig. 2]). Also, the teeth of *E. lakeside* are more slender and more elongate than those of *E. grouseri* (Fig. 3). *Eptatretus lakeside* differs from *E. profundus* in the following characters, respectively (based on the redescription of the holotype of *E. profundus*

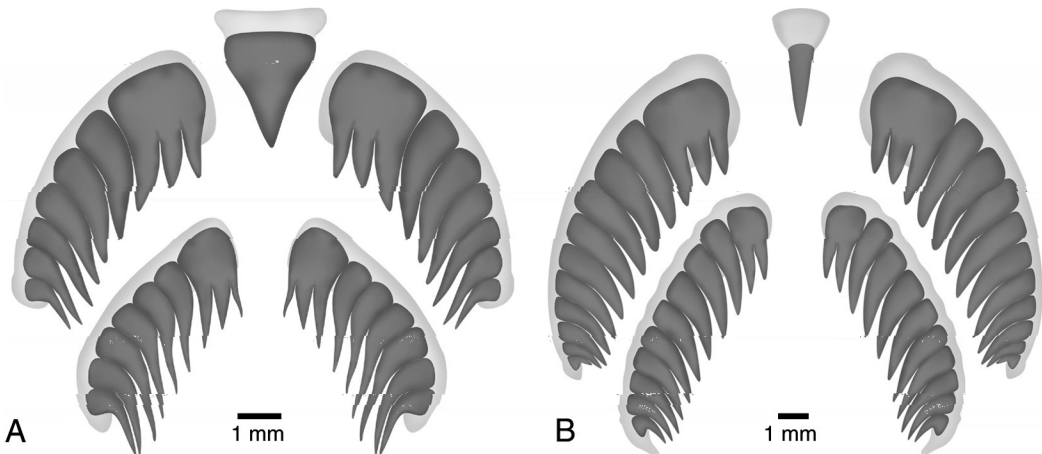


FIGURE 3. Dentition of (A) *Eptatretus lakeside* (CAS 201880, 275 mm TL), and (B) *Eptatretus grouseri* (CAS 201882, 420 mm TL).

TABLE 1. Measurements and counts of *Eptatretus* from the Galápagos Islands.

	<i>E. lakeside</i> Holotype	<i>E. grouseri</i> Holotype	<i>E. grouseri</i> Non-types (2)	<i>E. mccoskeri</i> Holotype	<i>E. wisneri</i> Holotype
Total length TL (mm)	275	370	315–420	310	355
Measurements in % of TL					
Prebranchial length	4.7	20.3	21.0–22.2	25.8	18.9
Branchial length	6.2	8.1	6.3–6.5	10.0	12.1
Trunk length	50.9	57.0	54.0–55.7	48.4	51.3
Tail length	18.2	14.6	16.9–17.5	15.8	17.7
Body width	5.0	5.9	5.4–6.3	7.3	6.5
Body depth					
Inc. ventral finfold	7.2	6.8	7.9–9.0	8.2	8.0
Exc. ventral finfold	6.4	6.8	7.9–8.8	8.2	7.7
Over cloaca	5.4	5.7	6.4–6.5	7.3	6.5
Tail	6.0	6.8	7.6–7.9	8.9	8.3
Counts					
Cusps					
Multicusps	3/3	3/2	3/2	3/3	3/2
Anterior unicusps*	6+6	9+9	9–10	10+10	9+9
Posterior unicusps*	6+6	8+8	9–9	9+10	9+9
Total cusps	36	44	46–48	51	46
Slime pores, left side					
Prebranchial	15	12	11–12	13	9
Branchial	4	4	5–5	7	7
Trunk	50	46	42–48	43	43
Tail	19	15	13–14	10	14
Total pores	88	77	71–79	73	73
Gill apertures*	5+5	5+5	5–6	8+8	8+8
Gill pouches*	5+5	5+5	5–6	8+8	8+8

* Left + right count.

by Strahan 1975): number of unicusps on each row (6 vs. 8); tail pores (19 vs. 15); and its body coloration (pinkish-orange vs. dark brown). Despite the multicusp condition, *E. eos* shares some characters with *E. lakeside*: both have a pinkish body coloration; a long tail (about 18% of TL); an elongated tube-like nostril (longer in *E. eos*); and the same number of unicusps (six). However, *E. lakeside* differs from *E. eos* in the number of prebranchial pores (15 vs. 26), trunk pores (50 vs. 75–77), tail pores (19 vs. 26–27), and total pores (88 vs. 128–130) (based on the original description of the holotype of *E. eos* by Fernholm 1991). The other two *Eptatretus* species from the Galápagos Islands, *E. mccoskeri* and *E. wisneri*, can be easily separated from *E. lakeside* by their having eight pairs of gill pouches and a brownish-black body coloration. The triangular shape of

the palatine tooth is probably an autapomorphy of *E. lakeside* (Fig. 3A). *Nemamyxine krefftii* McMillan & Wisner, 1982, is the only other hagfish that has a similar palatine tooth, but its tooth is more depressed and has a rounded point (Mincarone 2001). In most hagfish species the palatine tooth has a conical shape like a bird's claw (Fig. 3B).

The Galápagos species of *Eptatretus*, albeit based on a very limited sample size, appear to be stratified by depth. The only known *E. mccoskeri* were trapped at 215 m on a seamount SE of San Cristobal Island on the eastern edge of the archipelago. The other species were captured off Fernandina Island (F), along the western edge of the archipelago, and from Seymour (S) Island (= James) in the center of the archipelago. They were trapped at the following depths: *E. wisneri*, 512–563 m (F); *E. grouseri*, 648–722 m (F and S); and *E. lakeside*, 762 m (F).

REMARKS.— The location of capture, Cabo Douglas, is located along the NW corner of Fernandina Island and drops steeply into deep water (more than 1000 m depth at a distance less than 2 km from shore). The specimen was collected using a galvanized metal minnow trap baited with fish flesh and set from the submersible at 0845 and retrieved approximately one hour later. The bottom was nearly flat with a slight downward slope ($<10^\circ$) and covered with fine gray sediment and occasional lava boulders (~0.5 m in diameter) in the vicinity of other large lava reefs. The temperature at depth was 8°C and there was a current of ~0.3 knot. The habitat is further described by Iwamoto and McCosker (2001) who described a new macrourid, *Coryphaenoides gypsophilus*, from that site. Also observed at and near that locality were several pelagic holothurians (*Pelagothuria nanatrix* Ludwig), hagfishes (*Eptatretus grouseri* McMillan and *E. wisneri* McMillan), catsharks (*Apristurus* spp.), combtooth dogfish (*Centroscyllium nigrum* Garman), chimaeras (*Hydrolagus* spp.), witch-eels (*Facciolella equatorialis* (Gilbert)), viperfish (*Chauliodus sloani* Bloch and Schneider), grenadier (*Nezumia loricata loricata* (Garman)), cardinalfish (*Epigonus merleni* McCosker and Long), batfishes (*Dibranchius erinaceus* (Garman)), ateleopodids (*Guentherus altivelis* (Osório)), bythitids (*Diplacanthopoma jordani* (Garman)), and an undescribed scorpionfish (*Phenacoscorpius* sp.).

COMPARATIVE MATERIAL.— *Eptatretus grouseri*: CAS 86428, holotype, 370 mm TL, Punta Espinosa, Fernandina Island, Galápagos Islands, $00^\circ14'36''\text{S}$, $91^\circ26'36''\text{W}$, 722 m; SIO 97–77, paratype, 138 mm TL, taken with holotype; CAS 201882, 2 specimens, 315–420 mm TL, Seymour Island, Galápagos Islands, $00^\circ21'42''\text{S}$, $90^\circ15'00''\text{W}$, 648 m, 25 July 1998, *Johnson Sea-Link* (JSL Dive 3113). *Eptatretus mccoskeri*: CAS 86431, holotype, 310 mm TL, San Cristobal Island, Galápagos Islands, $01^\circ06'19''\text{S}$, $89^\circ06'56''\text{W}$, 215 m; SIO 97–75, paratype, 290 mm TL, taken with holotype; USNM 344905, paratype, 284 mm TL, taken with holotype. *Eptatretus wisneri*: CAS 86429, holotype, 355 mm TL, Cabo Hammond, Fernandina Island, Galápagos Islands, $00^\circ27'56''\text{S}$, $91^\circ37'33''\text{W}$, 563 m; SIO 97–76, paratype, 316 mm TL, Galápagos Islands, $00^\circ17'30''\text{S}$, $91^\circ38'54''\text{W}$, 512 m.

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CAPÍTULO II

**A new species of giant seven-gilled hagfish (Myxinidae: *Eptatretus*)
from New Zealand**

Michael M. Mincarone

&

Andrew L. Stewart

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A New Species of Giant Seven-gilled Hagfish (Myxinidae: *Eptatretus*) from New Zealand

MICHAEL M. MINCARONE AND ANDREW L. STEWART

Eptatretus goliath new species, is described from a specimen caught at the head of the Hauraki Canyon off the northeast North Island, New Zealand, at 811 m depth. It differs from all other seven-gilled *Eptatretus* in having three-cusp multicusps in anterior and posterior rows, 11–13 unicusps in anterior rows, nine unicusps in posterior rows, total cusps 54, 14–15 prebranchial pores, 57–58 trunk pores, 13–14 tail pores, 92 total pores, and a prominent ventral finfold. The single specimen, at 1275 mm TL and 6.2 kg, is the largest hagfish yet known.

THE seven-gilled hagfishes of the genus *Eptatretus* (Myxinidae) from the Pacific Ocean have been previously studied by McMillan and Wisner (1984), who recorded four species: *E. carlhubbsi* from the northern Pacific, *E. cirrhatus* from southeastern Australia and New Zealand, *E. laurahubbsae* from Juan Fernández Islands, and *E. strahani* from the Philippines. Prior to the present account, *Eptatretus carlhubbsi* had been the largest known hagfish, with nine specimens measuring 810–1160 mm total length (McMillan and Wisner, 1984).

During exploratory commercial fishing for deep-water crabs in 2002, a single specimen of an extremely large hagfish was taken off northeastern New Zealand and returned to the Museum of New Zealand. Detailed study indicates this species belongs to an undescribed species. Herein we describe it as a new seven-gilled *Eptatretus*. Measuring 1275 mm total length, it is the largest hagfish reported to date.

MATERIALS AND METHODS

Methods for measurements and counts follow those of Fernholm and Hubbs (1981) and McMillan and Wisner (1984). Terminology of anatomical structures follows Wisner and McMillan (1995) and Mok (2001). Length of specimens (in mm) is given as total length (TL), defined as the distance from the front of the rostrum to the posterior margin of caudal finfold. All other measurements are given in millimeters and as percentage of TL. Counts of gill pouches (GP), gill apertures (GA), cusps, and slime pores were taken from both sides of the specimen. Institutional abbreviations are as listed in Leviton et al. (1985), except MOVI—Museu Oceanográfico do Vale do Itajaí (Itajaí, Brazil).

Eptatretus goliath, new species

Goliath Hagfish

Figures 1, 2

Holotype.—NMNZ P.40729, adult female, 1275 mm TL, 6.2 kg, off New Zealand, northeastern North Island, from the head of the Hauraki Canyon, 35°27'54"S, 175°36'08"E, 811 m depth, collected in a crab pot, 22 March 2002, Greg Gibbs.

Diagnosis.—*Eptatretus goliath* can be distinguished from its congeners by the unique combination of the following characters: seven pairs of gill pouches; three-cusp multicusps in anterior and posterior rows; 11–13 unicusps in anterior rows; nine unicusps in posterior rows; total cusps 54; 14–15 prebranchial pores; 57–58 trunk pores; 13–14 tail pores; 92 total pores; ventral finfold prominent.

Description.—Body subcylindrical and extremely robust, slightly deeper than wide at prebranchial and branchial regions, laterally compressed at trunk, and strongly compressed at tail. Rostrum bluntly rounded, slightly projecting. One pair of conspicuous nasal-sinus papillae symmetrically placed on inner dorsal surface of nasal sinus. Three pairs of barbels on head, first two pairs about equal in size (15 mm) and adjacent to opening of nasopharyngeal duct; third pair longer (21 mm) and immediately adjacent to oral cavity. Ventral finfold (VFF) conspicuous, nine mm high, beginning 300 mm behind the last gill aperture and extending posteriorly to cloaca. Caudal finfold nearly rounded, extending around tail to dorsal surface, ending nearly over cloaca.

Total length 1275 mm; preocular length 55 mm (4.3% TL); prebranchial length 240 mm (18.8% TL); branchial length 85 mm (6.7% TL); trunk length 750 mm (58.8% TL);



Fig. 1. *Eptatretus goliath*, new species, holotype NMNZ P.40729, 1275 mm TL.

tail length 200 mm (15.7% TL); body width at prebranchial region 82 mm (6.4% TL); body depth at mid-trunk including VFF 130 mm (10.2% TL); body depth excluding VFF 121 mm (9.5% TL); body depth at cloaca 104 mm (8.2% TL); tail depth 145 mm (11.4% TL). Three-cusp multicuspis in anterior and posterior rows of cusps on each side; 13 unicusps in anterior and nine unicusps in posterior row on left side; 11 unicusps in anterior and nine unicusps in posterior row on right side; total cusps 54. Cusps proportionally small, slender, and pointed; palatine tooth conical (Fig. 2). Segmentally arranged row of slime pores on each side. Prebranchial pores (left/right) 14/15; branchial pores 6/7; trunk pores 58/57; tail pores 14/13; total pores 92/92. One slime pore associated with each gill aperture except for that of the pharyngocutaneous duct (PCD).

Seven pairs of gill pouches corresponding to seven pairs of gill apertures. Last branchial duct confluent with PCD on left side, forming a large aperture. Length of dental muscle 23% of total length; posterior tip of dental muscle reaches fourth gill pouch. Ventral aorta branches at seventh (last) gill pouch, very close to the heart; all afferent branchial arteries connected to branched portion of ventral aorta.

Body color in alcohol dark brown; rostrum and tip of barbels whitish; conspicuous eyespots; irregular white spots around mouth; gill apertures, slime pores, and VFF colored as body; caudal finfold with a narrow dark distal margin;

dark spots of different sizes and shapes randomly distributed over entire body.

The holotype is an adult female containing dozens of small eggs, measuring about 45×14 mm. All eggs are still in the mesentery, which is attached to the body wall; terminal anchor filaments and hooks are not present on any of the eggs.

Distribution.—Known only from type locality.

Comparisons.—In the Pacific Ocean, four seven-gilled species of *Eptatretus* have been recorded: *E. carlhubbsi* from the northern Pacific, *E. cirrhatus* from southeastern Australia and New Zealand, *E. laurahubbsae* from the Juan Fernández Islands, and *E. strahani* from the Philippines.

Eptatretus goliath differs from *E. carlhubbsi* in the following characters: multicusp pattern (3/3 vs. 2/3), number of anterior unicusps (11–13 vs. 15–17), posterior unicusps (9 vs. 11–13), total cusps (54 vs. 63–71), trunk pores (57–58 vs. 60–70), and ventral finfold (present vs. absent). Whilst *E. goliath* seems to be more robust than *E. carlhubbsi*, the body proportions for both species are very similar, except the tail depth (11.4 vs. 8.9–10.5% TL, respectively). *Eptatretus goliath* and *E. carlhubbsi* are the only species of hagfish that attain more than one meter in length. Nine specimens of *E. carlhubbsi* examined by McMillan and Wisner (1984) measured between 813 and 1160 mm TL.

Eptatretus goliath and *E. cirrhatus* have the same multicusp pattern (3/3), but differ in the

following characters: preocular length (4.3 vs. 5.2–6.7% TL), prebranchial length (18.8 vs. 21.4–23.9% TL), trunk length (58.8 vs. 52.5–56.3% TL), body depth over cloaca (8.2 vs. 5.7–7.5% TL), tail depth (11.4 vs. 7.7–9.1% TL), number of anterior unicusps (11–13 vs. 8–11), total cusps (54 vs. 43–51), prebranchial pores (14–15 vs. 16–20), and total pores (92 vs. 83–90). The largest known specimen of *E. cirrhatus* is 830 mm TL (Fernholm, 1998).

Eptatretus goliath differs from *E. laurahubbsae* in the following characters: tail length (15.7 vs. 18.1–21.3% TL), tail depth (11.4 vs. 8.2–9.9% TL), multicusp pattern (3/3 vs. 2/2), number of anterior unicusps (11–13 vs. 13–17), posterior unicusps (9 vs. 11–16), total cusps (54 vs. 61–68), trunk pores (57–58 vs. 60–67), and total pores (92 vs. 97–105). *Eptatretus laurahubbsae* is also only known from juvenile specimens (maximum

Stewart, pers. obs.). Generally these two species can be easily sampled by divers or inshore commercial trawling. The other three species, however, appear to either avoid being captured by trawl or are able to escape through the mesh. Added to that is the aversion of most fishermen to have these fishes on board their vessels, which has limited the number of specimens being returned to scientific institutions. As deepwater species are known just from a few specimens their distribution, abundance, and biology remains poorly understood.

MATERIAL EXAMINED

Eptatretus carlhubbsi.—USNM 227440, paratype, 868 mm TL, 24°48'N, 167°14'W, 853 m, 9 Dec. 1980; USNM 233742, paratype, 940 mm TL, 14°59'N, 145°13'E, 1016 m, 5–6 Apr. 1981; CAS 50705, paratype, 1000 mm TL, Leeward Islands, Hawaii, Nov. –Dec. 1981; CAS 50706, paratype, 950 mm TL, Leeward Islands, Hawaii, 481 m, 19 Nov. 1981.

Eptatretus cirrhatus.—MOVI 27797, 1, 460 mm TL, 37°34.00'S, 178°20.00'E, 17 m, 28 June 1988; MOVI 27798, 1, 620 mm TL, 37°11.50'S, 176°10.00'E–37°10.50'S, 176°11.50'E, 190–265 m, 22 Jan. 1979; SAM F5363, 433 mm TL, 37°59'S, 150°05'E, 452 m, 14 Oct. 1984; SAM F5360, 439 mm TL, 37°44'S, 150°16'E, 620 m, 14 Oct. 1984; SAM F5356, 441 mm TL, 38°11'S, 149°58'E, 620 m, 15 Oct. 1984.

Eptatretus laurahubbsae.—USNM 227441, paratypes, 2, 185–200 mm TL, and CAS 49125, paratypes, 2, 225–270 mm TL, Juan Fernandez Island, 33°31'S, 78°50'W, 2400 m, 12–13 Dec. 1965.

Eptatretus strahani.—MNHN 1981-0722, paratype, 500 mm TL, SIO 81-116, paratype, 430 mm TL, and USNM 227442, paratype, 435 mm TL, South China Sea, near Lugbarg Island, Philippines, 14°00'N, 120°18.2'E, 189 m, 21–22 March 1976.

Eptatretus caribbeus.—USNM 218405, paratype, 340 mm TL, Caribbean Sea, Nicaragua-Colombia, 200 fms (366 m), 5 July 1972; UF 27894, paratype, 334 mm TL, Caribbean Sea, Nicaragua, WSW of Quitasueño, 14°08'N, 81°55'W, 200–244 fms (366–446 m), 21 May 1962; UF 27895, paratype, 350 mm TL, Caribbean Sea, Honduras, W of Rosalind Bank, 16°50'N, 81°21'W, 200 fms (366 m), 7 June 1962.

Eptatretus menezesi.—MOVI 14729, holotype, 737 mm TL, off Santa Catarina, Brazil, 29°14'S,

48°02'W, 250 m, 31 July 1998; MZUSP 52492, paratypes, 2, 390–462 mm TL, off Rio de Janeiro, Brazil, 24°09'19"S, 43°14'13"W, 510 m, 6 Dec. 1997; MZUSP 52493, 12, 314–602 mm TL, off Santa Catarina, Brazil, 29°37'42"S, 48°00'30"W, 380 m, 27 April 1997.

Nemamyxine elongata.—NMNZ P.37198, 1, 790 mm TL, north Canterbury Bight, South Island, New Zealand, 44°20.3'S, 172°00.5'E, 132 m, F/V SAPUN GORA, trawl, 21 March 2000, B. Liddle.

Neomyxine biniplicata.—AMS I.24337001, 1, 305 mm TL, no data (probably New Zealand), L. R. Richardson and J. P. Jowett, 1957; AMS I.24336001, 1, 324 mm TL, no data (probably New Zealand), 1958, L. R. Richardson; AMS IB.3806, 1, 314 mm TL, and AMS IB.3807, 1, 350 mm TL, 41°15'S, 172°34'E, 73 m, 1957, L. R. Richardson; MOVI 27795, 1, 380 mm TL, 41°44'S, 174°16'E, 146.3 m, 5 Nov. 1952; MOVI 27796, 1, 446 mm TL, 42°44.30–45.00'S, 176°02.40–00.20'E, 778–798 m, 8 Jan. 1989; NMNZ P.24787, 2, 410–450 mm TL, 42°44.30–45.00'S, 176°02.400–0.20'E, 778–798 m, 8 Jan. 1989; NMNZ P.1171, 1, 375 mm TL, 41°44'S, 174°16'E, 146.3 m, 5 Nov. 1952; SIO 94-1, 1, 333 mm TL, south of Cape Campbell, New Zealand, 40–50 fms (73–91 m).

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- (MMM) MUSEU OCEANOGRÁFICO DO VALE DO ITAJAÍ, UNIVERSIDADE DO VALE DO ITAJAÍ, CP 360, 88302-202, ITAJAÍ, SC, BRAZIL; AND (ALS) MUSEUM OF NEW ZEALAND TE PAPA TONGAREWA, P.O. BOX 467, WELLINGTON, NEW ZEALAND. E-mail: (MMM) mincarone@univali.br. Send reprint requests to MMM. Submitted: 27 April 2005. Accepted: 22 Dec. 2005. Section editor: D. Buth.

Hagfishes of the World
A catalogue of Myxinidae known to date

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Museu Oceanográfico do Vale do Itajaí
Universidade do Vale do Itajaí
CP 360, Itajaí, SC, 88302-202, Brazil

ABSTRACT

ACKNOWLEDGEMENTS

1. INTRODUCTION

2. SYSTEMATIC CATALOGUE

Eptatretus

Eptatretus

Eptatretus bischoffii

Eptatretus burgeri

Eptatretus caribbeaus

Eptatretus carlhubbsi

Eptatretus cirrhatus

Eptatretus deani

Eptatretus eos

Eptatretus fernholmi

Eptatretus fritzi

Eptatretus goliath

Eptatretus grouseri

Eptatretus hexatrema

Eptatretus indrambaryai

Eptatretus lakeside

Eptatretus longipinnis

Eptatretus mcconnaugheyi

Eptatretus mccoskeri

Eptatretus mendozai

Eptatretus menezesi

Eptatretus minor

Eptatretus multidens

Eptatretus nanii

Eptatretus octatrema

Eptatretus okinoseanus

Eptatretus polytrema

Eptatretus profundus

Eptatretus sinus

Eptatretus stoutii

Eptatretus strahani

Eptatretus wisneri

Paramyxine

Paramyxine

Paramyxine ancon

Paramyxine atami

Paramyxine cheni

Paramyxine chinensis

Paramyxine fernholmi

Paramyxine moki

Paramyxine nelsoni

Paramyxine sheni

Paramyxine springeri

Paramyxine taiwanae

Paramyxine walkeri

Paramyxine wayuu

Paramyxine wisneri

Paramyxine yangi

Myxine

Myxine

Myxine affinis

Myxine australis

Myxine capensis

Myxine circifrons

Myxine debueni

Myxine fernholmi

Myxine formosana

Myxine garmani

Myxine glutinosa

Myxine hubbsi

Myxine hubbsoides

Myxine ios

Myxine jespersenae

Myxine knappi

Myxine kuoi

Myxine mccoskeri

Myxine mcmillanae

Myxine paucidens

Myxine pequenoi

Myxine robinsorum

Myxine sotoi

Notomyxine

Notomyxine tridentiger

Nemamyxine

Nemamyxine

Nemamyxine elongata

Nemamyxine krefftii

Neomyxine

Neomyxine biniplicata

3. LIST OF NOMINAL SPECIES OF MYXINIDAE

4. LIST OF SPECIES BY MAJOR FISHING AREAS

5. BIBLIOGRAPHY

1. INTRODUCTION

et al *Eptatretus burgeri* *et al*
et al *et al*

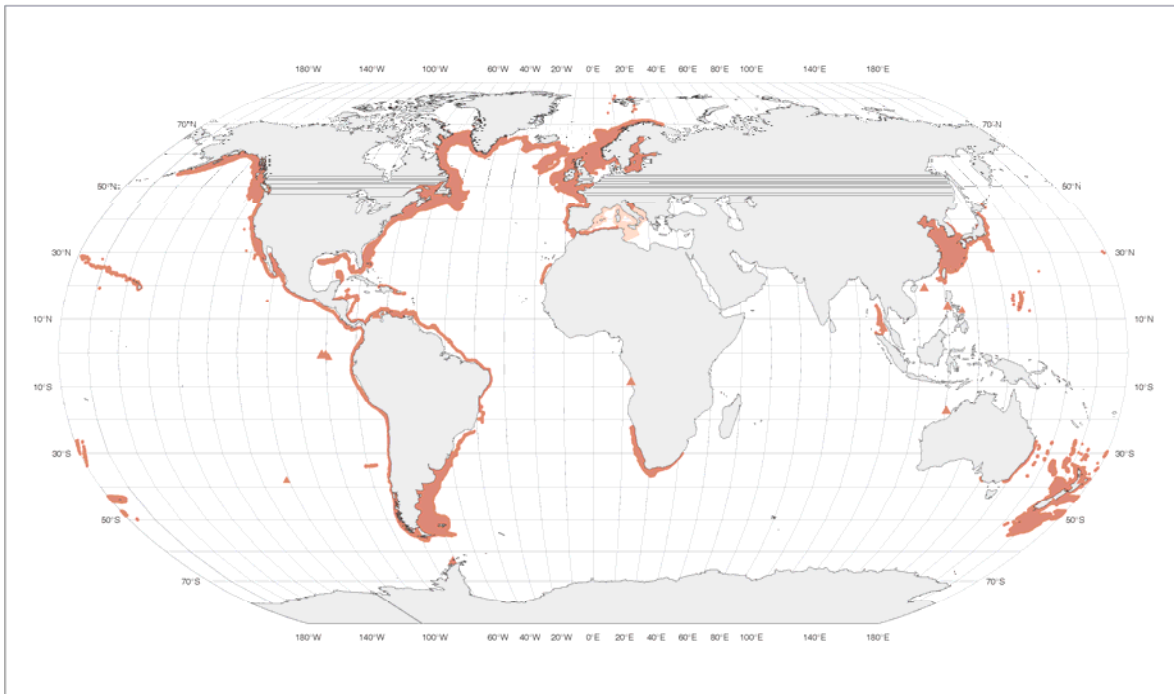


Fig. 1. Global distribution of family Myxinidae.

et al

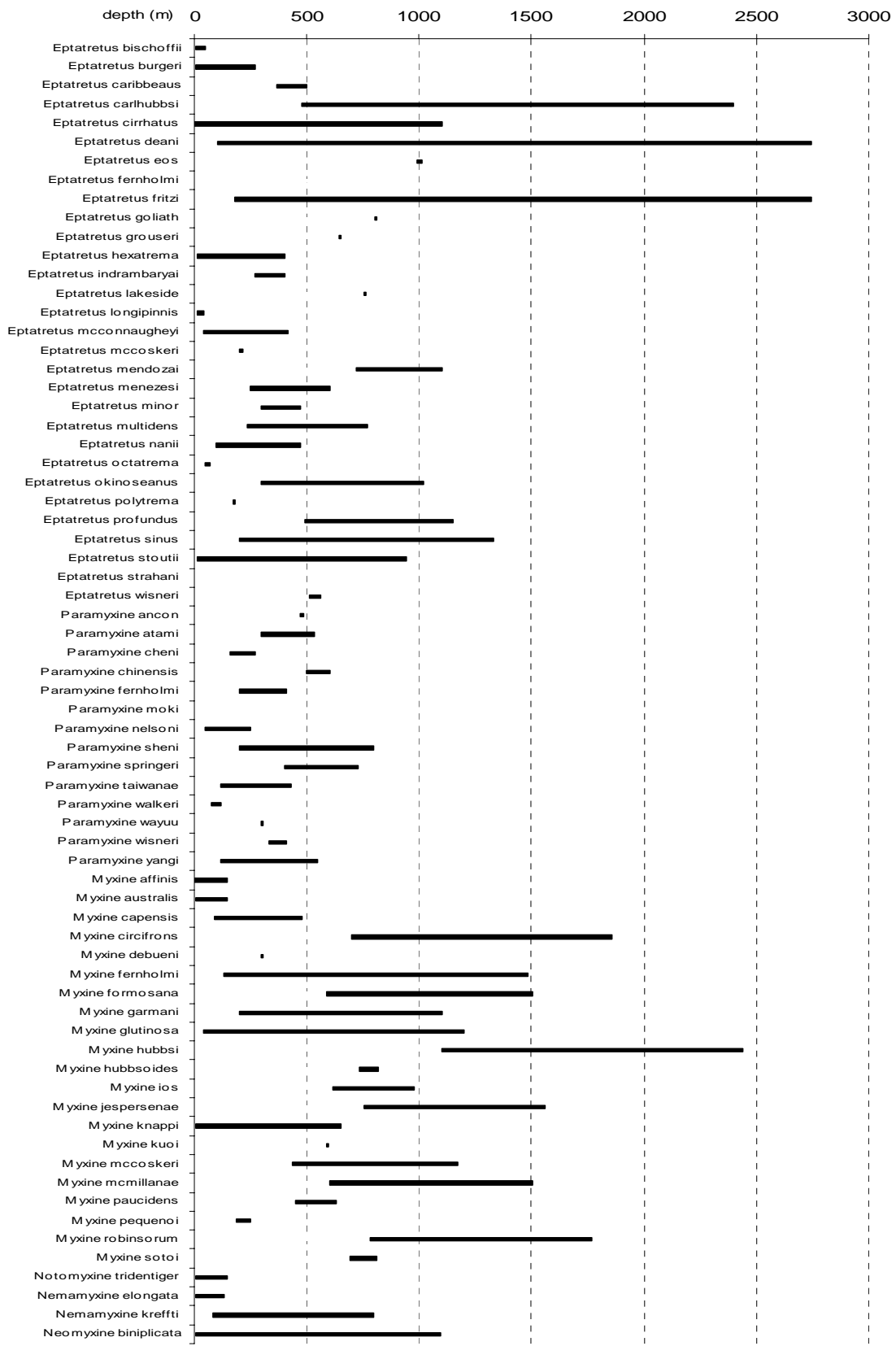


Fig. 2. Vertical distribution for all species of Myxinidae.

1.1 Classification and Systematic Arrangement

Myxina glutinosa

Systema Naturae

et al

siroka

gonororum

Myxinikela

Myxineidus

Paramyxine *Eptatretus* *Paramyxine* *Eptatretus*
Quadratus

Eptatretus *et al* *Eptatretus*
et al *Paramyxine* *Quadratus*
et al

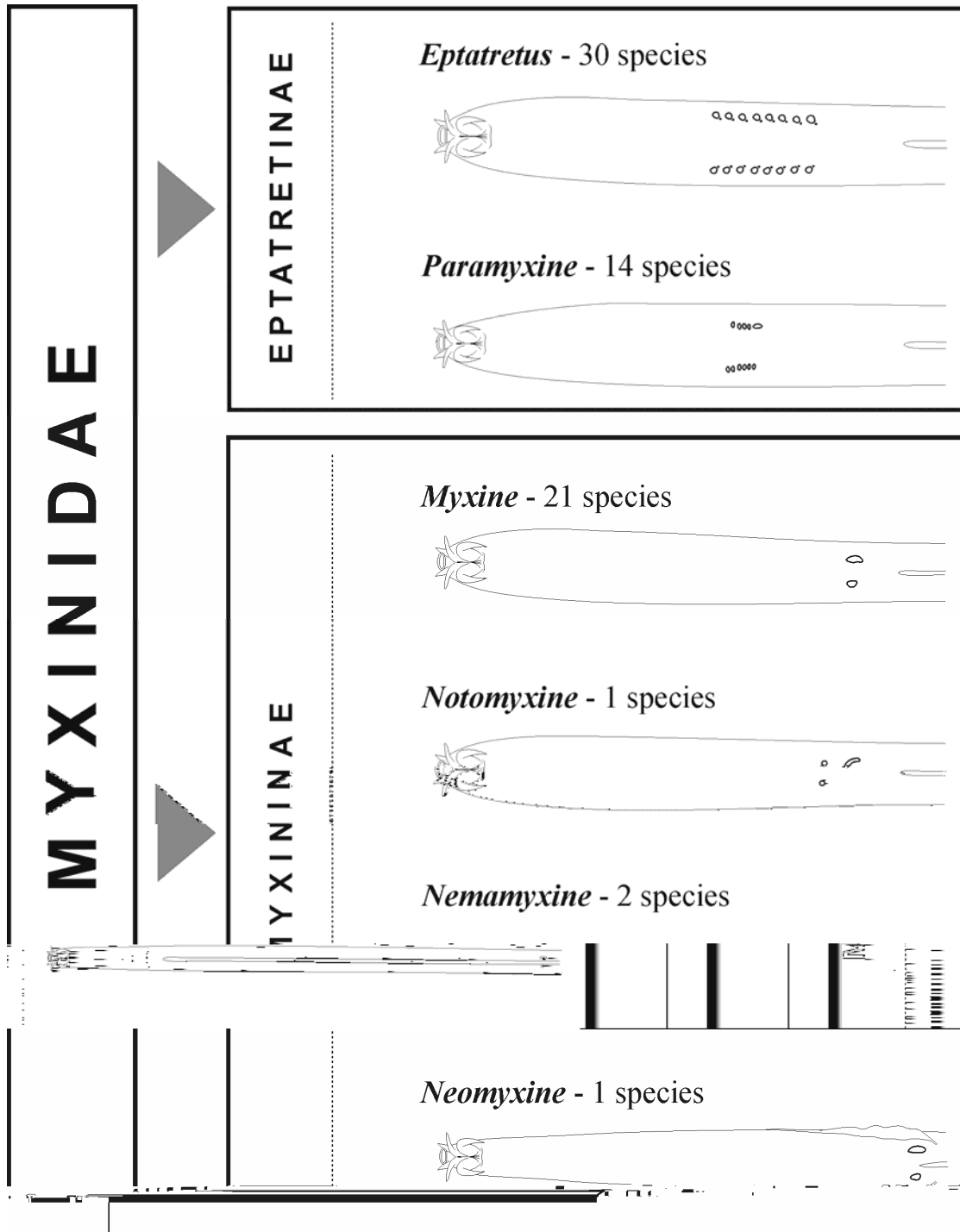


Fig. 3. Arrangement of Myxinidae followed in this catalogue.

1.2 Fisheries

Eptatretus burgeri *Paramyxine atami*

E. okinoseanus *Myxine garmani*

et al

Paramyxine atami

Paramyxine

et al

et al

et al

et al

Table 1. Hagfish landed at Izumozaki* (1962-1987 [Gorbman *et al.* 1990]; 1988-1995 [Honma, 1998]).

E. stoutii

M. glutinosa

Table 2. Landings (in metric tonnes) for hagfish (Pacific *E. stoutii*, Black *E. deani*, and Atlantic *M. glutinosa*) in North America (from Leask and Beamish, 1999).

	Pacific + Black	Atlantic
	391.2	
	1 980.3	
	2 501.8	
	325.8	
	588.9	
	151.2	484.4
	0.6	1 213.0
	1.4	1 924.4
	100.1	2 227.8
	0.03	437.0
	3.9	1 869.5

1.3 Plan of the Catalogue

Family accounts.

Generic accounts.

Species accounts.

1. *Scientific name*

2. *Material examined*

al

et

3. *Species illustration*

4. *Diagnostic Features*

5. *Size*

6. *Distribution and habitat*

7. *Map*

8. *Interest to fisheries*

9. *Remarks*

10. *Common names*

1.4 Glossary of Technical Terms and Measurements

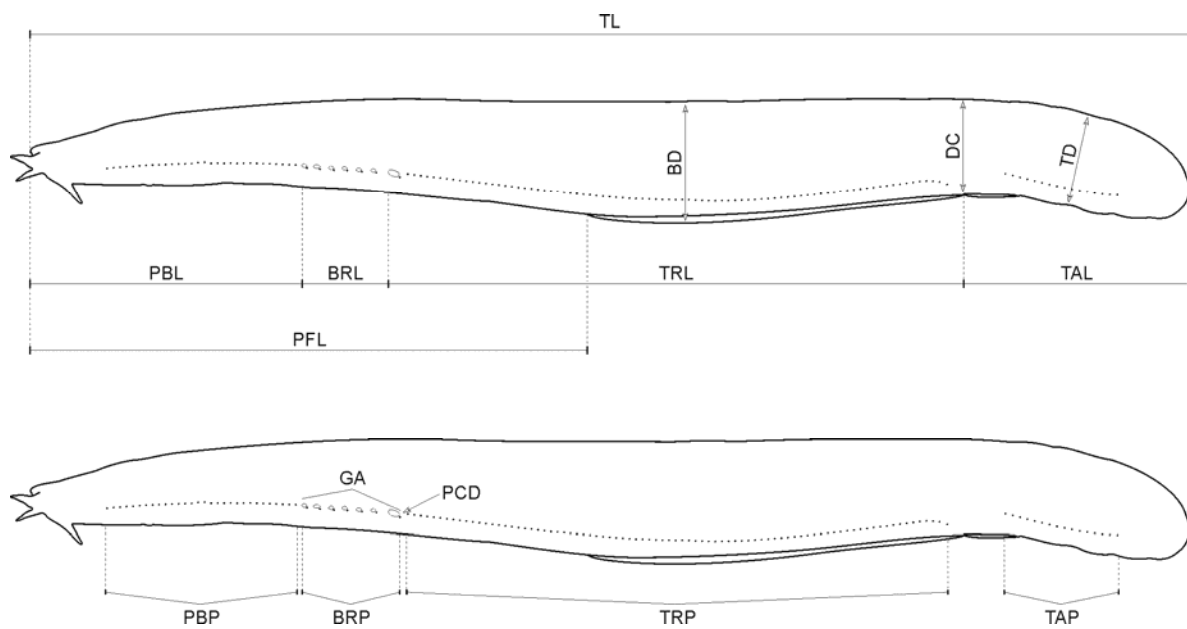


Fig. 4. Measurements and external morphology of body (see acronyms below).

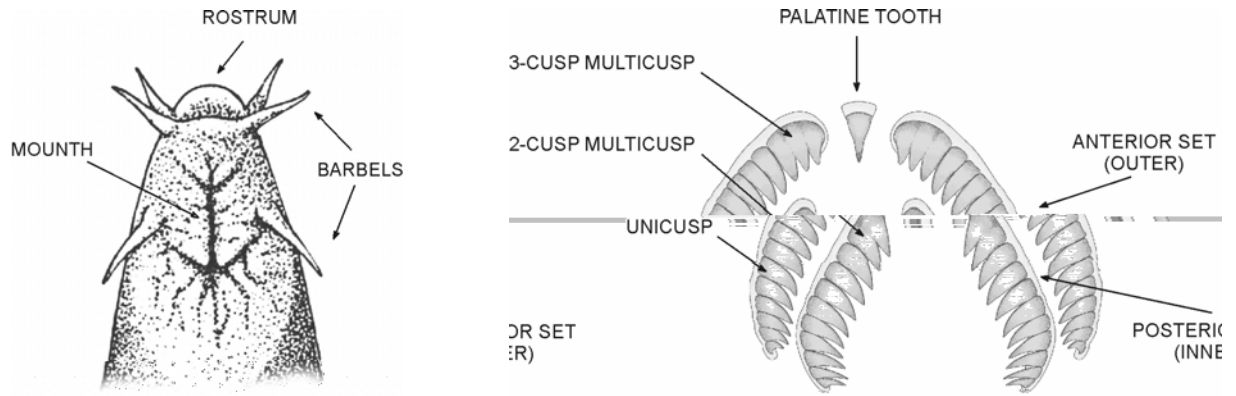


Fig. 5. Morphology of head and teeth.

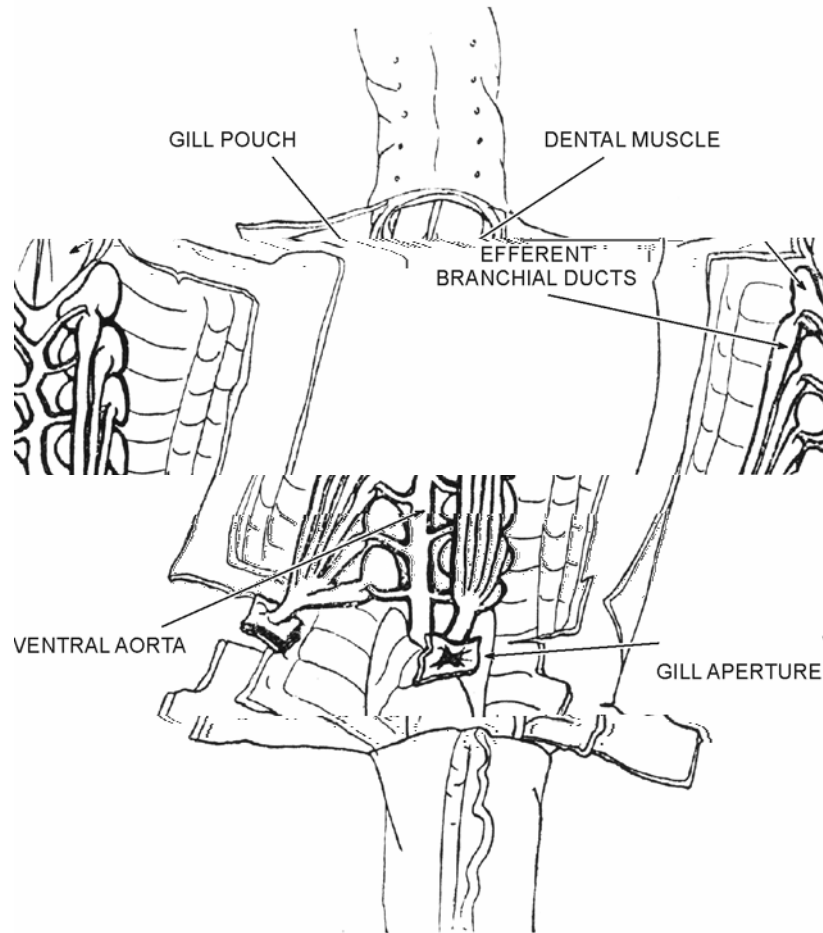


Fig. 6. Internal morphology of branchial region of *Myxine*.

Anatomical structures:

Rostrum

Barbels

Nasal-sinus papillae

Multicusp

Unicusp

Palatine tooth

Pharyngocutaneous duct (PCD)

Gill aperture (GA)

Gill pouch (GP)

Dental muscle (DM)

Ventral aorta (VA)

Ventral finfold (VFF)

Caudal fin (CF)

Measurements:

Total length (TL)

Prefinfol length (PFL)

Prebranchial length (PBL)

Branchial length (BRL)

Trunk length (TRL)

Tail length (TAL)

Body width (BW)

Body depth (BD)

Depth at cloaca (DC)

Tail depth (TD)

Counts:

Anterior multicusps (AMC)

Posterior multicusps (PMC)

Anterior unicusps (AUC)

Posterior unicusps (PUC)

Total cusps (TC)

Prebranchial pores (PBP)

Branchial pores (BRP)

Eptatretus

Paramyxine

Trunk pores (TRP)

Tail pores (TAP)

Total pores (TP)

Table 3. Selected characters for species of *Eptatretus*.

Eptatretus
bischoffii
burgeri
caribbeaus
carlhubbsi
cirrhatius
deani
eos
fernholmi
fritzi
goliath
grouseri
hexatrema
indrambaryai
lakeside
longipinnis
mcconnaugheyi
mccoskeri
mendozai
menezesi
minor
multidens
nanii
octatrema
okinoseanus
polytrema
profundus
sinus
stoutii
strahani
wisneri

Table 4. Selected characters for species of *Paramyxine*.

Paramyxine
ancon
atami
cheni
chinensis
fernholmi
moki
nelsoni
sheni
springeri
taiwanae
walkeri
wayuu
wisneri
yangi

Table 5. Selected characters for species of *Myxine*, *Notomyxine*, *Nemamyxine*, and *Neomyxine*.

Myxine
affinis
australis
capensis
circifrons
debueni
fernholmi
formosana
garmani
glutinosa
hubbsi
hubbsoides
ios
jespersenae
knappi
kuoi
mccoskeri
mcmillanae
paucidens
pequenoii
robinsorum
sotoi
Notomyxine
tridentiger
Nemamyxine
elongata
kreffti
Neomyxine
biniplicata

2. SYSTEMATIC CATALOGUE

FAMILY MYXINIDAE

Type Genus: *Myxine*

Diagnostic features:

Genera: *Eptatretus* *Paramyxine* *Myxine* *Notomyxine*
Nemamyxine *Neomyxine*

Common names:

Key to Genera

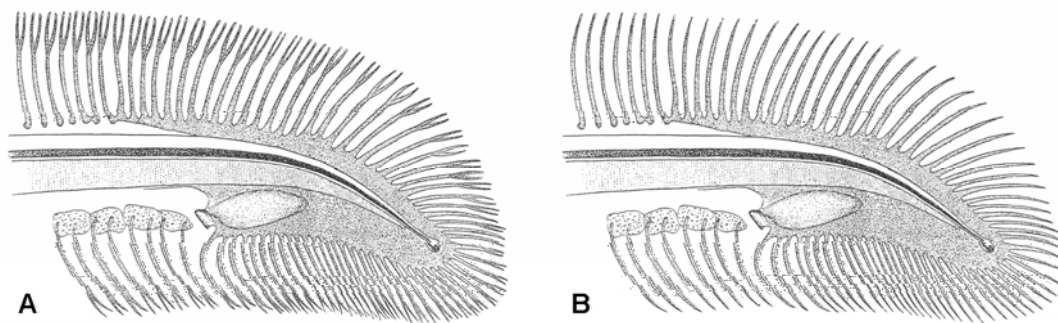


Fig. 7. Caudal fin rays of hagfish. A – Subfamily Eptatretinae. B – Subfamily Myxininae.

Eptatretus

Paramyxine

Nemamyxine

Notomyxine

Neomyxine

Myxine

***Eptatretus* Cloquet, 1819**

Eptatretus

Gastrobranche dombey

Homea

Homea banksii

Heptatrema

Myxine

Gastrobranche dombey

Bdellostoma

Bdellostoma hexatrema

Polistotrema

Bdellostoma stoutii

Heptatretus

Gastrobranche dombey

Dodecatrema

Bdellostoma polytrema

Diagnostic features:

Distribution:

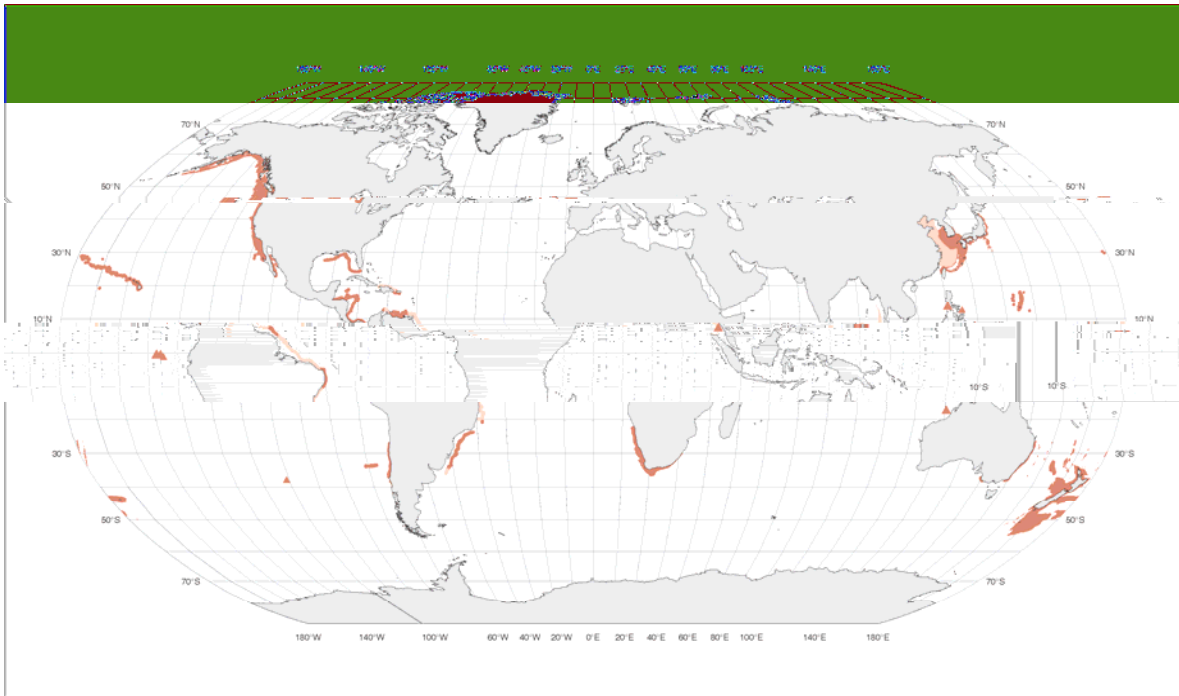


Fig. 8. Global distribution of the genus *Eptatretus*.

Species:

Eptatretus bischoffii

Eptatretus burgeri

Eptatretus caribbeaus

Eptatretus carlhubbsi

Eptatretus cirrhatus

Eptatretus deani

Eptatretus eos

Eptatretus fernholmi

Eptatretus fritzi

Eptatretus goliath

Eptatretus grouseri

Eptatretus hexatrema

Eptatretus indrambaryai

Eptatretus lakeside

Eptatretus longipinnis
Eptatretus mcconnaugheyi
Eptatretus mccoskeri
Eptatretus mendozai
Eptatretus menezesi
Eptatretus minor
Eptatretus multidentis
Eptatretus nanii
Eptatretus octatrema
Eptatretus okinoseanus
Eptatretus polytrema
Eptatretus profundus
Eptatretus sinus
Eptatretus stoutii
Eptatretus strahani
Eptatretus wisneri

Remarks: *dombey*
Eptatretus

dombey *Eptatretus*
Polistotrema *Gastrobranchus dombeyi*

Gastrobranche dombey
Bdellostoma stoutii

Polytrema *Heterotrema* *Hexatrema*
Heptatretus *Eptatretus*

Key to Species of *Eptatretus*

Eptatretus mccoskeri

Eptatretus octatrema

Eptatretus wisneri

Eptatretus okinoseanus

Eptatretus indrambaryai

Eptatretus fernholmi

Eptatretus carlhubbsi

Eptatretus cirrhatus

Eptatretus strahani

Eptatretus goliath

Eptatretus caribbeaus

Eptatretus menezesi

Eptatretus multidentis

Eptatretus minor

Eptatretus mendozai

Eptatretus longipinnis

Eptatretus burgeri

Eptatretus hexatrema

Eptatretus lakeside

Eptatretus eos

Eptatretus grouseri
Eptatretus profundus

Eptatretus bischoffi (Schneider, 1880)

Bdellostoma bischoffi

Bdellostoma polytrema

Homea polytrema

Heptatretus decatrema

Bdellostoma (Polistotrema) decatrema

Eptatretus dombeyi

Polistotrema decatrema

Homea decatrema

Polistotrema polytrema

Bdellostoma decatrema

Bdellostoma bischoffi

Eptatretus decatrema

Eptatretus bischoffi

Eptatretus bischoffi

et al

Eptatretus bischoffi

Material examined:

decatrema

Eptatretus

Anton Bruun

Diagnostic features:

Size:

Distribution and habitat:

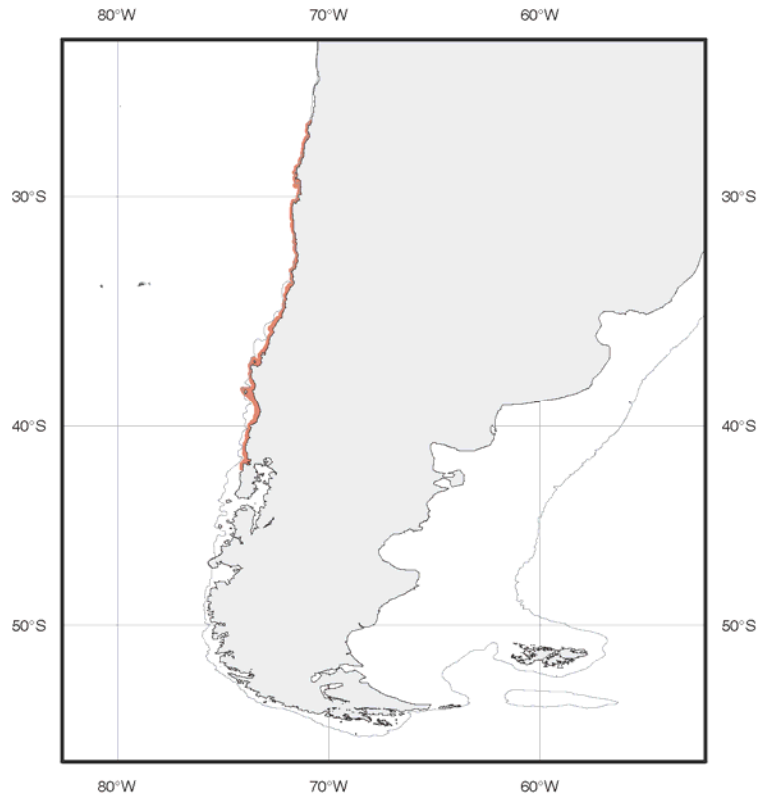


Fig. 9. Distribution of *Eptatretus bischoffi*.

Interest to fishery:

Remarks:

E. bischoffii

E. polytrema

Common names:

Eptatretus burgeri (Girard, 1855)

Heptatrema cirrhatum

Bdellostoma burgeri

Eptatretus burgeri

et al

et al

Eptatretus okinoseanus

et al

et

al

et al

et al

et al

Homea burgeri

Heptatretus buergeri

Bdellostoma (Eptatretus) burgeri

Heptatretus bürgeri

Heptatretus burgeri

Eptatretus bugeri

Paramyxine burgeri

Material examined:

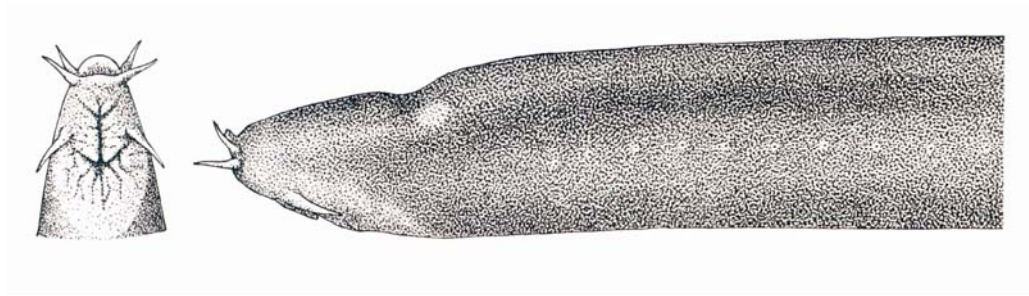


Fig. 10. *Eptatretus burgeri* (after Jordan and Snyder, 1901).

Diagnostic features:

Size:

Distribution and habitat:

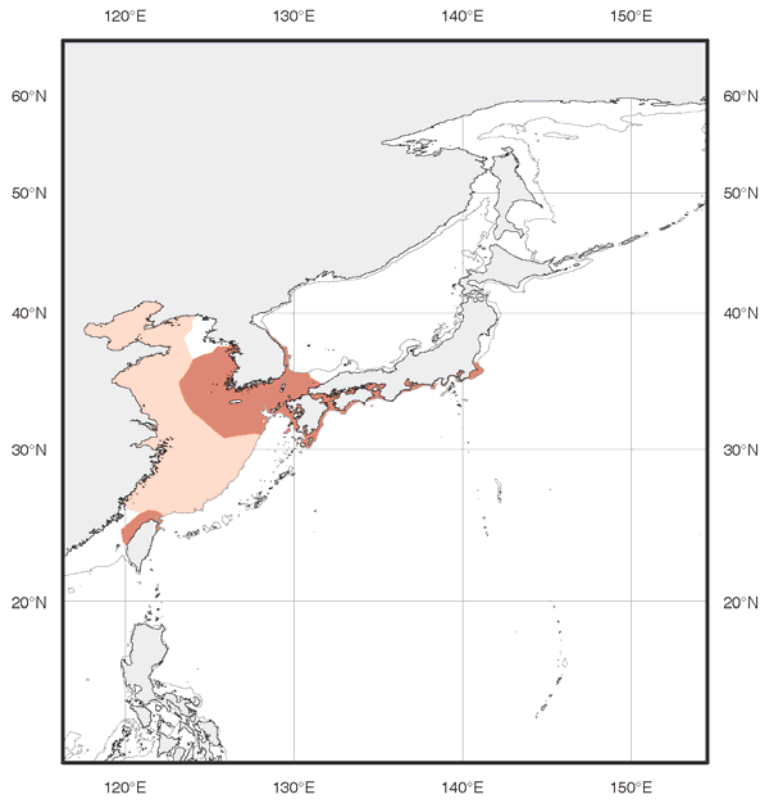


Fig. 11. Distribution of *Eptatretus burgeri*.

Interest to fishery:

Remarks: *Eptatretus burgeri*

Heptatrema cirrhatum

Eptatretus burgeri

et al

et al

et al

et al

et al

et al

Common names:

Миксина

Буррепа

Eptatretus caribbeus Fernholm, 1982

Eptatretus multidentis

Eptatretus caribbeus

Eptatretus menezesi

Eptatretus goliath

Eptatretus caribbeanus

Material examined:

Oregon

Oregon

Canopus

Diagnostic features:

Size:

Distribution and habitat:

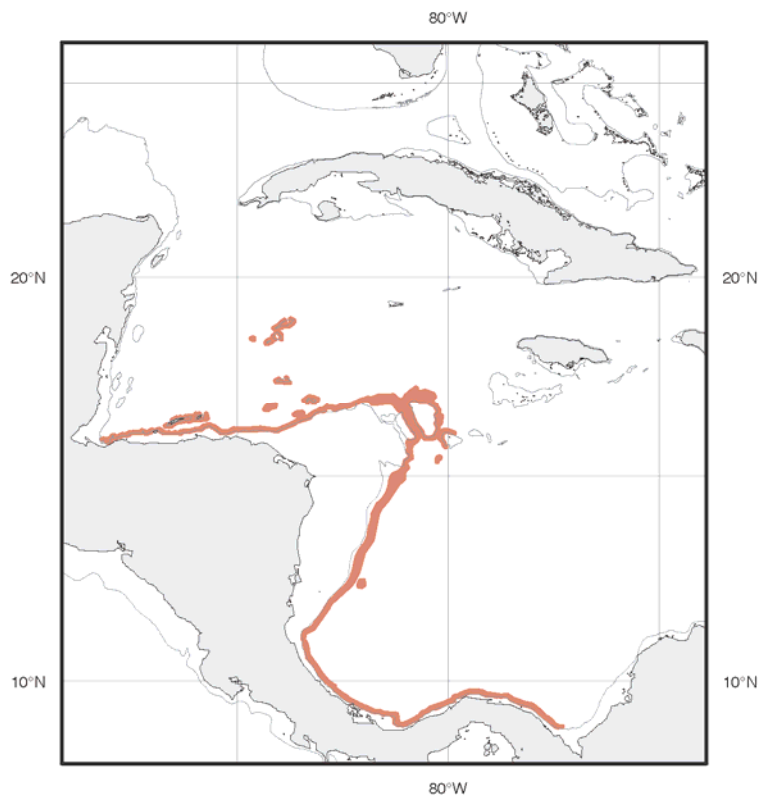


Fig. 12. Distribution of *Eptatretus caribbeus*.

Interest to fishery:

Remarks: *Eptatretus caribbeus*

Common names:

Eptatretus carlhubbsi McMillan and Wisner, 1984

Eptatretus carlhubbsi

Eptatretus laurahubbsi

Eptatretus goliath

Diagnostic features:

Size:

Distribution and habitat:

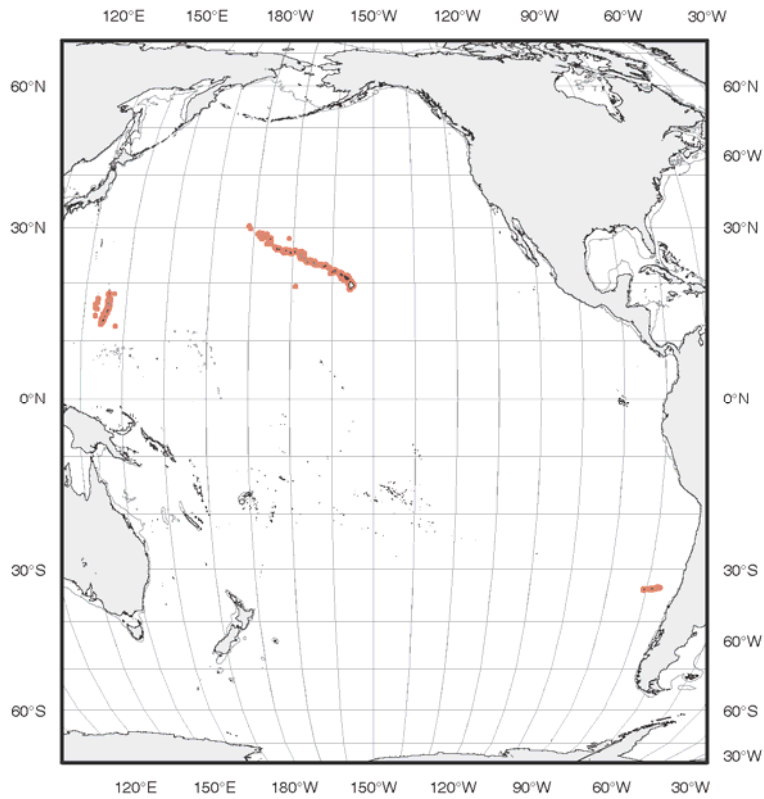


Fig. 13. Distribution of *Eptatretus carlhubbsi*.

Interest to fishery:

Remarks: *Eptatretus laurahubbsae*

Eptatretus carlhubbsi

E. carlhubbsi

E. laurahubbsae

E. carlhubbsi

Common names:

Eptatretus cirrhatus (Forster, 1801)

Petromyzon cirrhatus

Homea banksii

Bdellostoma heptatrema

Bdellostoma forsteri

Bdellostoma forsteri *heptatrema*

Bdellostoma cirrhatum

Homea cirrhata

Heptatrema cirrata

Eptatretus forsteri

Heptatretus banksii

Heptatretus cirratus

Heptatretus cirrhatus

et al

Bdellostoma (Eptatretus) cirrhatum

Eptatretus cirrhatus

Eptatretus caribbeus

et al

Eptatretus longipinnis

Eptatretus goliath

Material examined:

Soela

Soela

Soela

Tangaroa

Diagnostic features:

Size:

Distribution and habitat:

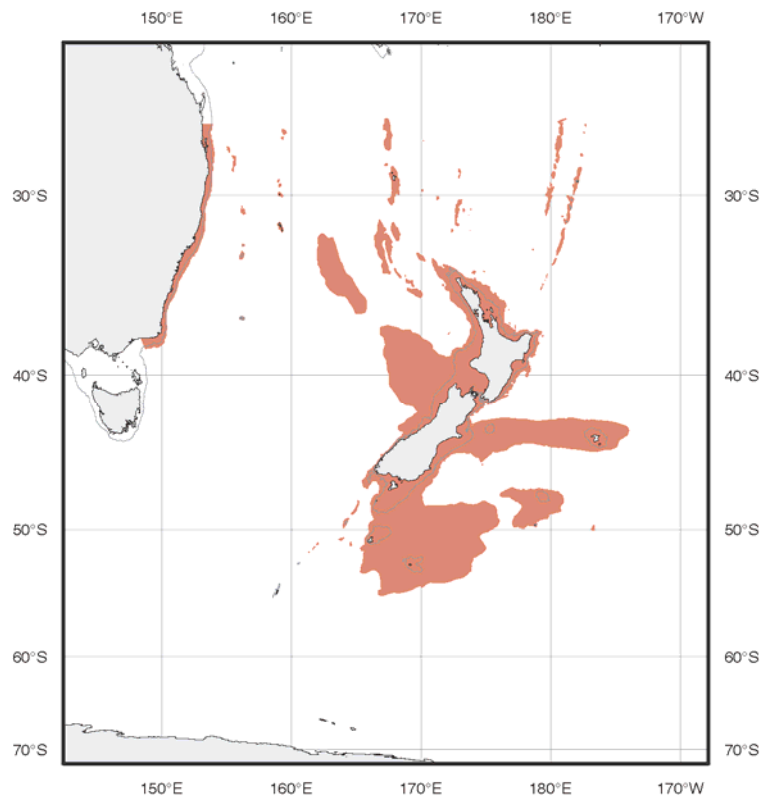


Fig. 14. Distribution of *Eptatretus cirrhatus*.

Interest to fishery:

Remarks:

Common names:

***Eptatretus deani* (Evermann and Goldsborough, 1907)**

Polistotrema deani

et al

et al

Heptatretus deani

Polistotrema curtiss-jamesi

Bdellostoma (Polistotrema) deani

Bdellostoma deani

Dodecatrema stoutii

Eptatretus deani

et al

et al

et al

et al

et al

Material examined:

Albatross

Yaquina

Sallie Boy II

David Starr Jordan

Albatross

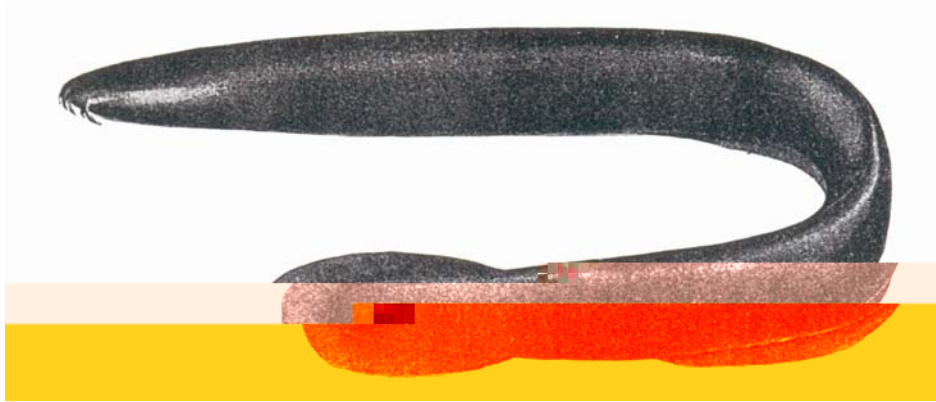


Fig. 15. *Eptatretus deani* (after Evermann and Goldsborough, 1907).

Diagnostic features:

Size:

Distribution and habitat:

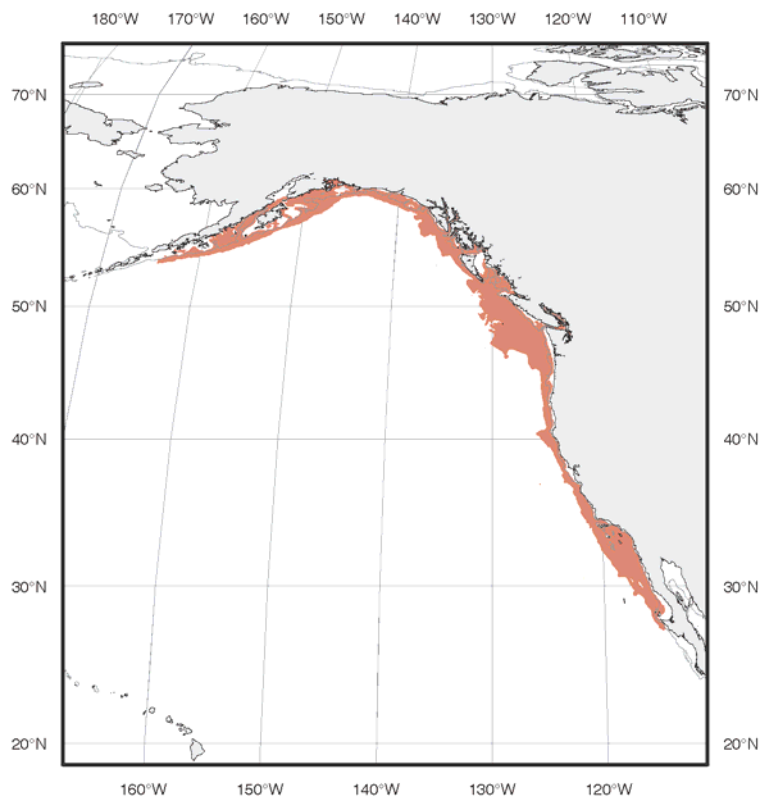


Fig. 16. Distribution of *Eptatretus deani*.

Interest to fishery: *Eptatretus stoutii*

Remarks:

Eptatretus deani

Common names:

Eptatretus eos Fernholm, 1991

Eptatretus eos

et al

Eptatretus wayuu

Eptatretus lakeside

Eptatretus goliath

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

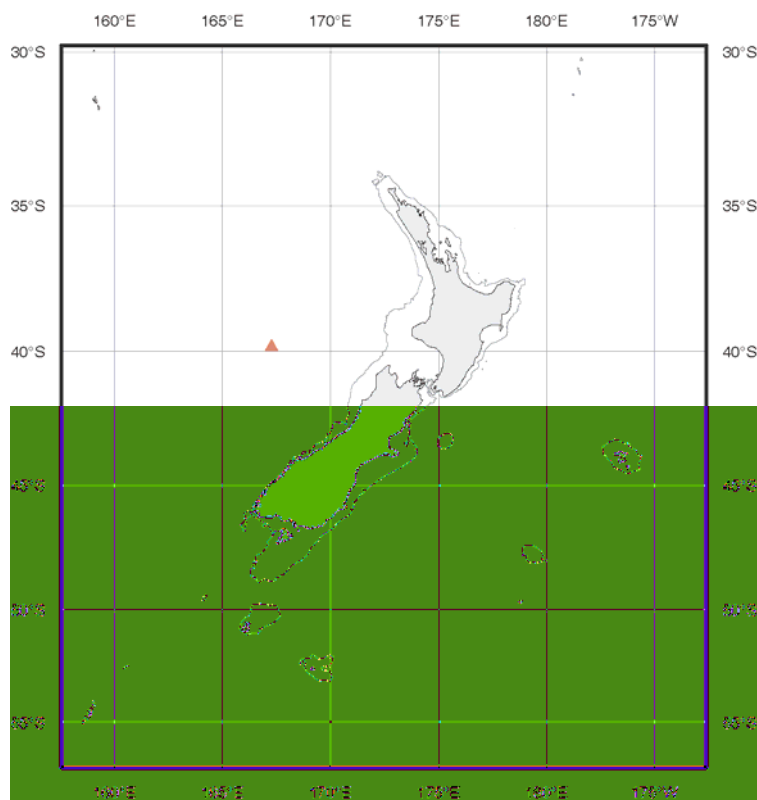


Fig. 17. Distribution of *Eptatretus eos*.

Interest to fishery:

Remarks:

Hoplostethus atlanticus

Common names:

Eptatretus fernholmi McMillan and Wisner, 2004

Eptatretus fernholmi

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

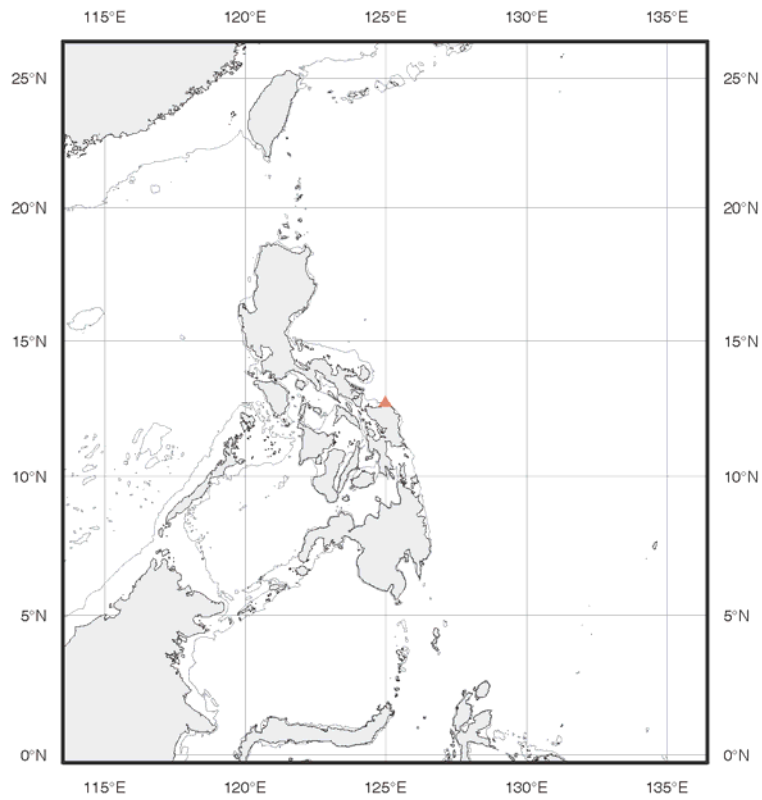


Fig. 18. Distribution of *Eptatretus fernholmi*.

Interest to fishery:

Remarks: *Eptatretus fernholmi*

Common names:

***Eptatretus fritzi* Wisner and McMillan, 1990**

Eptatretus fritzi

et al

Material examined:

Velero IV

Diagnostic features:

Size:

Distribution and habitat:

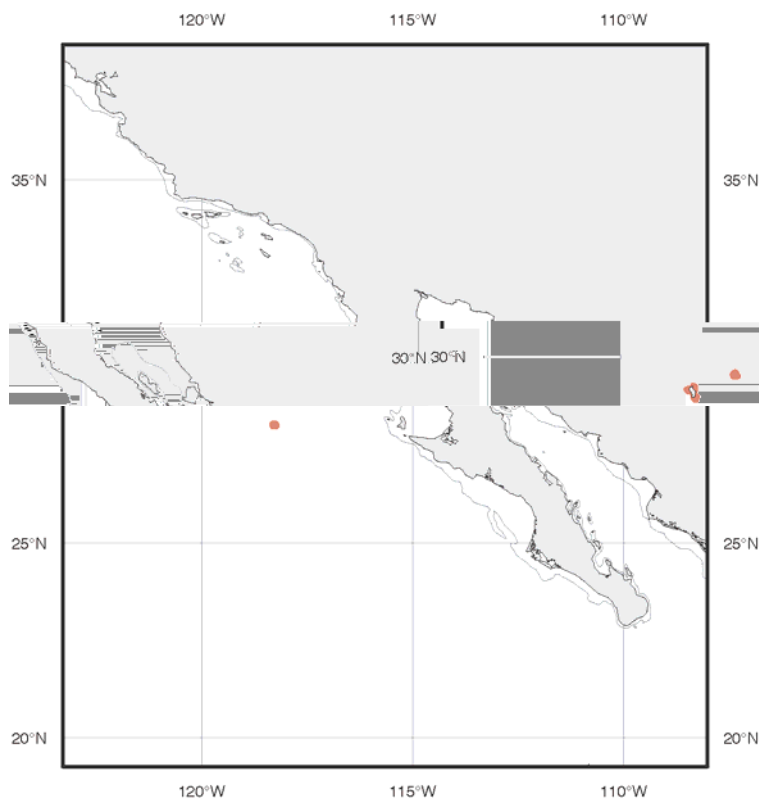


Fig. 19. Distribution of *Eptatretus fritzi*.

Interest to fishery:

Remarks: *Eptatretus fritzi* *E. deani*

Common names:

Eptatretus goliath Mincarone and Stewart, 2006

Eptatretus goliath

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

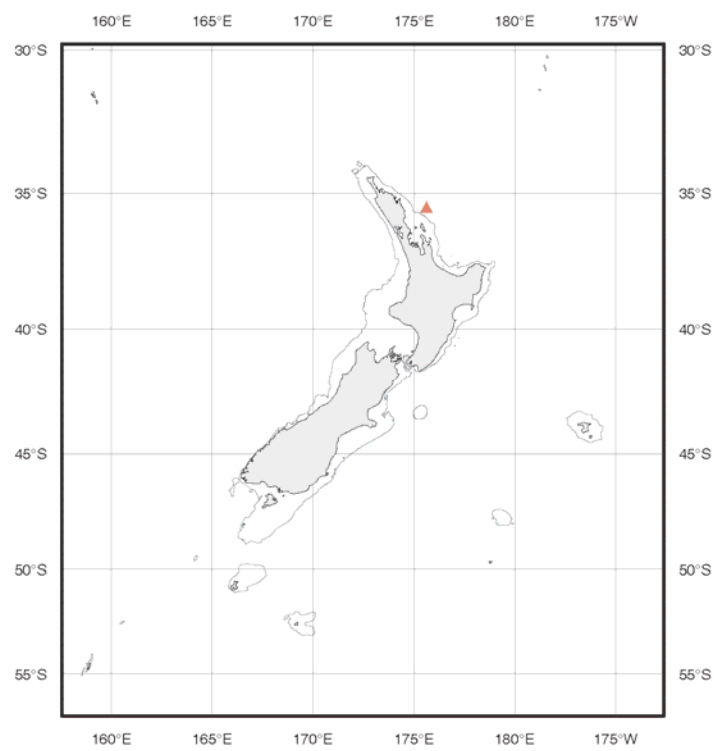


Fig. 20. Distribution of *Eptatretus goliath*.

Interest to fishery:

Remarks:

Common names:

Eptatretus grouseri McMillan, 1999

Eptatretus grouseri

Material examined:

Johnson Sea Link

Johnson Sea Link

Diagnostic features:

Size:

Distribution and habitat:

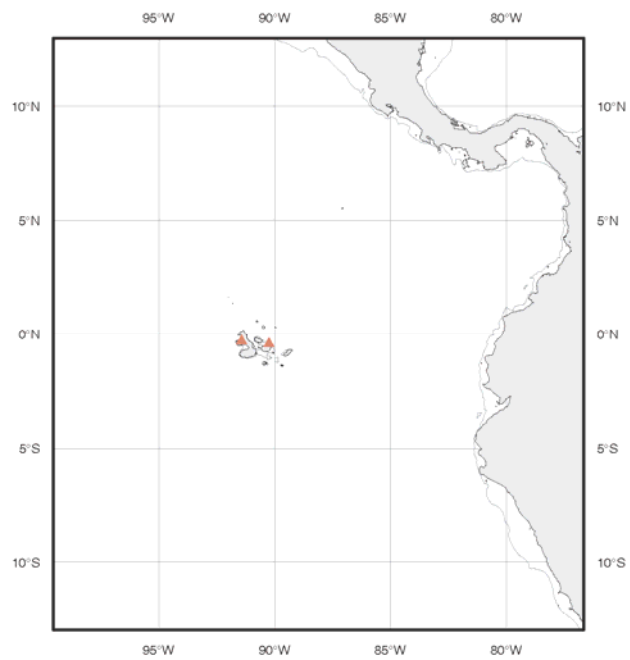


Fig. 21. Distribution of *Eptatretus grouseri*.

Interest to fishery:

Remarks: *Eptatretus grouseri*

grouseri

E.

Common names:

Eptatretus hexatrema (Müller, 1836)

Bdellostoma hexatrema

Bdellostoma heterotrema

Bdellostoma forsteri *heterotrema*

Bdellostoma forsteri *hexatrema*

Bdellostoma cirrhatum

Homea cirrhata

Heptatretus hexatrema

Bdellostoma (Eptatretus) hexatrema

Eptatretus hexatrema

et al

Material examined:

Africana

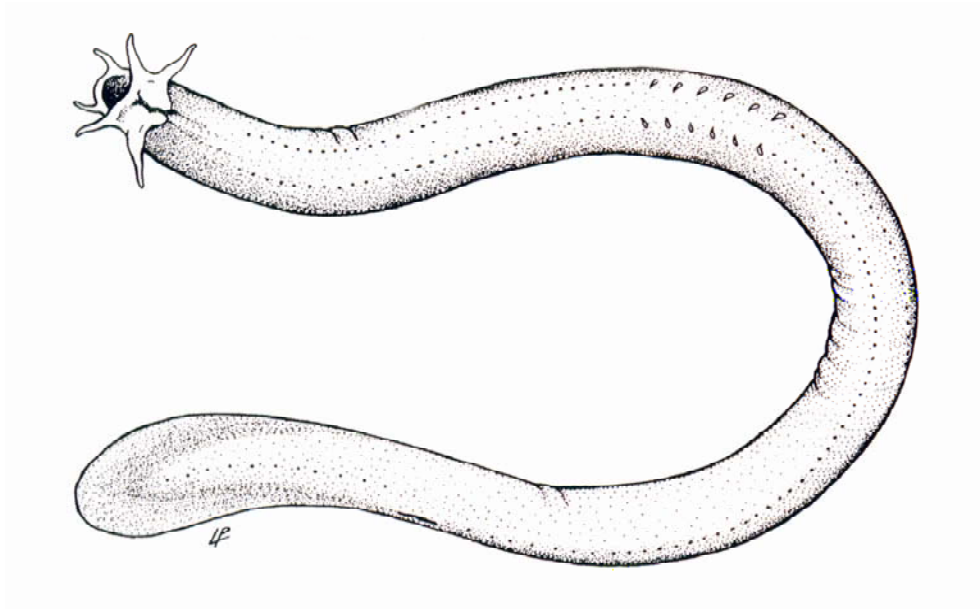


Fig. 22. *Eptatretus hexatrema* (after Smith and Heemstra, 1986).

Diagnostic features:

Size:

et al

Distribution and habitat:

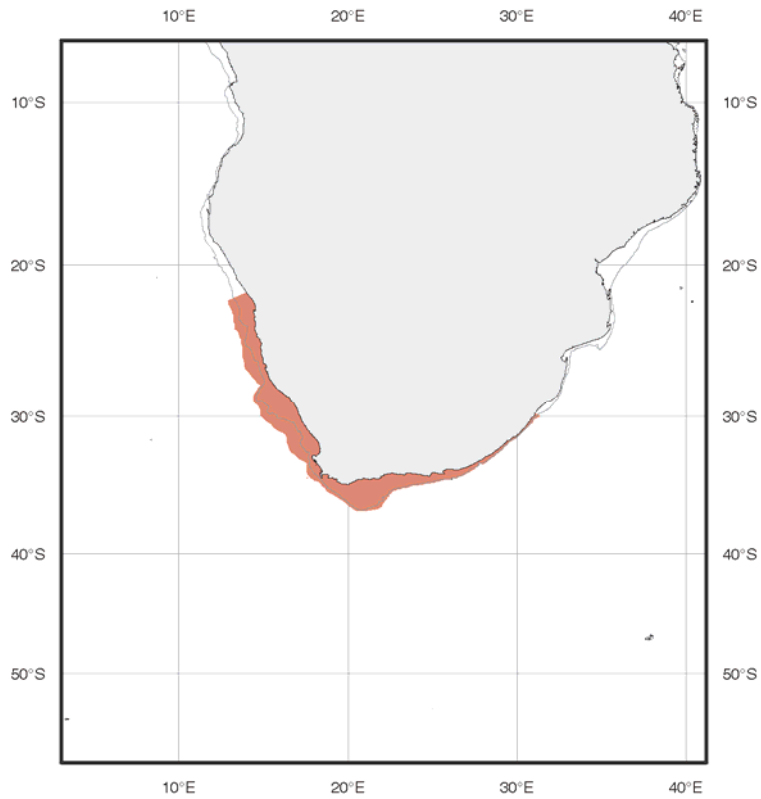


Fig. 23. Distribution of *Eptatretus hexatrema*.

Interest to fishery:

Remarks: *Bdellostoma hexatrema*

Bdellostoma heterotrema

E. hexatrema

Bdellostoma heterotrema

Bdellostoma heptatrema

Bdellostoma forsteri

Eptatretus cirrhatus

Bdellostoma forsteri

heterotrema

Bdellostoma

forsteri hexatrema

Common names:

Eptatretus indrambaryai Wongratana, 1983

Eptatretus indrambaryai

et al

Material examined:

Nagasaki Maru

Diagnostic features:

Size:

Distribution and habitat:

Nagasaki-maru

	<i>Cephaloscyllium fasciatum</i>	<i>C. umbratile</i>
<i>Squalus acanthias</i>	<i>Uroconger lepturus</i>	
<i>Gymnothorax fimbriatus</i>	<i>Therapon theraps</i>	
<i>Neobythites fasciatus</i>		
	<i>E. indrambaryai</i>	
<i>Exploratory 2</i>		

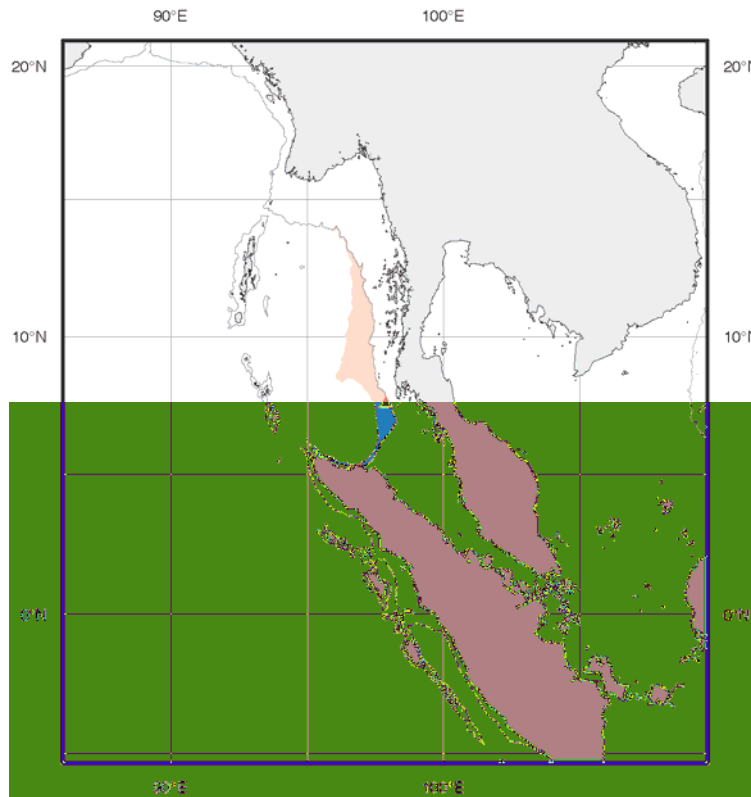


Fig. 24. Distribution of *Eptatretus indrambaryi*.

Interest to fishery:

Remarks:

indambaryai

indrambaryi

indrambaryai

Common names:

Eptatretus lakeside Mincarone and McCosker, 2004

Eptatretus lakeside

Material examined:

Johnson Sea Link

Diagnostic features:

Size:

Distribution and habitat:

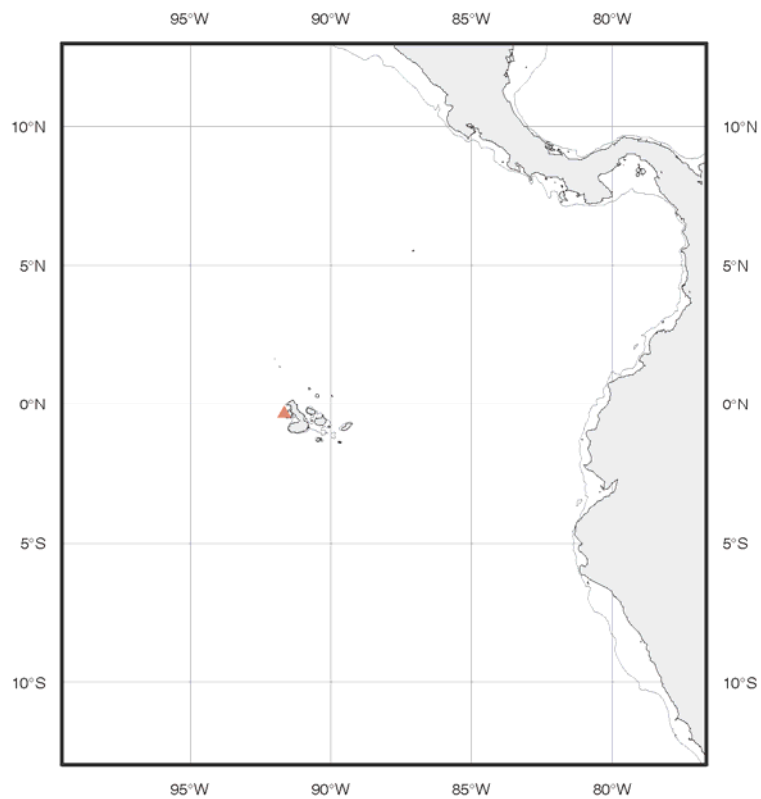


Fig. 25. Distribution of *Eptatretus lakeside*.

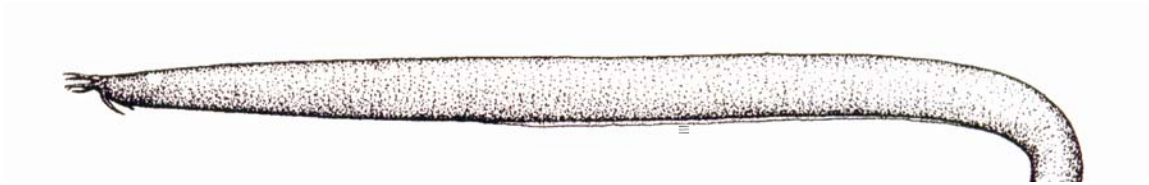
Interest to fishery:

Common names:

***Eptatretus longipinnis* Strahan, 1975**

Eptatretus longipinnis

Material examined:



Size:

Distribution and habitat:

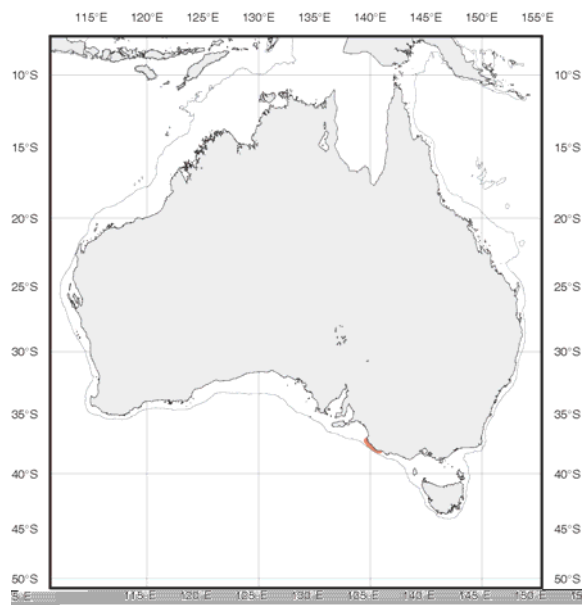


Fig. 27. Distribution of *Eptatretus longipinnis*.

Interest to fishery:

Remarks: *Eptatretus longipinnis*

Common names:

Eptatretus mcconnaugheyi Wisner and McMillan, 1990

Eptatretus mcconnaugheyi

et al

Material examined:

Miss Behavior

Diagnostic features:

Size:

Distribution and habitat:

E. mcconnaugheyi

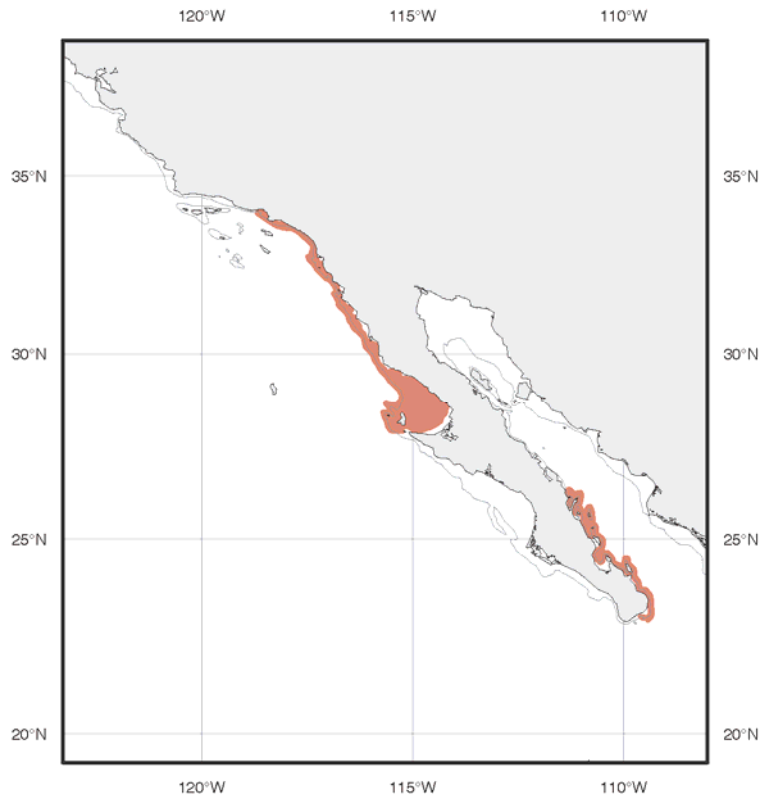


Fig. 28. Distribution of *Eptatretus mcconnaugheyi*.

Interest to fishery:

Remarks:

Eptatretus mcconnaugheyi *E. stoutii*

mcconnaugheyi

E. stoutii

E.

Common names:

Eptatretus mccoskeri McMillan, 1999

Eptatretus mccoskeri

Eptatretus lakeside

Material examined:

Johnson Sea Link

Diagnostic features:

Size:

Distribution and habitat:

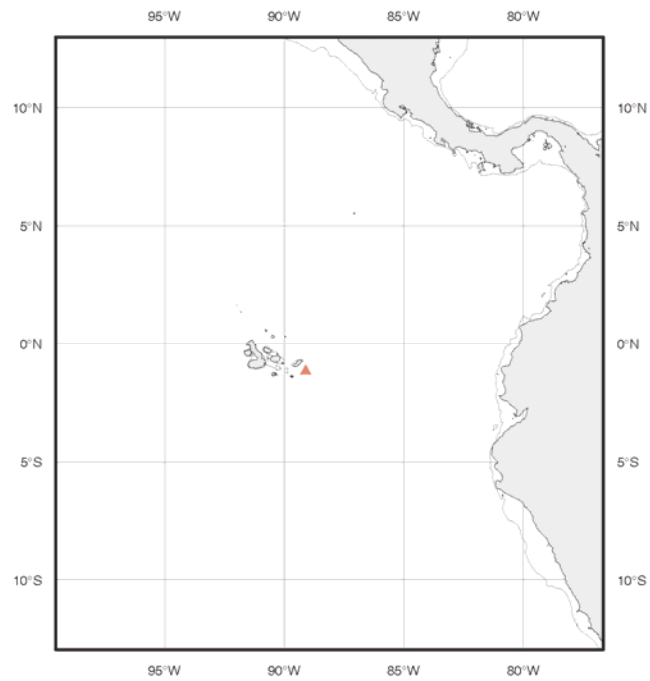


Fig. 29. Distribution of *Eptatretus mccoferi*.

Interest to fishery:

Common names:

Eptatretus mendozai Hensley, 1985

Eptatretus mendozai

et al

Eptatretus wayuu

Eptatretus

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

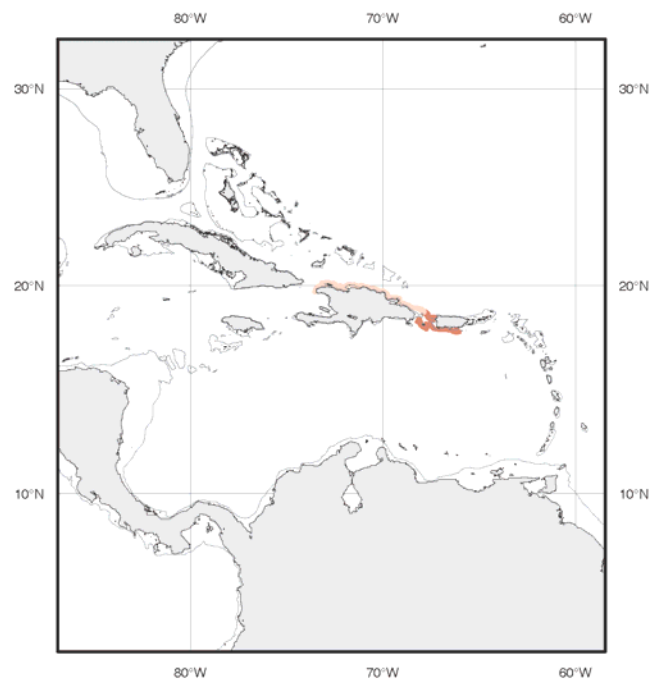


Fig. 30. Distribution of *Eptatretus mendozai*.

Interest to fishery:

Remarks:

Eptatretus

E. mendozai

Common names:

Eptatretus menezesi Mincarone, 2000

Eptatretus *et al*

Eptatretus menezesi

et al

et al

et al

Eptatretus goliath

Material examined:

Margus II

Espadarte

Diadorim

Iporanga

Diadorim

Diadorim

Diadorim

Prof. W. Besnard

Saga de Thor

Saga de Thor

Saga de Thor

Sambaqui III

Soloncy Moura

Soloncy Moura

Soloncy Moura

Diagnostic features:

Size:

Distribution and habitat:

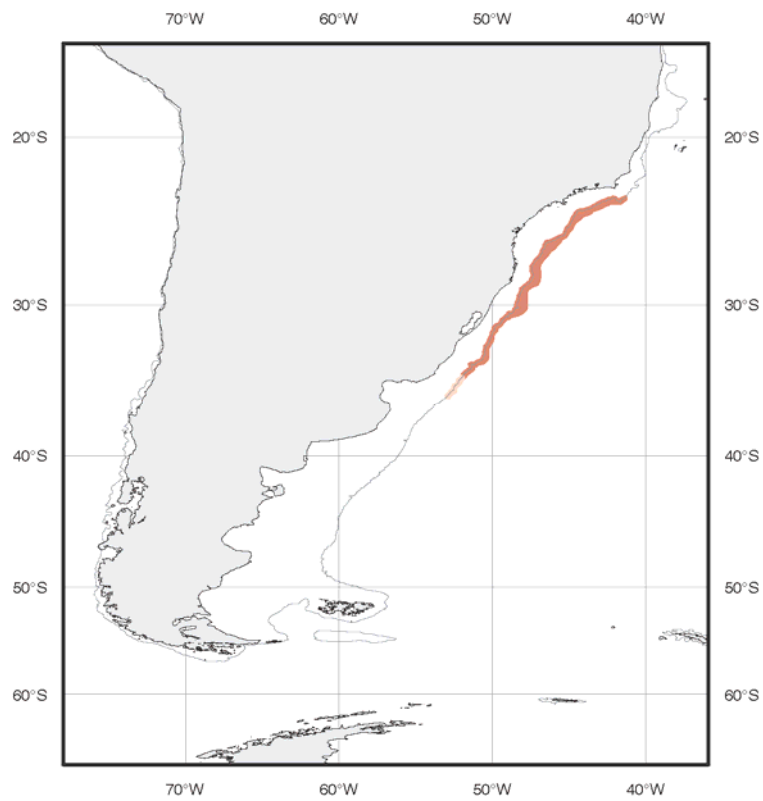


Fig. 31. Distribution of *Eptatretus menezesi*.

Interest to fishery:

E. menezesi

et

al

Remarks:

Common names:

Eptatretus minor Fernholm and Hubbs, 1981

Paramyxine springeri

Eptatretus minor

Eptatretus chinensis

et al

Eptatretus wayuu

Material examined:

Oregon

Paramyxine springeri

Oregon

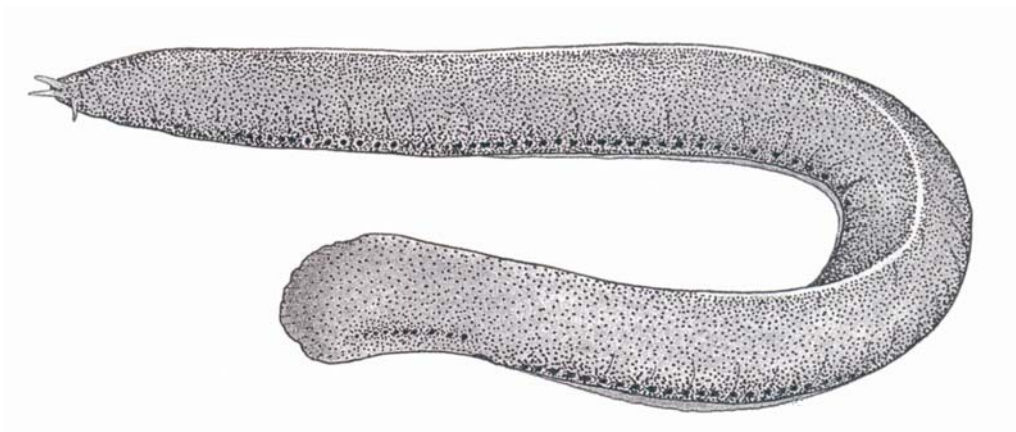


Fig. 32. *Eptatretus minor* (after McEachran and Fechhelm, 1998).

Diagnostic features:

Size:

Distribution and habitat:

E. minor *P. springeri*
E. minor

P. springeri

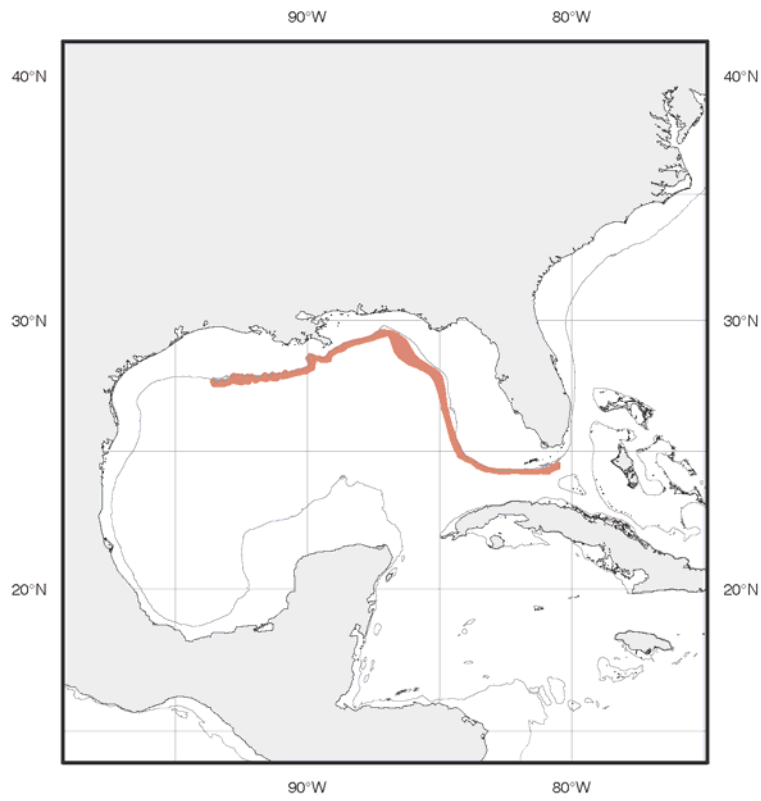


Fig. 33. Distribution of *Eptatretus minor*.

Interest to fishery:

Remarks:
minor

P. springeri

E.

Eptatretus minor

Common names:

***Eptatretus multidens* Fernholm and Hubbs, 1981**

Eptatretus multidens

Eptatretus caribbeus

Eptatretus chinensis

et al.

Eptatretus wayuu

Material examined:

Oregon II

Oregon II

Oregon II

Oregon II

Natureza

Natureza

Natureza

Kayar I

Kayar I

Natureza

Natureza

Diagnostic features:

Size:

Distribution and habitat:

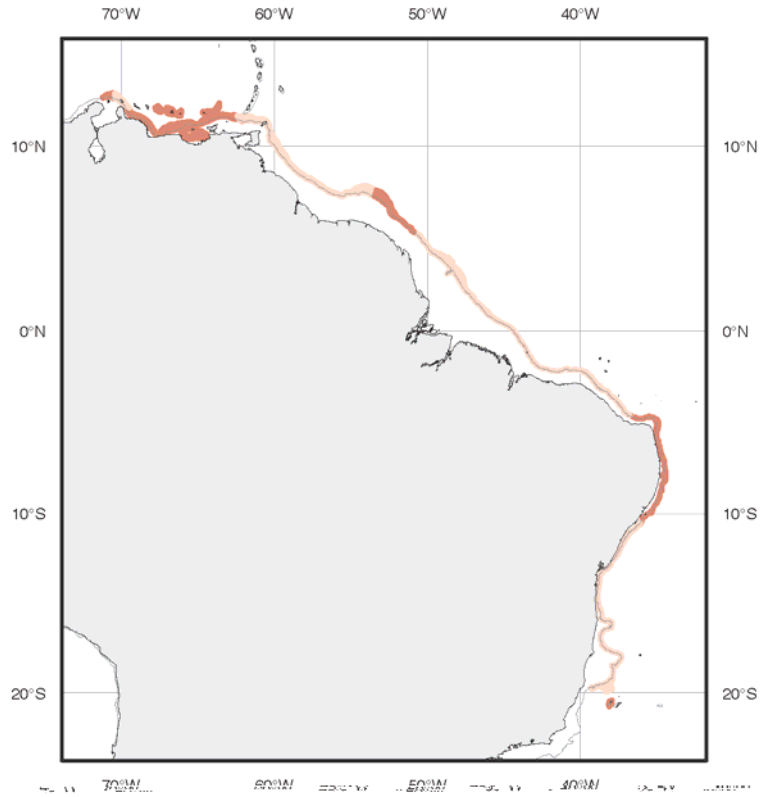


Fig. 34. Distribution of *Eptatretus multidens*.

Interest to fishery:

Remarks:

E. multidens

E.

caribbeaus

Eptatretus

Common names:

***Eptatretus nanii* Wisner and McMillan, 1988**

Eptatretus nanii

et al

Material examined:

Anton Bruun

Anton Bruun

Anton Bruun

Diagnostic features:

Size:

Distribution and habitat:

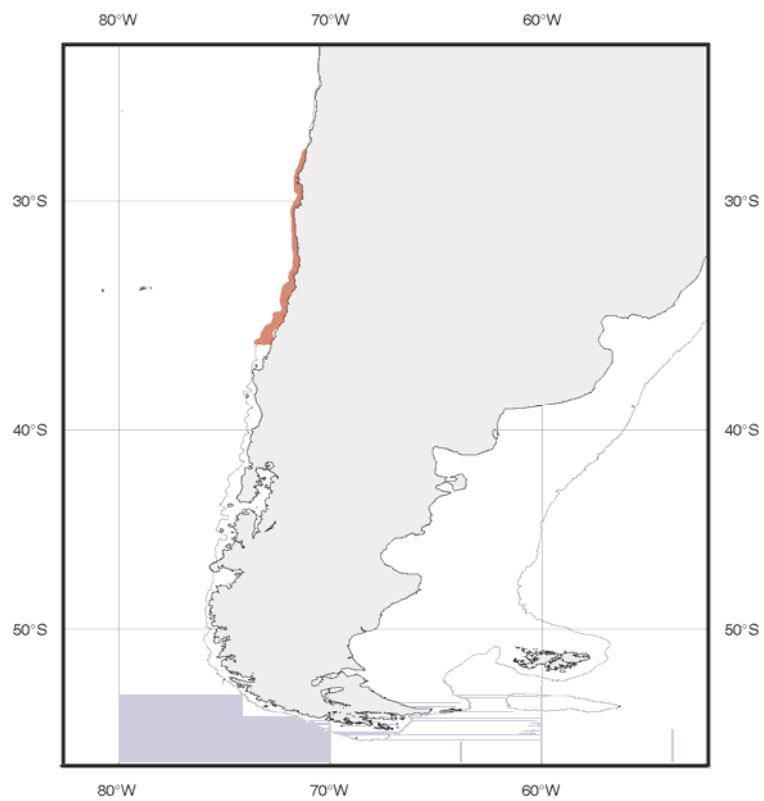


Fig. 35. Distribution of *Eptatretus nanii*.

Interest to fishery:

Remarks:

Eptatretus nanii

E. polytrema

Common names:

Eptatretus octatrema (Barnard, 1923)

Heptatretus octatrema

Bdellostoma (Eptatretus) octatrema

Bdellostoma octatrema

Homea octatrema

Eptatretus octatrema

Material examined:

Faure

Pieter

Diagnostic features:

Size:

Distribution and habitat:

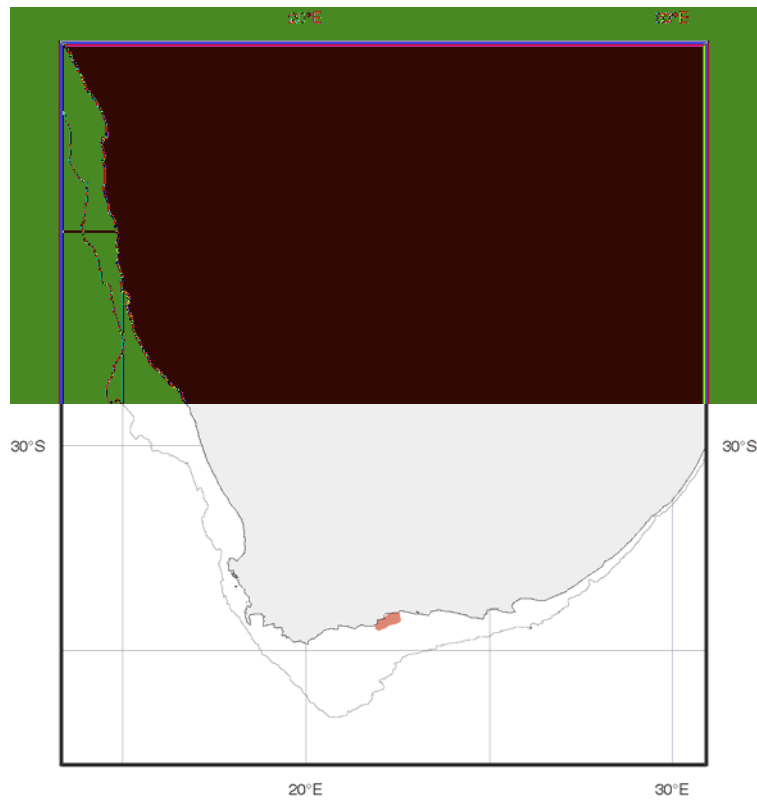


Fig. 36. Distribution of *Eptatretus octatrema*.

Interest to fishery:

Remarks:

E. octatrema

Pieter Faure

Pieter Faure

E.

octatrema

Common names:

Eptatretus okinoseanus (Dean, 1904)

Homea okinoseana

Heptatretus okinoseanus

Eptatretus okinoseanus *et al*

et al

et al

et al

Bdellostoma (Eptatretus) okinoseanum

Bdellostoma okinoseanum

Eptatretus okinoseanum

Material examined:

Yoko-maru

Diagnostic features:

Size:

Distribution and habitat:

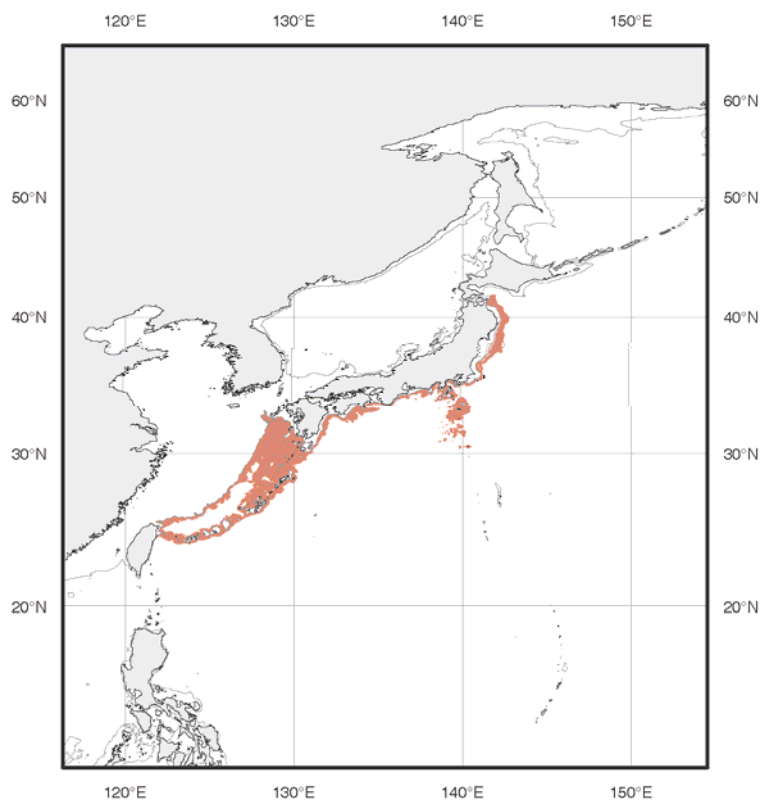


Fig. 37. Distribution of *Eptatretus okinoseanus*.

Interest to fishery:

Remarks:

Common names:

Eptatretus polytrema (Girard, 1855)

Bdellostoma polytrema

Bdellostoma stoutii

Homea polytrema

Polistotrema polytrema

Heptatretus polytrema

Bdellostoma (Polistotrema) polytrema

Dodecatrema polytrema

Eptatretus polytrema

et al

et al

Material examined:

Anton Bruun

Anton Bruun

Diagnostic features:

Size:

Distribution and habitat:

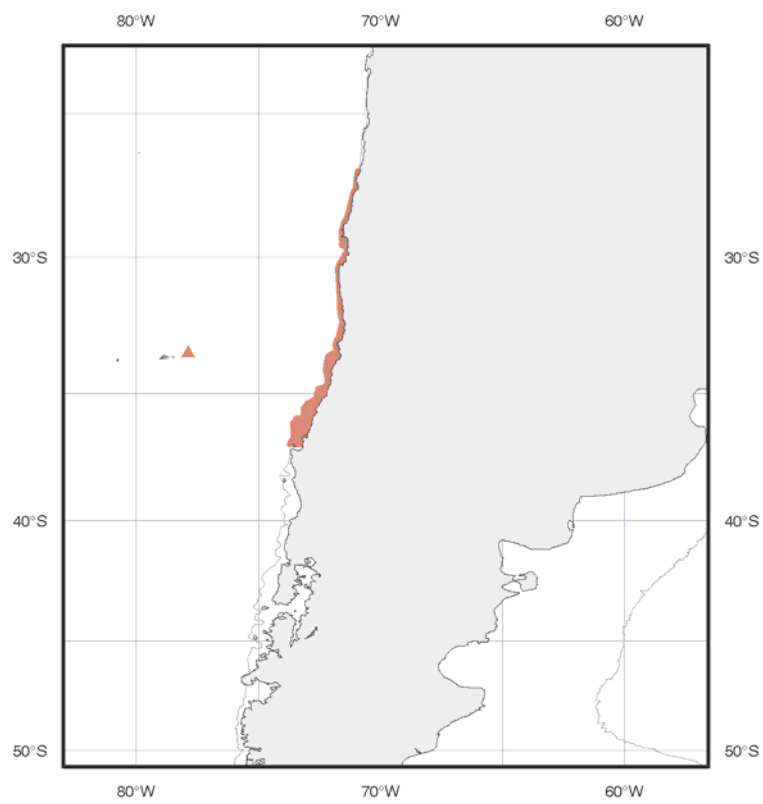


Fig. 38. Distribution of *Eptatretus polytremas*.

Interest to fishery:

Remarks:

polytremas

dombey Gastrobranche dombey
dombeyi
Eptatretus

dombeyi Gastrobranchus

E. polytrema

E. bischoffi

E.

nani

Common names:

Eptatretus profundus (Barnard, 1923)

Heptatretus profundus

Bdellostoma (Eptatretus) profundum

Bdellostoma profundum

Homea profunda

Eptatretus profundus

Eptatretus

lakeside

Eptatretus profundum

Material examined:

Africana

Africana

Diagnostic features:

Size:

Distribution and habitat:

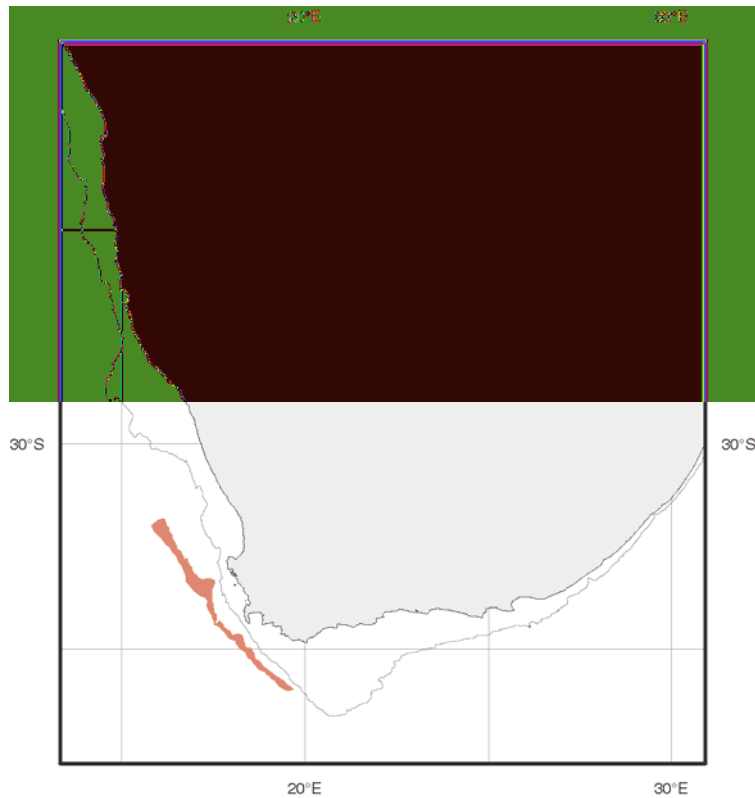


Fig. 39. Distribution of *Eptatretus profundus*.

Interest to fishery:

Remarks:

Pieter Faure

Eptatretus profundus

Common names:

Eptatretus sinus Wisner and McMillan, 1990

Eptatretus sinus

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

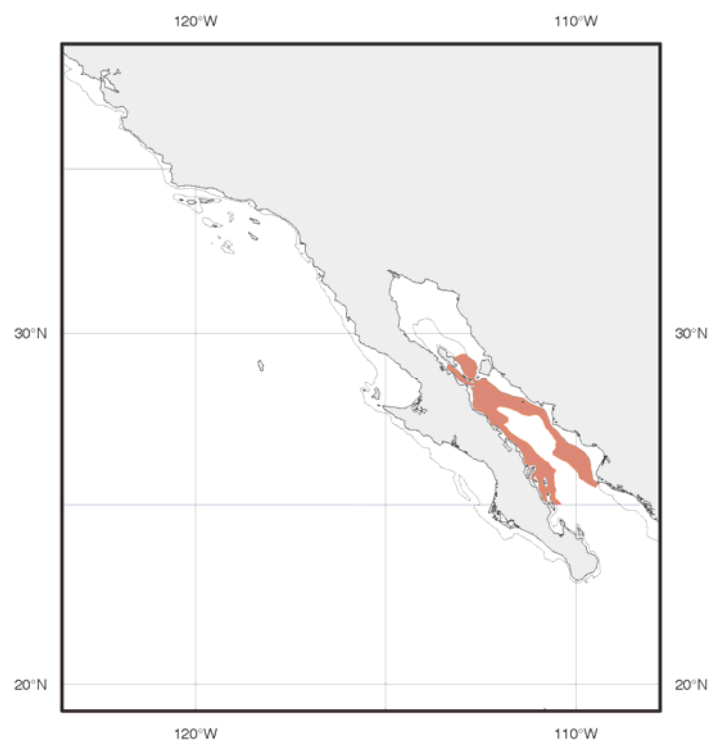


Fig. 40. Distribution of *Eptatretus sinus*.

Interest to fishery:

Remarks: *Eptatretus sinus*

Eptatretus

Common names:

Eptatretus stoutii (Lockington, 1878)

Bdellostoma stoutii

Polistotrema dombeyi

Bdellostoma stouti

Polistotrema stouti

Polistotrema deani

Polistotrema curtiss-jamesi

et al

Homea stouti

Eptatretus stouti

Mirounga

angustirostris

Polistotrema stoutii

et al

Heptatretus stouti

Bdellostoma (Polistotrema) stouti

Dodecatrema stoutii

Eptatretus stoutii

Eptatretus deani

et

al

et al

et al

et al

et al

et al

et al

et al

Material examined:

Yaquina

Yaquina

Scofield

Scofield

Scofield

Scofield

Diagnostic features:

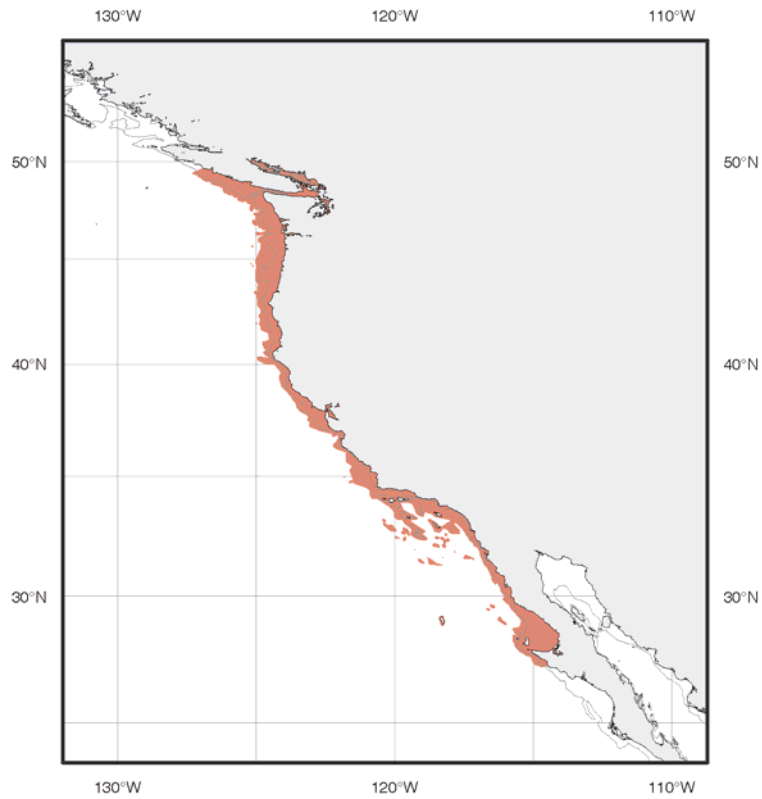


Fig. 41. Distribution of *Eptatretus stoutii*.

Interest to fishery:

Eptatretus stoutii

E. deani

Table 6. Oregon hagfish landings 1988-1992 (from Barss, 1993).

1988	1991
1989	

Eptatretus stoutii

Common names:

Eptatretus strahani McMillan and Wisner, 1984

Eptatretus strahani

Eptatretus goliath

Material examined:

Vauban

Striker

Diagnostic features:

Size:

Distribution and habitat:

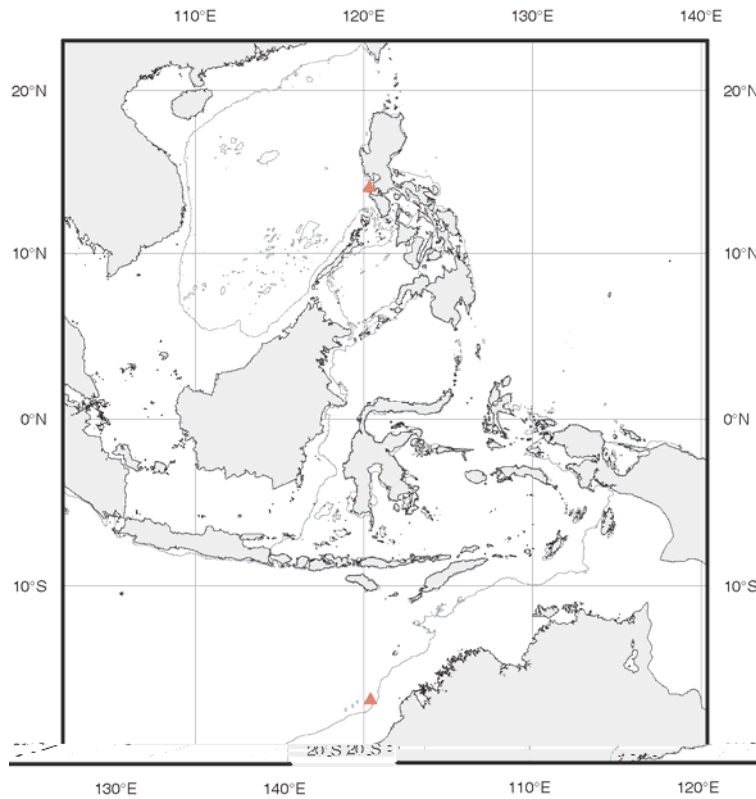


Fig. 42. Distribution of *Eptatretus strahani*.

Interest to fishery:

Remarks:

E. strahani

Common names:

Eptatretus wisneri McMillan, 1999

Eptatretus wisneri

Material examined:

Johnson Sea Link *et al*

Johnson Sea Link *et al*

Diagnostic features:

Size:

Distribution and habitat:

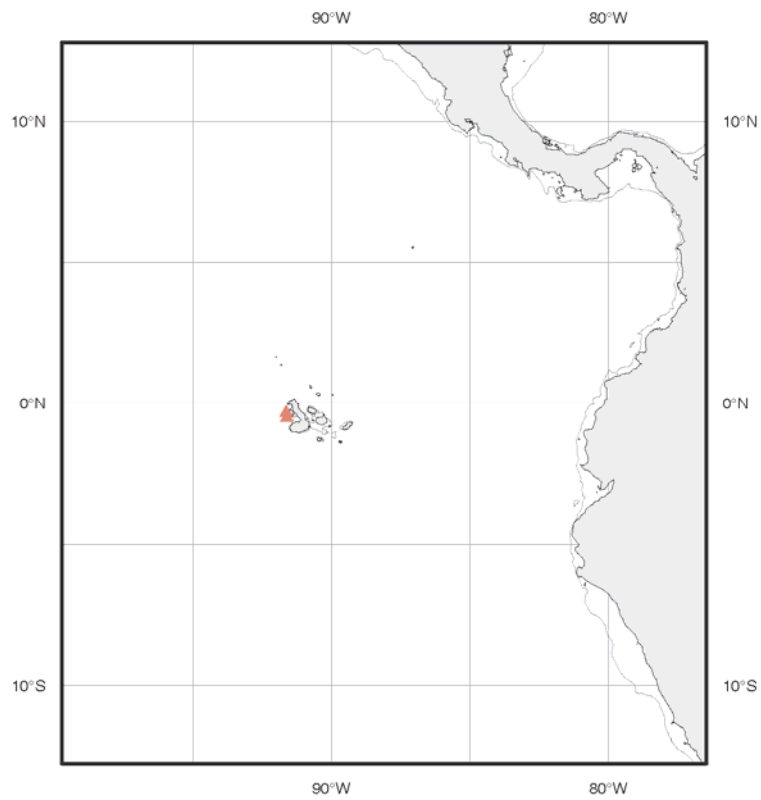


Fig. 43. Distribution of *Eptatretus wisneri*.

Interest to fishery:

Remarks:

Common names:

Paramyxine Dean, 1904

Paramyxine

Paramyxine atami

Quadratus

Paramyxine taiwanae

Diagnostic features:

Distribution:

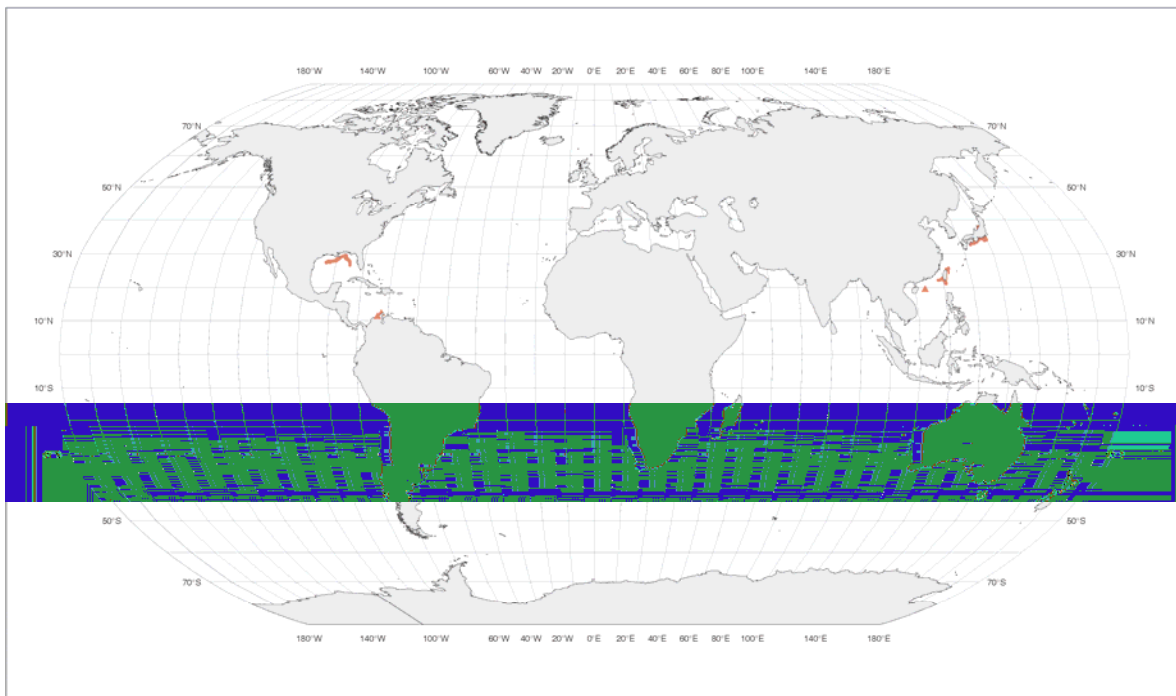


Fig. 44. Global distribution of the genus *Paramyxine*.

Species:

Paramyxine ancon

Paramyxine atami

Paramyxine cheni

Paramyxine chinensis

Paramyxine fernholmi

Paramyxine moki

Paramyxine nelsoni

Paramyxine sheni

Paramyxine springeri

Paramyxine taiwanae

Paramyxine walkeri

Paramyxine wayuu

Paramyxine wisneri

Paramyxine yangi

Remarks:

Paramyxine

Paramyxine

Quadratus

Quadratus

Paramyxine

Paramyxine taiwanae

Quadratus

Paramyxine

yangi

Quadratus

Paramyxine

Key to Species of *Paramyxine*

Paramyxine chinensis

Paramyxine atami

Paramyxine sheni

Paramyxine ancon

Paramyxine taiwanae

Paramyxine springeri

Paramyxine moki

Paramyxine fernholmi

Paramyxine walkeri

Paramyxine wisneri

Paramyxine cheni

Paramyxine wayuu

Paramyxine nelsoni

Paramyxine yangi

Paramyxine ancon (Mok, Saavedra-Diaz and Acero-P., 2001)

Quadratus ancon

et al

Material examined:

Diagnostic features:

Size:

et al

Distribution and habitat:

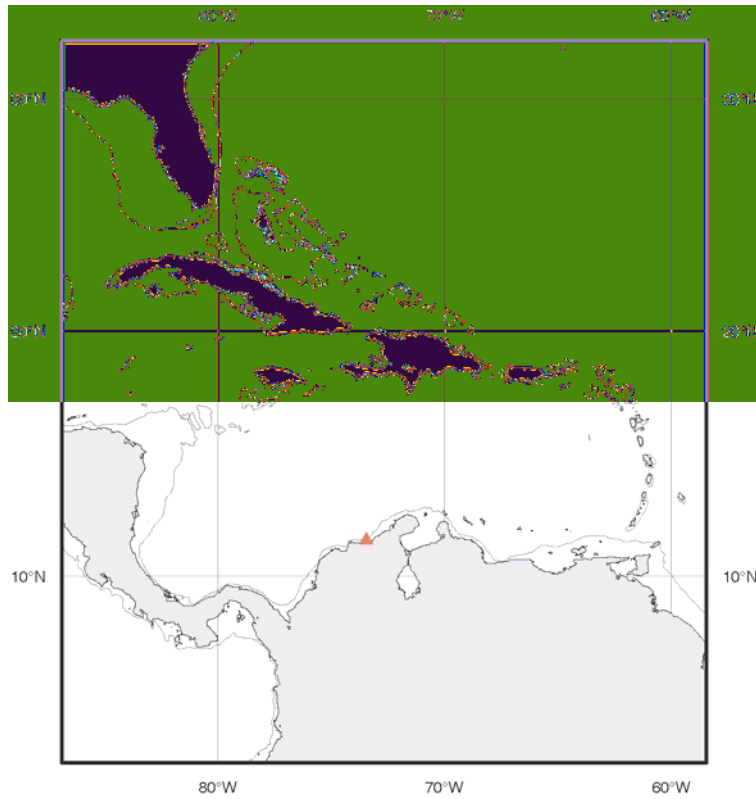


Fig. 45. Distribution of *Paramyxine ancon*.

Interest to fishery:

Remarks:

et al

Common names:

***Paramyxine atami* Dean, 1904**

Paramyxine atami

et al

Paramyxine springeri

et al

et al

Eptatretus atami

Material examined:

Albatross

Diagnostic features:

Size:

Distribution and habitat:

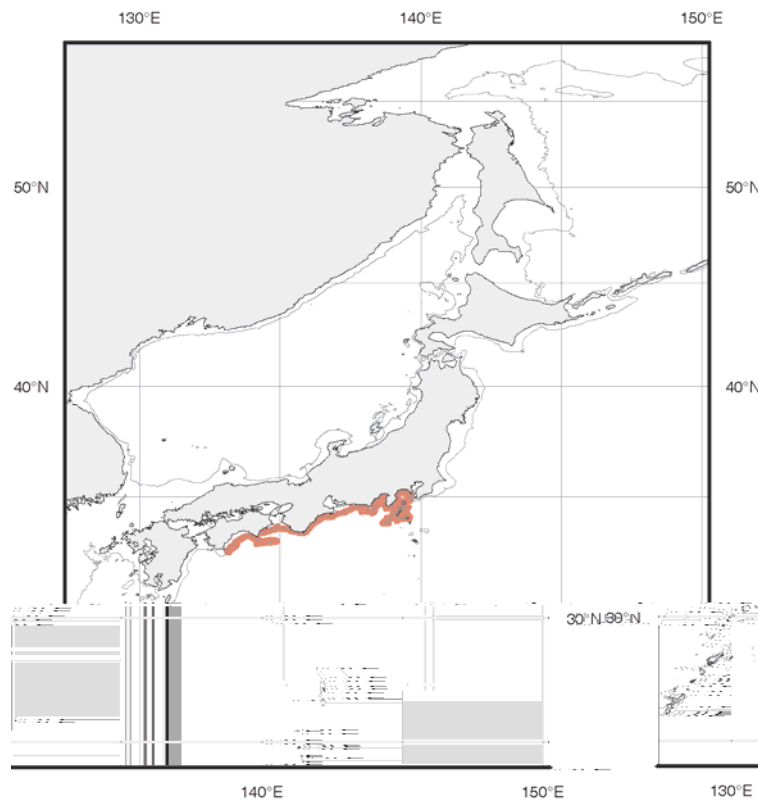


Fig. 46. Distribution of *Paramyxine atami*.

Interest to fishery:

Remarks: *Paramyxine*

P. atami

et al

et al

P. fernholmi P. sheni P. wisneri

P. moki P. walkeri

P. atami

Common names:

Paramyxine cheni Shen and Tao, 1975

Paramyxine cheni

et al

Eptatretus cheni

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

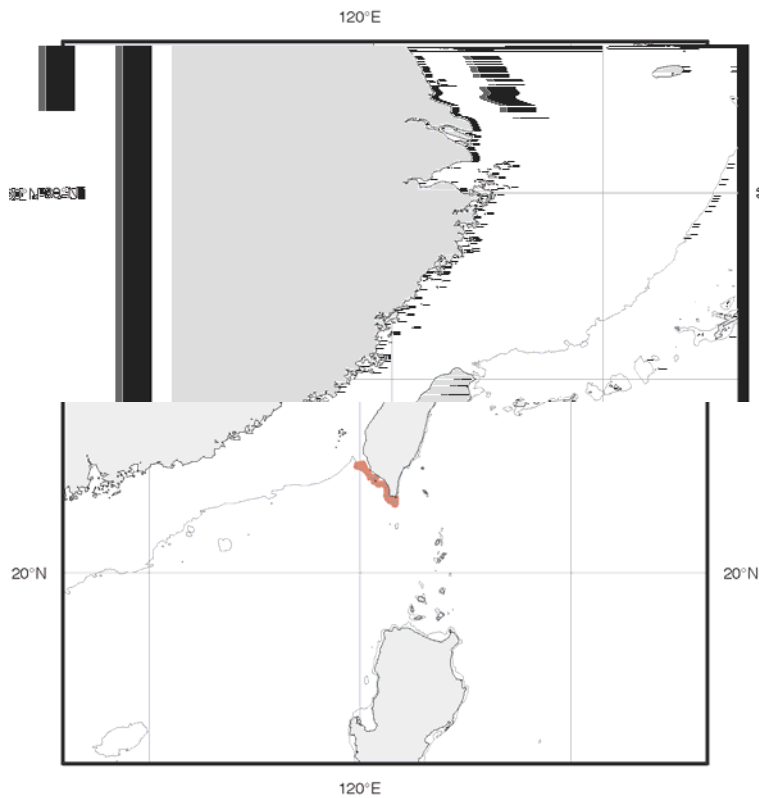


Fig. 47. Distribution of *Paramyxine cheni*.

Interest to fishery:

Remarks:

et al

Common names:

***Paramyxine chinensis* (Kuo and Mok, 1994)**

Eptatretus chinensis

et al

Material examined:

Diagnostic features:

Size:

et al

Distribution and habitat:

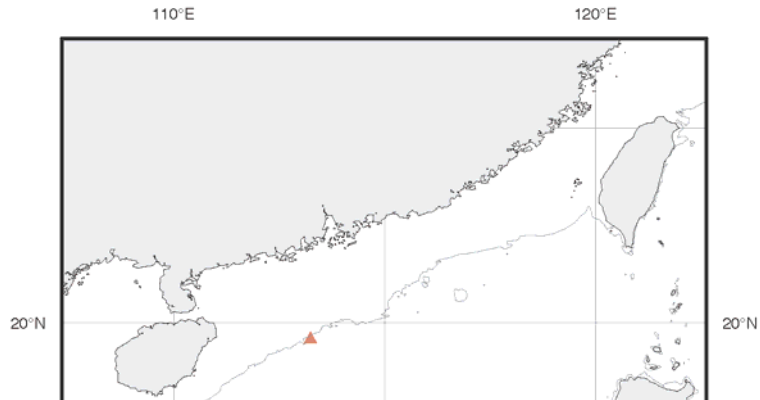


Fig. 48. Distribution of *Paramyxine chinensis*.

Interest to fishery:

P. chinenses

et al

Remarks:

chinensis

Quadratus

et al

Eptatretus

Paramyxine

Paramyxine

et al

Paramyxine chinensis

et al

et al

P. chinensis

Common names:

Paramyxine fernholmi Kuo, Huang and Mok, 1994

Paramyxine fernholmi

et al.

Quadratus ancon

Eptatretus fernholmi

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

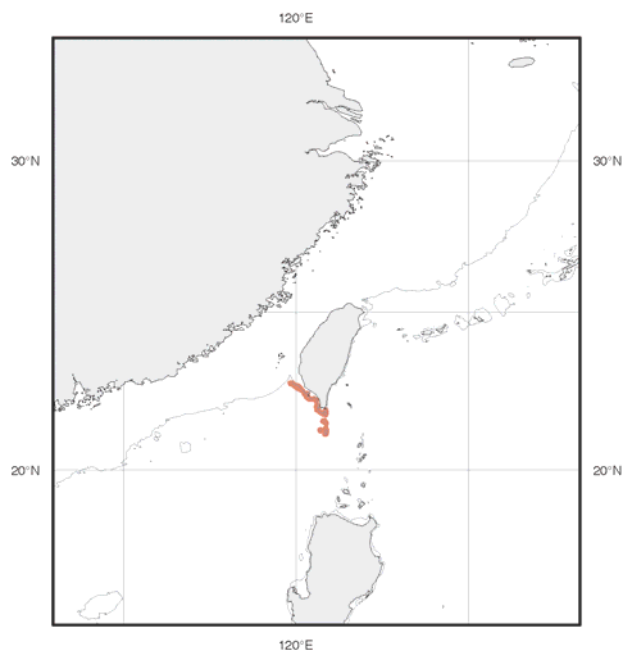


Fig. 49. Distribution of *Paramyxine fernholmi*.

Interest to fishery:

Remarks: *et al*

Common names:

Paramyxine moki McMillan and Wisner, 2004

Paramyxine moki

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

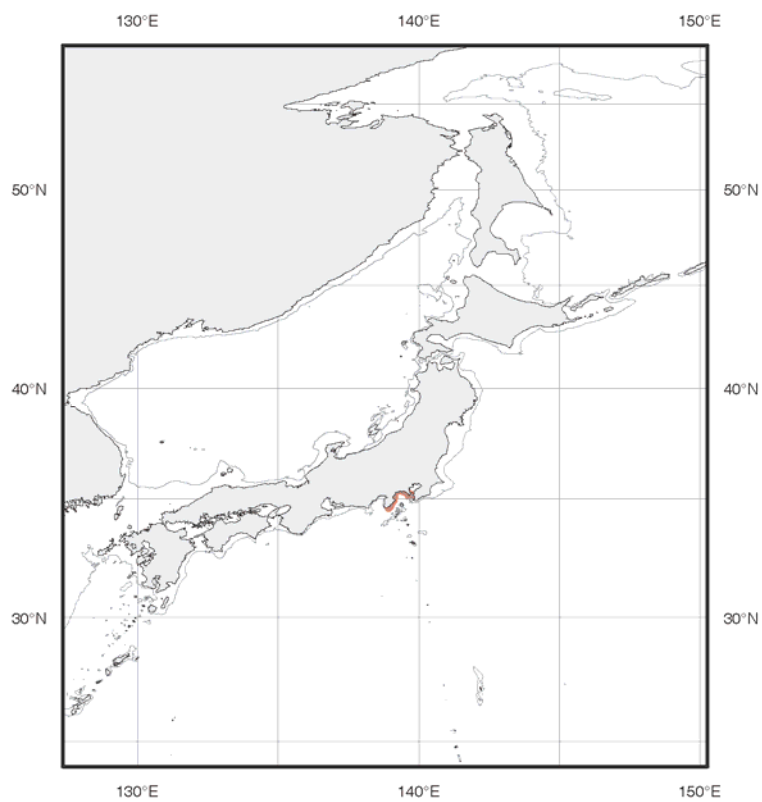


Fig. 50. Distribution of *Paramyxine moki*.

Interest to fishery:

Paramyxine atami

Remarks:

Paramyxine
P. atami
P. moki

Common names:

Paramyxine nelsoni Kuo, Huang and Mok, 1994

Paramyxine nelsoni

Eptatretus nelsoni

Quadratus nelsoni et al.

Quadratus ancon

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

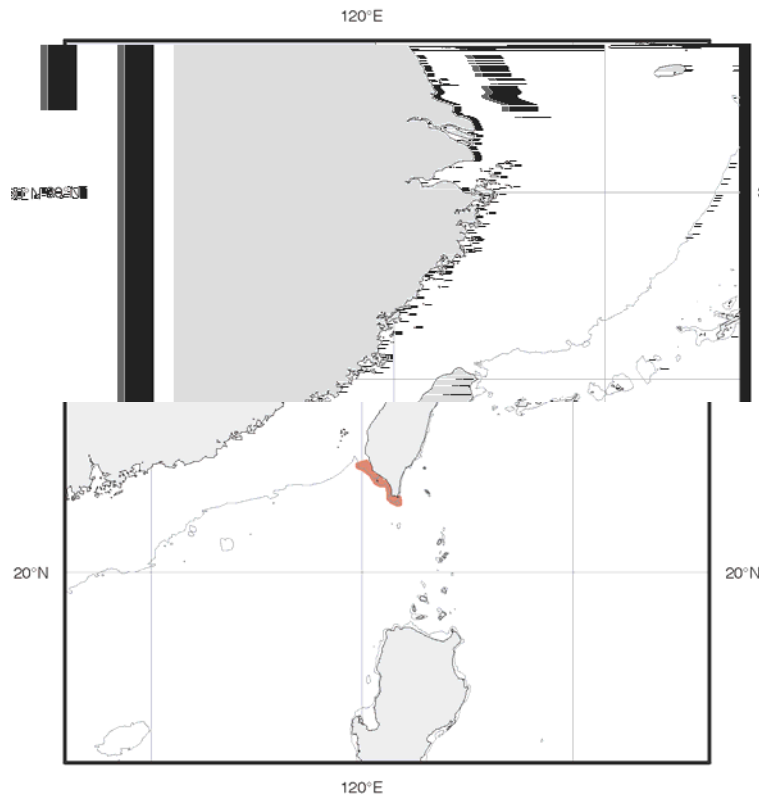


Fig. 51. Distribution of *Paramyxine nelsoni*.

Interest to fishery:

Remarks:

P. nelsoni

Paramyxine nelsoni

Common names:

Size:

Distribution and habitat:

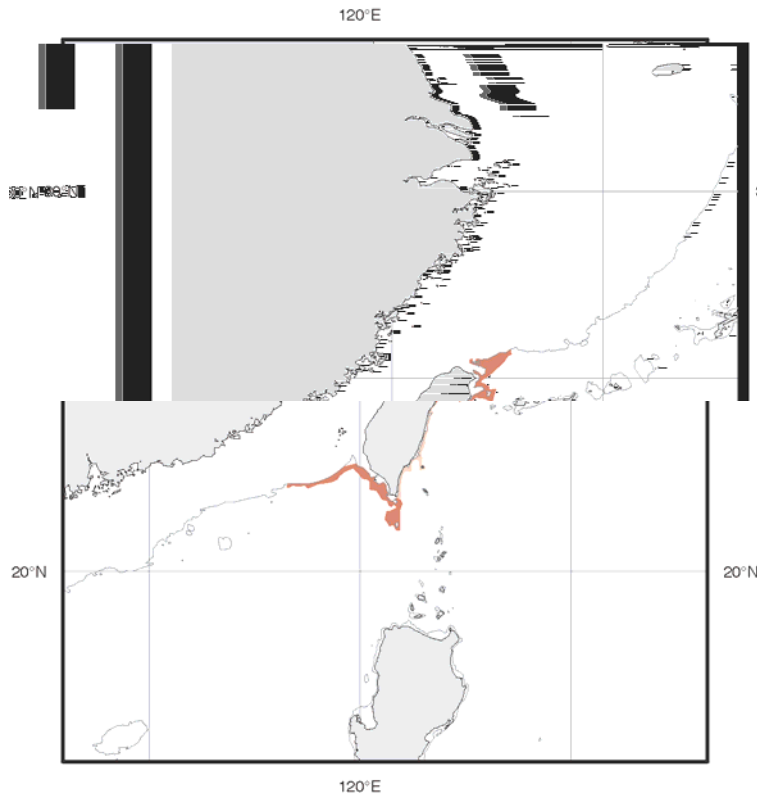


Fig. 52. Distribution of *Paramyxine sheni*.

Interest to fishery:

Remarks:

et al

P. sheni

P. sheni

Common names:

Paramyxine springeri Bigelow and Schroeder, 1952

Paramyxine springeri

Paramyxine atami

et al

Eptatretus wayuu

Eptatretus springeri

Material examined:

Oregon

Oregon II

Oregon II

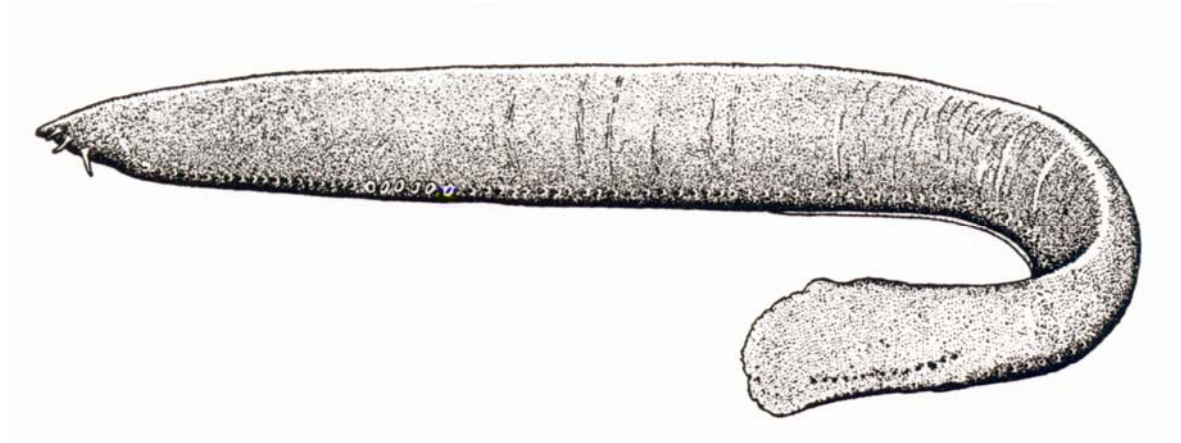


Fig. 53. *Paramyxine springeri* (after Bigelow and Schroeder, 1952).

Diagnostic features:

Size:

Distribution and habitat:

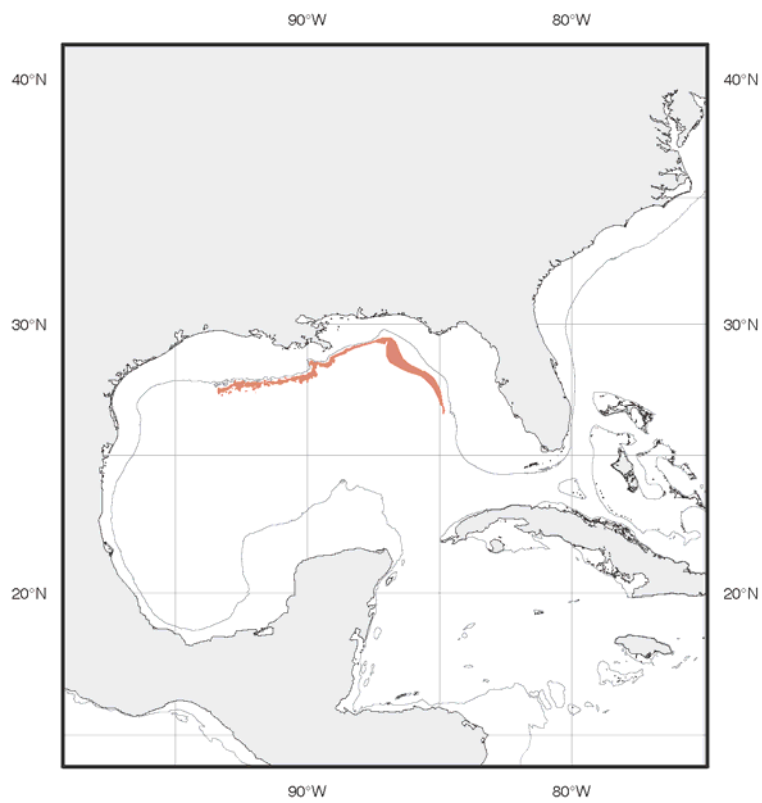


Fig. 54. Distribution of *Paramyxine springeri*.

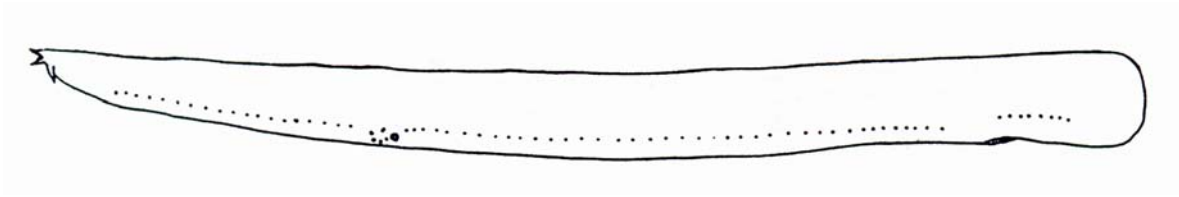


Fig. 55. *Paramyxine taiwanae* (after Shen and Tao, 1975).

Diagnostic features:

Size:

Distribution and habitat:

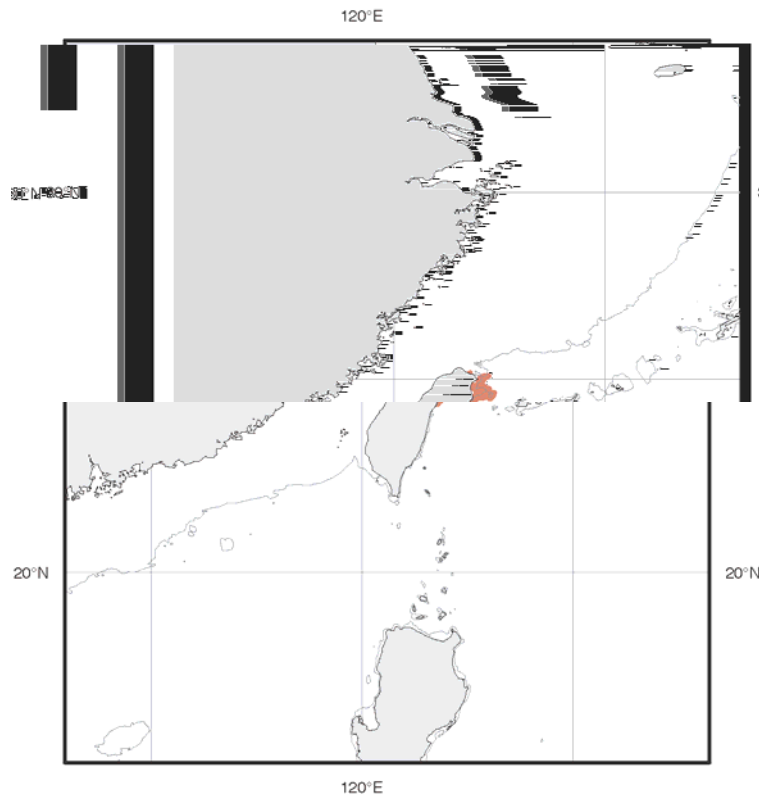


Fig. 56. Distribution of *Paramyxine taiwanae*.

Interest to fishery:

Remarks: *Paramyxine taiwanae*

et al

Common names:

Paramyxine walkeri McMillan and Wisner, 2004

Paramyxine walkeri

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

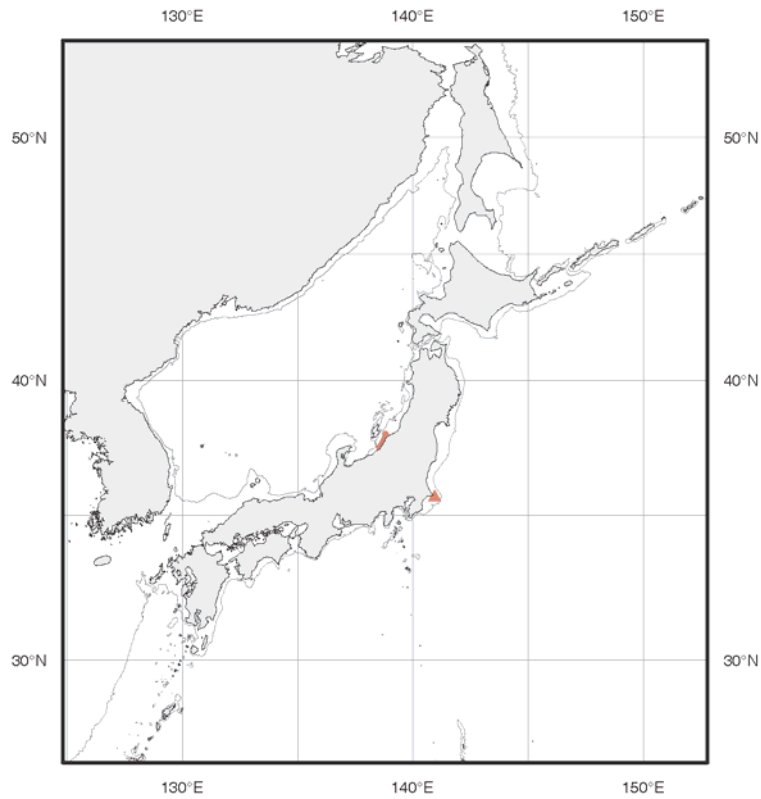


Fig. 57. Distribution of *Paramyxine walkeri*.

Interest to fishery: *Paramyxine atami*

Remarks: *Paramyxine*
P. atami
P. walkeri

Common names:

Paramyxine wayuu (Mok, Saavedra-Diaz and Acero-P., 2001)

Eptatretus wayuu

et al

Material examined:

Diagnostic features:

Size:

t al

Distribution and habitat:

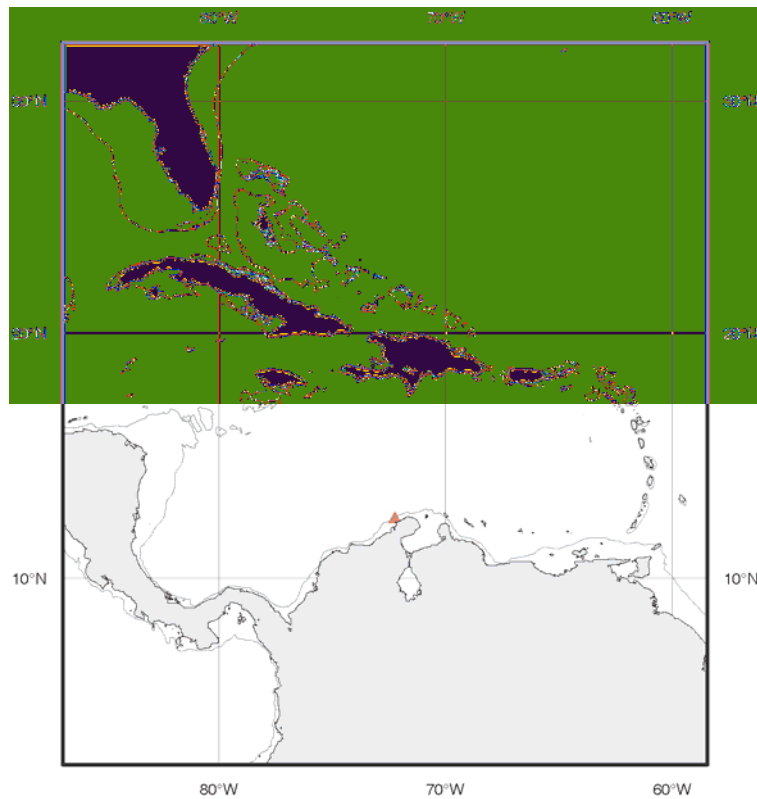


Fig. 58. Distribution of *Paramyxine wayuu*.

Interest to fishery:

Remarks:

Eptatretus

Paramyxine

Common names:

Paramyxine wisneri Kuo, Huang and Mok, 1994

Paramyxine wisneri

Eptatretus wisneri

Material examined:

Diagnostic features:

Size: *et al*

Distribution and habitat:

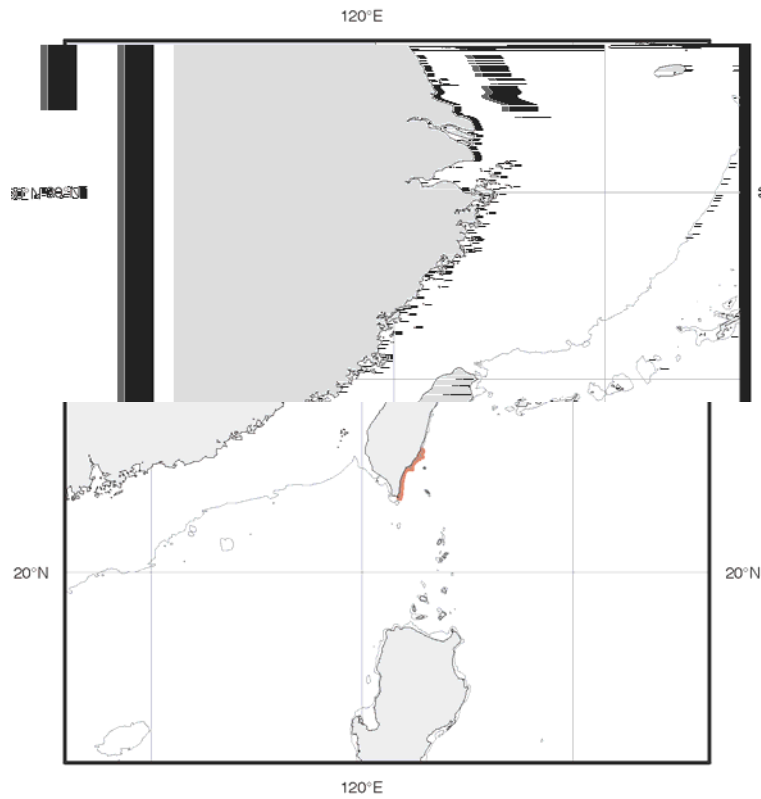


Fig. 59. Distribution of *Paramyxine wisneri*.

Interest to fishery:

Remarks:

Common names:

***Paramyxine yangi* Teng, 1958**

Paramyxine yangi

al

et

Eptatretus yangi

Quadratus yangi

Quadratus ancon

Quadratus

et al.

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

taiwanae *P. nelsoni* *E. burgeri*

P.

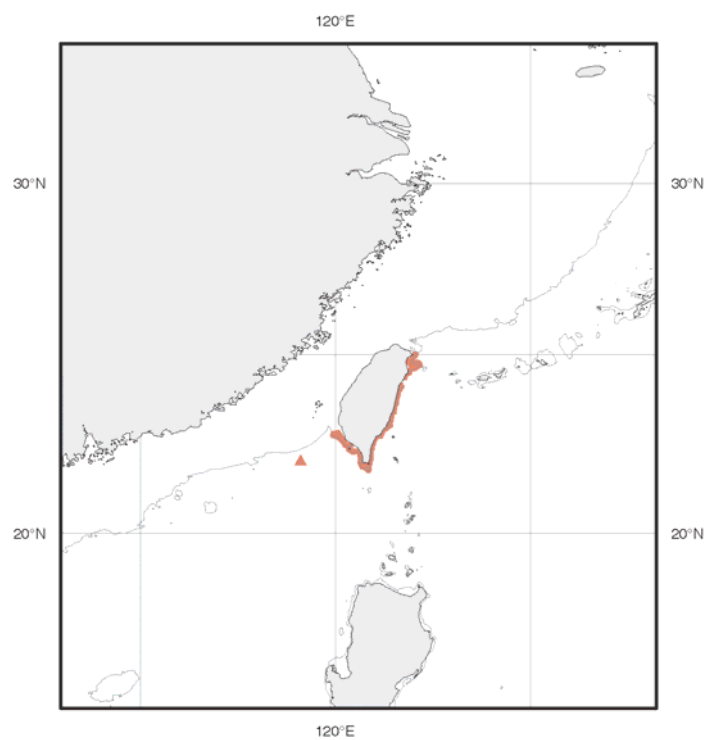


Fig. 60. Distribution of *Paramyxine yangi*.

Interest to fishery:

Remarks: *Paramyxine yangi*

Common names:

Myxine Linnaeus, 1758

Myxine

5Td(Lin) sas:

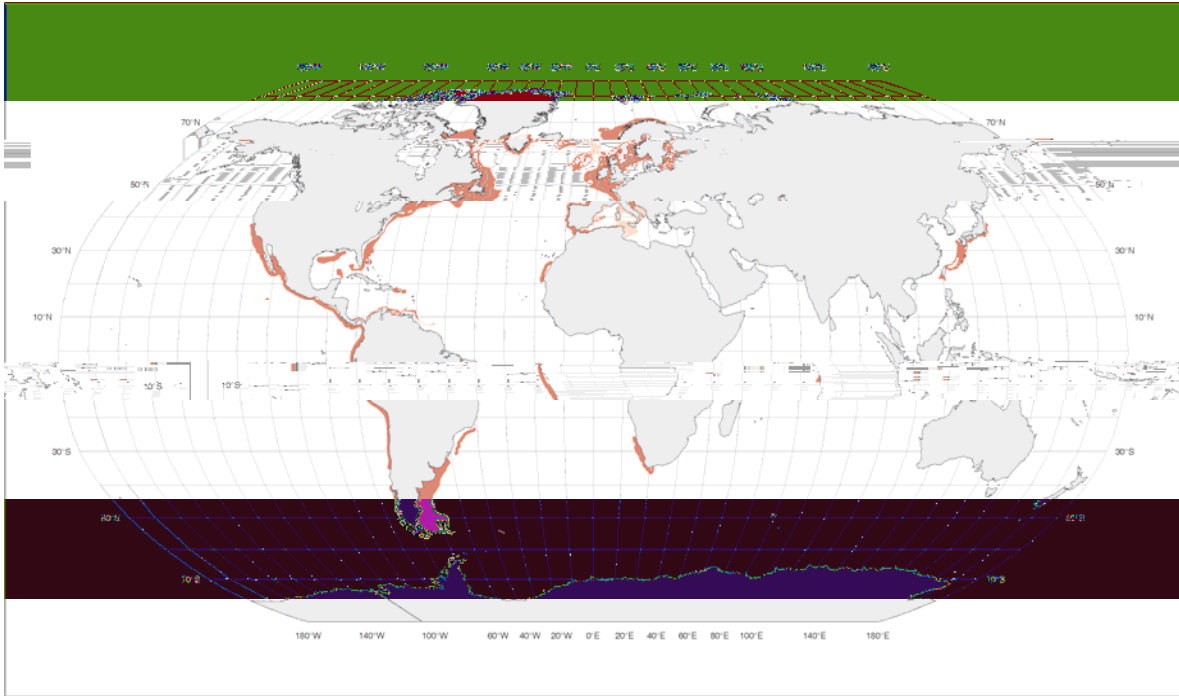
Distribution:

Fig. 61. Global distribution of the genus *Myxine*.

Species:

Myxine affinis

Myxine australis

Myxine capensis

Myxine circifrons

Myxine debueni

Myxine fernholmi

Myxine formosana

Myxine garmani

Myxine glutinosa

Myxine hubbsi

Myxine hubbsoides

Myxine ios

Myxine jespersenae

Myxine knappi

Myxine kuoi

Myxine mccoskeri

Myxine mcmillanae

Myxine paucidens

Myxine pequenoi

Myxine robinsorum

Myxine sotoi

Key to Species of *Myxine* from the Atlantic Ocean

Myxine capensis

Myxine ios

Myxine fernholmi

Myxine debueni

Myxine jespersenae

M. glutinosa

Myxine mcmillanae

Myxine sotoi

Myxine affinis

Myxine australis

Myxine glutinosa

Myxine knappi

Myxine mccoskeri

Myxine robinsorum

Key to Species of *Myxine* from the Pacific Ocean

Myxine pequenoi

Myxine garmani

Myxine paucidens

Myxine kuoi

Myxine hubbsi

Myxine hubbsoides

Myxine circifrons

Myxine formosana

Myxine affinis Günther, 1870

Myxine affinis

Myxine

et al

Myxine australis

b-d

Myxine glutinosa *australis*

Myxine glutinosa *australis*

Myxine tridentiger

Myxine glutinosa

et al

Myxine glutinosa *olivacea*

Myxine affinis-australis

Material examined:

San Juan

San Luis

Myxine tridentiger

Romanche

Hero

Albatross

Diagnostic features:

Size:

Distribution and habitat:

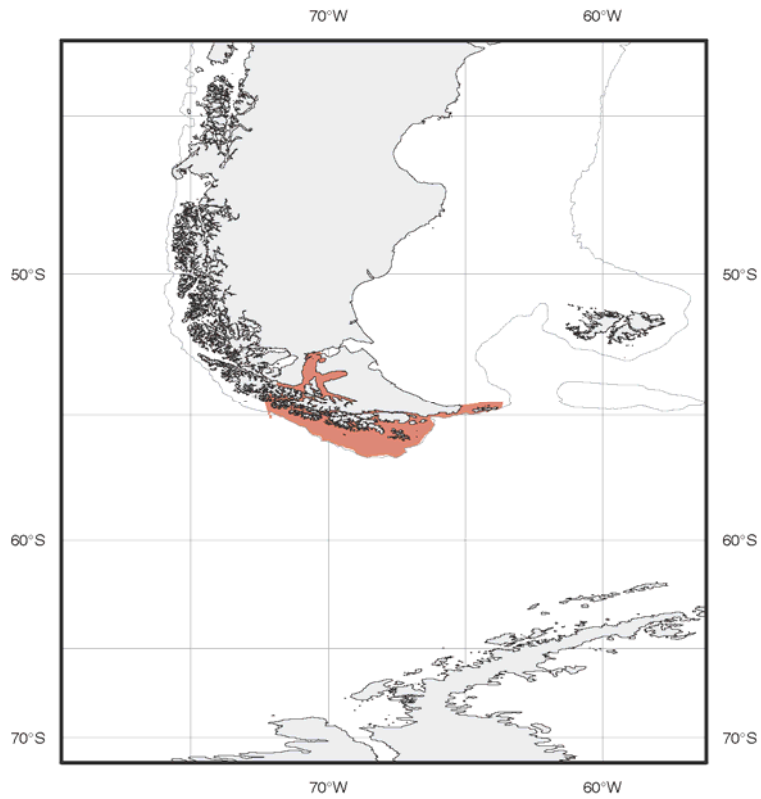


Fig. 62. Distribution of *Myxine affinis*.

Interest to fishery:

Remarks:

Myxine affinis

Myxine tridentiger

Myxine affinis

Myxine

australis

b – d

Muraenoblenna olivacea

Myxine affinis nomen dubium

Myxine

Myxine affinis

Myxine australis

vs

affinis-australis

M. affinis

M. australis

Common name:

Myxine australis Jenyns, 1842

Myxine australis

Myxine

et al

Myxine glutinosa *australis*

Myxine acutifrons

Myxine australis acutifrons

Myxine glutinosa

Myxine affinis-australis

Myxine glutinosa australis

Material examined:

Comodoro Rivadavia

Bahia

Blanca

Bahia Blanca

Chiriguano

Hero

Robinson

Alcyone Cousteau

Diagnostic features:

Size:

Distribution and habitat:

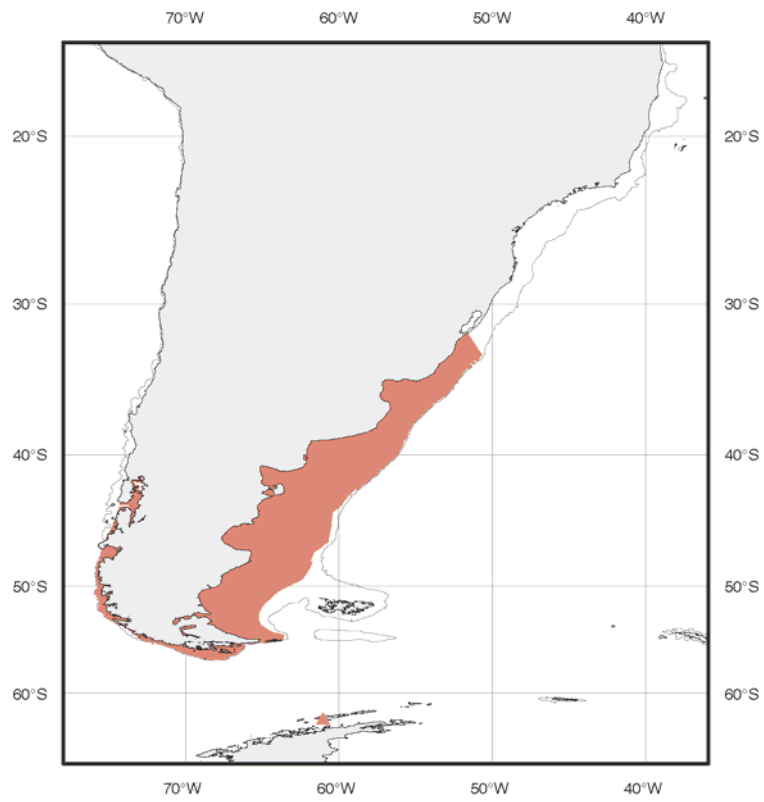


Fig. 63. Distribution of *Myxine australis*.

Interest to fishery:

Remarks:

M. australis

Myxine

australis

Myxine tridentiger

Myxine acutifrons

Lagenorhynchus australis

et al

Myxine australis

M. australis

Common names:

Myxine capensis Regan, 1913

Myxine capensis

magnificus

Octopus

et al

et al

et al

Myxine glutinosa

Material examined:

Africana

Africana

Fridtjof Nansen

Africana

Pickle

Diagnostic features:

Size:

Distribution and habitat:

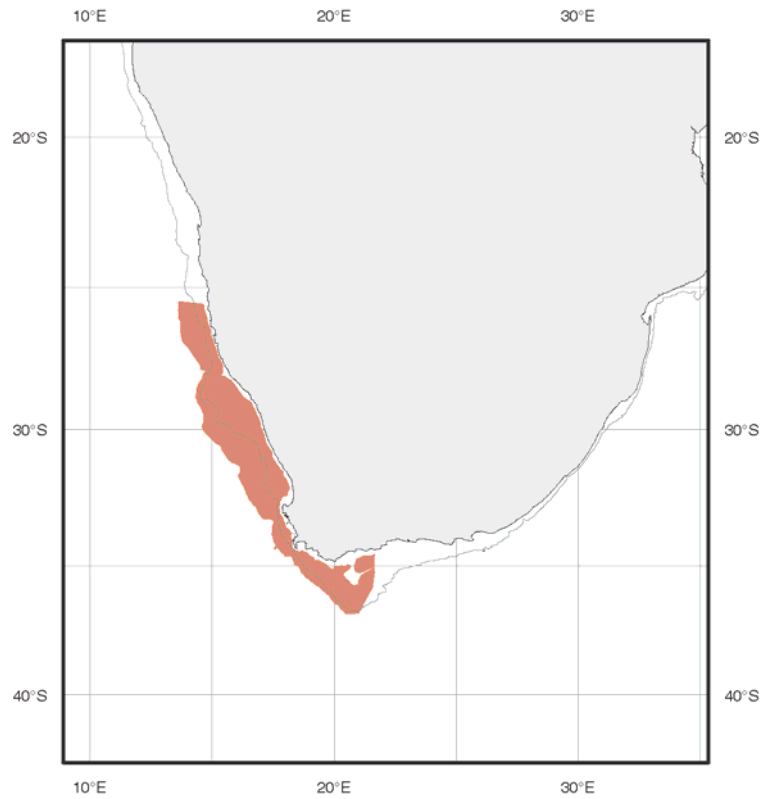


Fig. 64. Distribution of *Myxine capensis*.

Interest to fishery:

Remarks:

tridentiger

Notomyxine

Myxine capensis

Octopus magnificus

Common names:

Myxine circifrons Garman, 1899

Myxine circifrons

et al

et al

Myxine

et al

et al

Material examined:

T-441

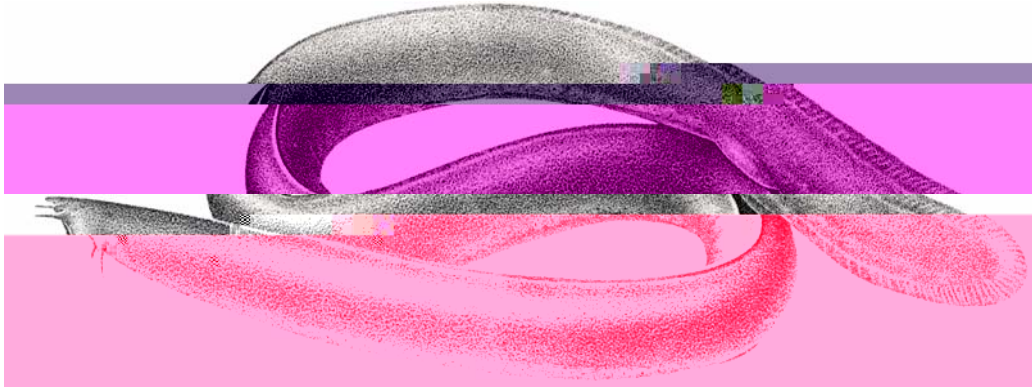


Fig. 65 *Myxine circifrons* (after Garman, 1899).

Diagnostic features:

Size:

Distribution and habitat:

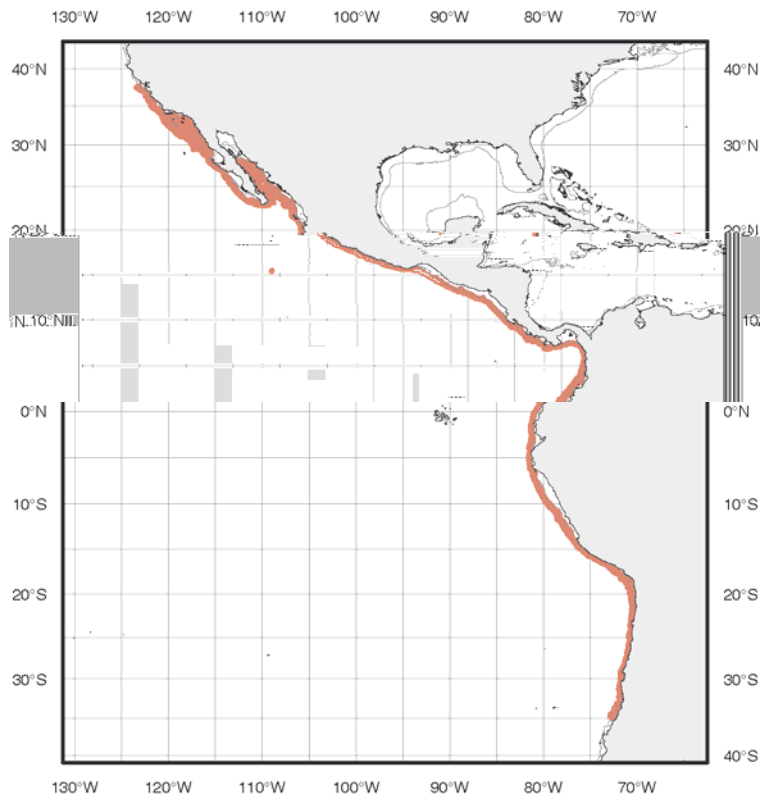


Fig. 66. Distribution of *Myxine circifrons*.

Interest to fishery:

Remarks:

n

n

Common names:

Myxine debueni Wisner and McMillan, 1995

Myxine debueni

al

et

Material examined

Hero

Diagnostic features:

Size:

Distribution and habitat:

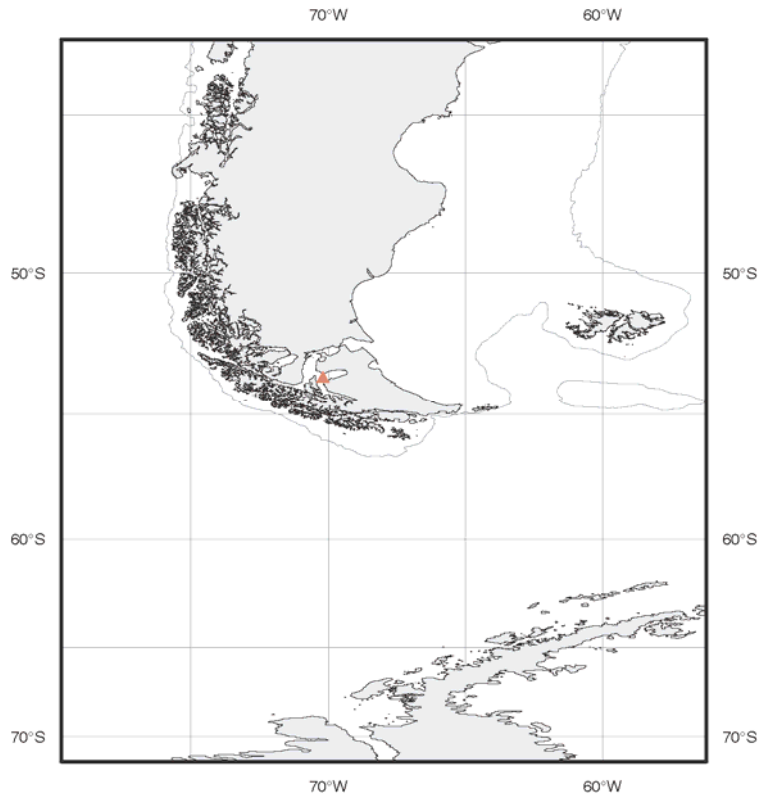


Fig. 68. Distribution of *Myxine debueni*.

Interest to fishery:

Common names:

***Myxine fernholmi* Wisner and McMillan, 1995**

Myxine fernholmi

et al

Material examined:

Commandant

Gue

Anton Bruun

Diagnostic features:

Size:

Distribution and habitat:

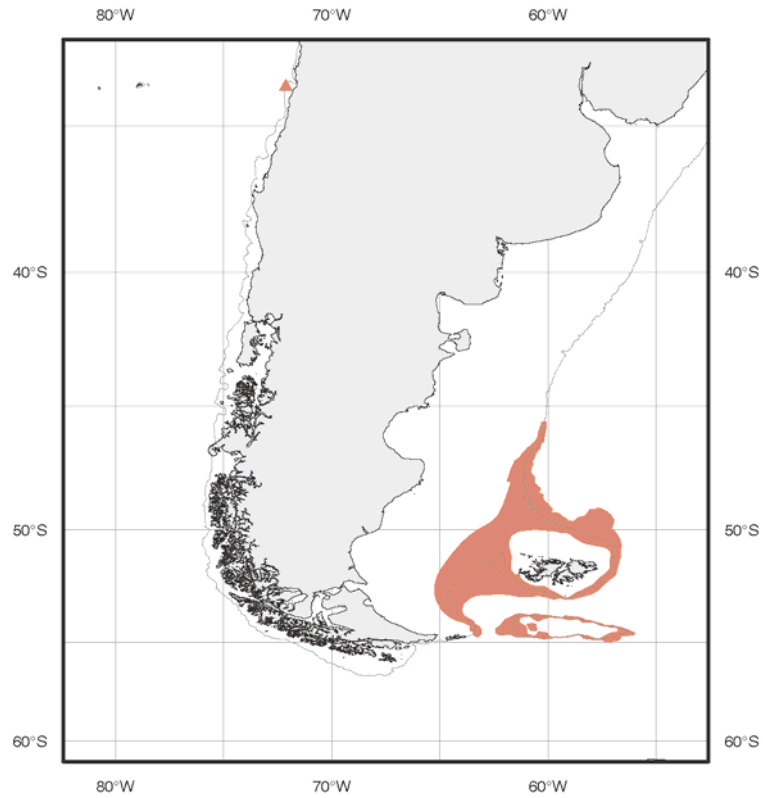


Fig. 69. Distribution of *Myxine fernholmi*.

Interest to fishery:

Remarks:

et al

fernholmi

Myxine knappi

et al
Myxine

Common names:

Myxine formosana Mok and Kuo, 2001

Myxine formosana

et al

Myxine

Material examined:

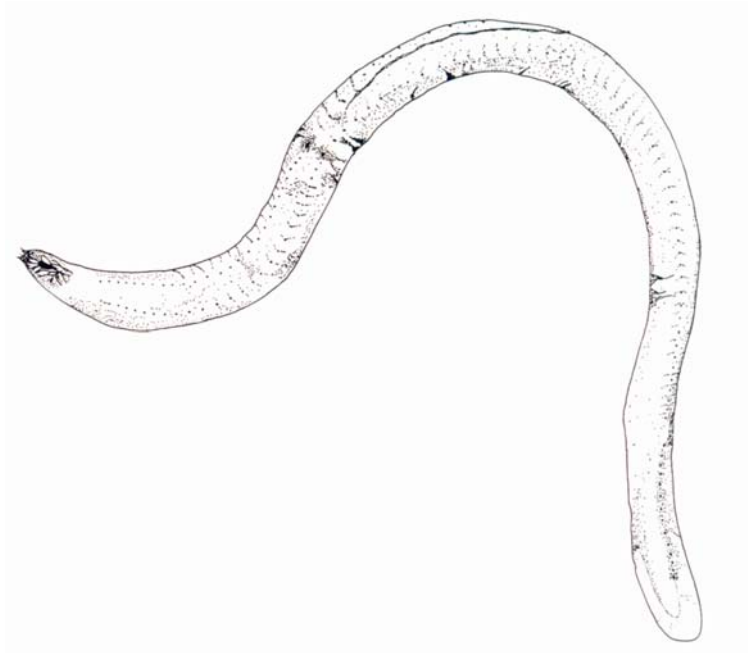


Fig. 70 *Myxine formosana* (after Mok and Kuo, 2001).

Diagnostic features:

Size:

Distribution and habitat:

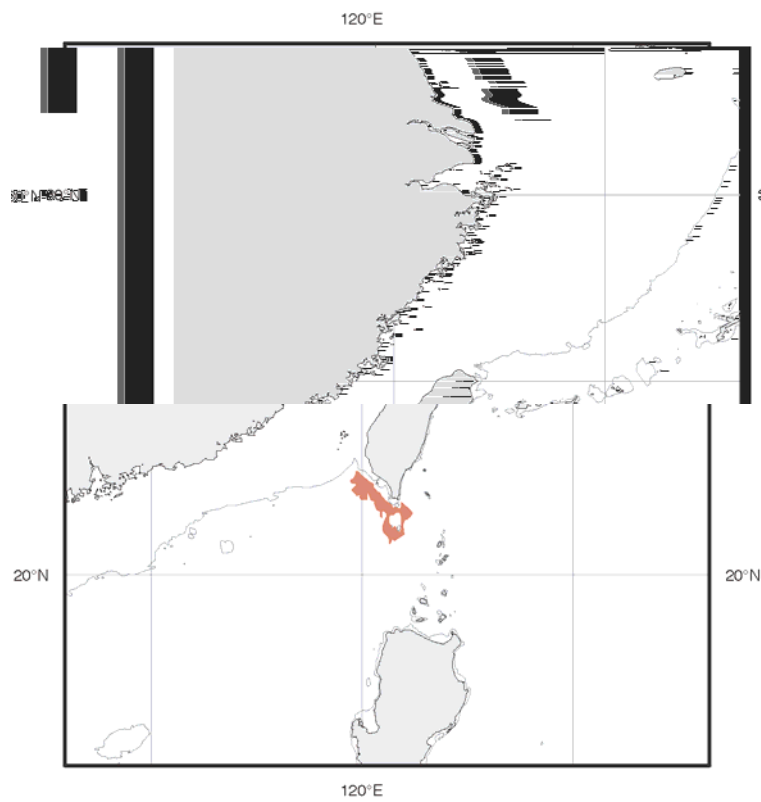


Fig. 71. Distribution of *Myxine formosana*.

Interest to fishery: *Myxine formosana*

Remarks:

Common names:

Myxine garmani Jordan and Snyder, 1901

Myxine garmani

et al

Hyalonema

et al

et al

Myxine australis

Hyalonema

Challenger

Hyalonema

Challenger

Material examined:

Challenger

Hyalonema

Challenger

Sōyō-Maru

Diagnostic features:

Size:

Distribution and habitat:

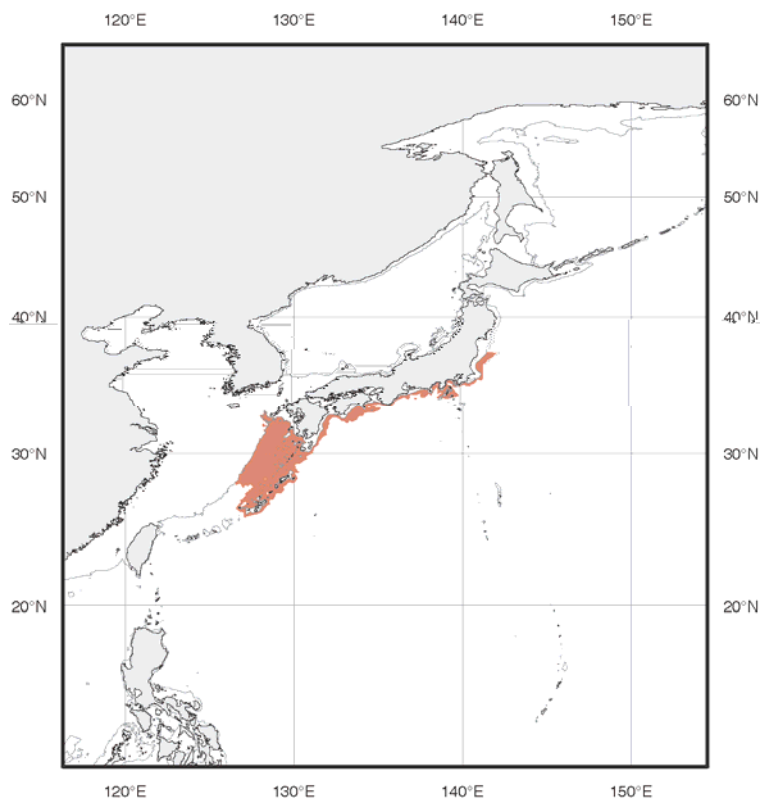


Fig. 72. Distribution of *Myxine garmani*.

Interest to fishery:

Paramyxine atami *Paramyxine*

M. garmani

Paramyxine

Common names:

Myxine glutinosa Linnaeus, 1758

Myxine glutinosa

et al

et al.

et al

et al

et al

et al

et al

et al

et

al

Myxine jespersenae

Gastrobranchus coecus

Myxine

glutinosa

Myxine glutinosa

Myxine glutinosa

Petromyzon myxine

Myxine (Gastrobranchus) glutinosa

Myxine limosa

et al

Myxine

Myxine glutinosa septentrionalis

Myxine glutinosa limosa

Myxine atlantica

Material examined:
atlantica

Myxine

Albatross IV

A. T. Cameron

Iselin

et

al

See Breeze

Albatross

Iselin,

Albatross

Gilliss

et al

Delaware II

G.O. Sars

Asterias



Fig. 73. *Myxine glutinosa* (after Bigelow and Schroeder, 1948).

Diagnostic features:

Size:

Distribution and habitat:

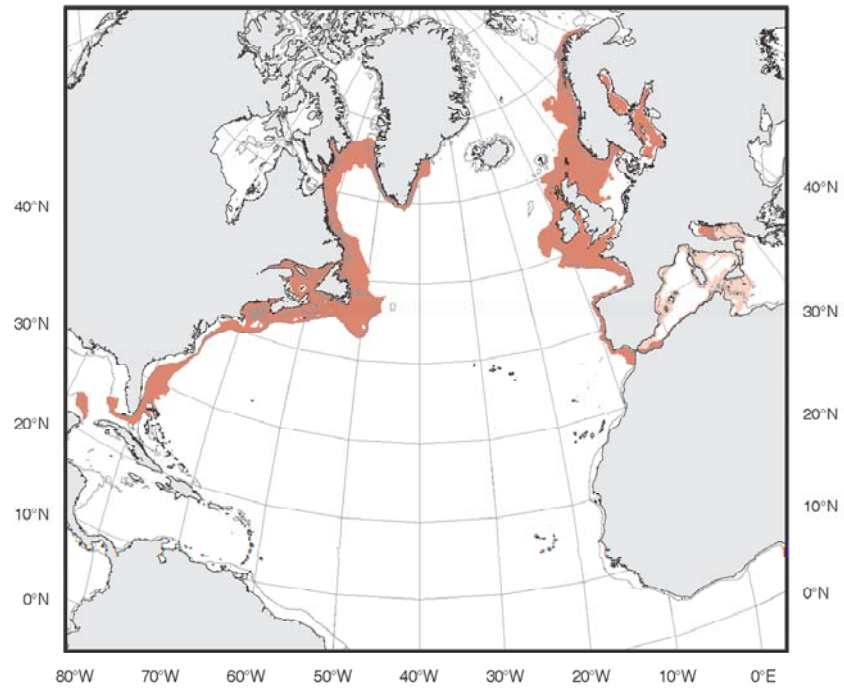


Fig. 74. Distribution of *Myxine glutinosa*.

Interest to Fisheries:

M. glutinosa

Remarks:

Myxine limosa

Common names:

Myxine hubbsi Wisner and McMillan, 1995

Myxine hubbsi

et al

et al

Myxine

et al

et al

Material examined:

Alexander Agassiz

Velero IV

Diagnostic features:

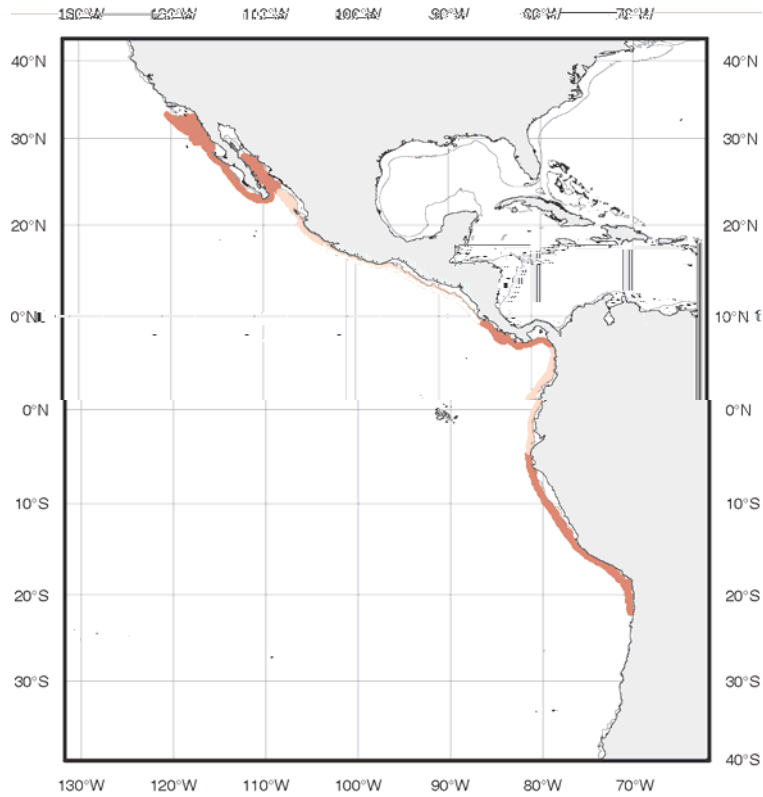


Fig. 75. Distribution of *Myxine hubbsi*.

Interest to fishery:

Remarks:

Myxine hubbsi

Common names:

Myxine hubbsoides Wisner and McMillan, 1995

Myxine hubbsoides

et al

Material examined:

Izumi

Izumi

Izumi

Diagnostic features:

Size:

Distribution and habitat:

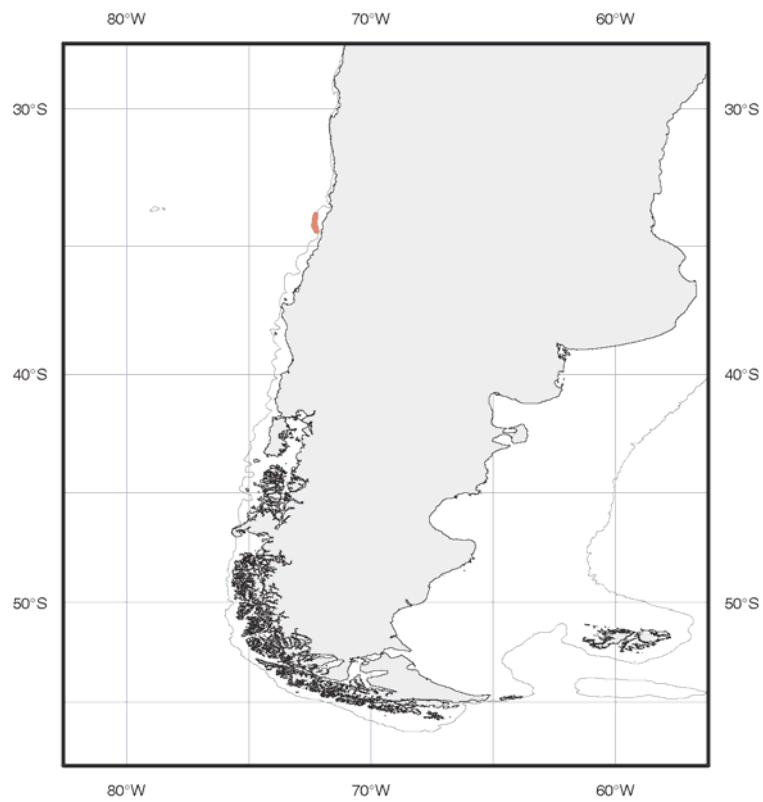


Fig. 76. Distribution of *Myxine hubbsoides*.

Interest to fishery:

Common names:

***Myxine ios* Fernholm, 1981**

Myxine ios

et al

et al

et al

Myxine

jespersenae

Myxine

Material examined:

Discovery

Discovery

Discovery

Dr. Fridtjof Nansen

Dr. Fridtjof Nansen

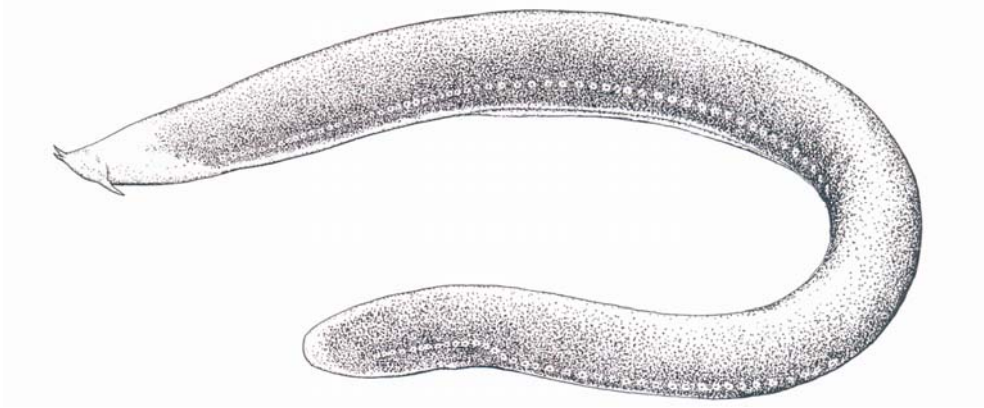


Fig. 77 *Myxine ios* (after Jónsson, 1992).

Diagnostic features:

Size:

Distribution and habitat:

et al

et al

M. ios

et al

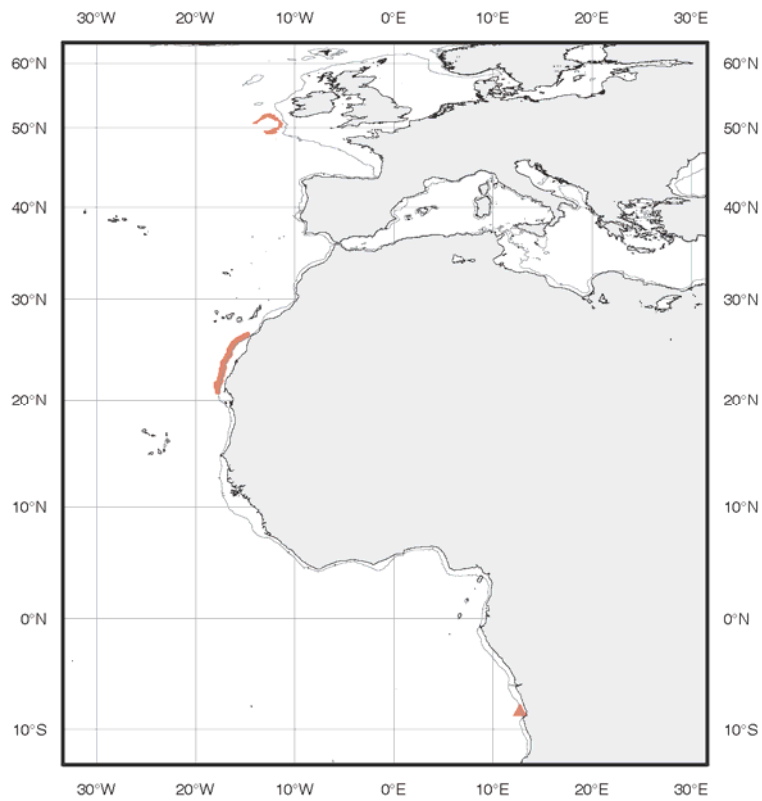


Fig. 78. Distribution of *Myxine ios*.

Interest to fishery:

Remarks:

et al

M. ios

M. jespersenae

et al

Common names:

***Myxine jespersenae* Møller, Feld, Poulsen, Thomsen and Thormar, 2005**

Myxine jespersenae

Myxine glutinosa

Myxine limosa

Myxine ios

Material examined:

Shinkai

Maru

Diagnostic features:

Size:

et al

Distribution and habitat:

et al

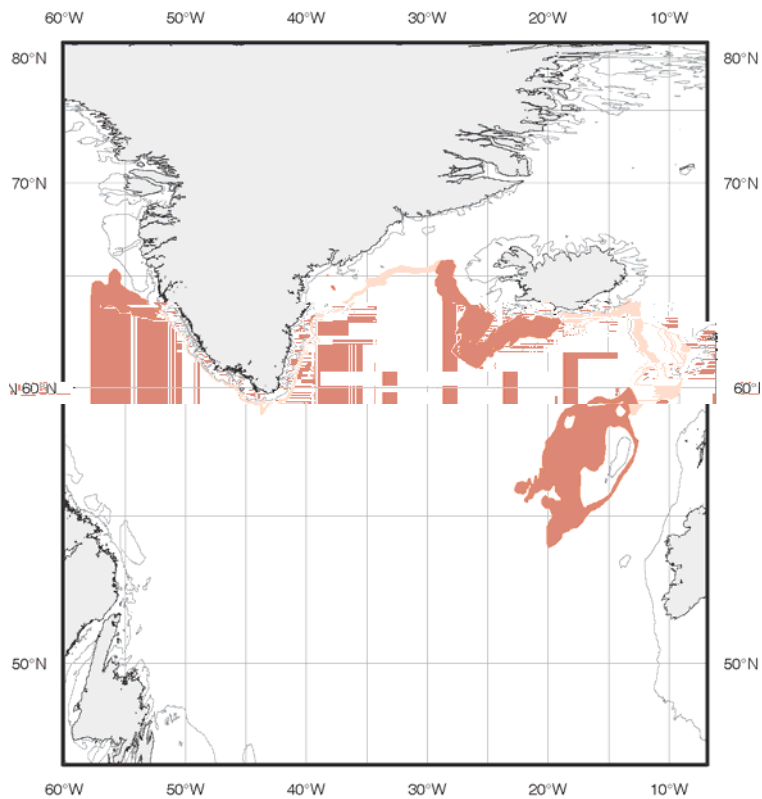


Fig. 79. Distribution of *Myxine jespersenae*.

Interest to fishery:

Remarks:

et al

et al

Common names:

***Myxine knappi* Wisner and McMillan, 1995**

Myxine knappi

et al

Myxine australis

e f

Myxine tridentiger

Myxine dorsum

et al

Material examined:

Academican Knopowich

Myxine dorsum

Academican Knopowich

Myxine tridentiger

Commandant Gue

Romanche

Diagnostic features:

Size:

Distribution and habitat:

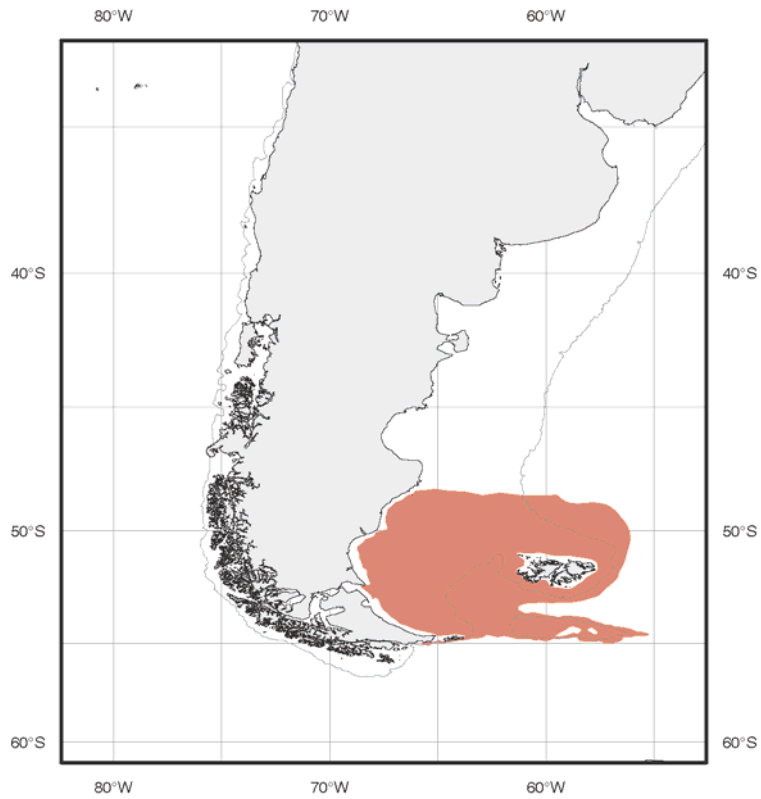


Fig. 80. Distribution of *Myxine knappi*.

Interest to fishery:

Remarks: *Myxine dorsum*

M. knappi

M. knappi

M. dorsum

M. knappi

M. dorsum

Myxine tridentiger

Myxine knappi

Myxine australis

Common names:

***Myxine kuoi* Mok, 2002**

Myxine

Myxine kuoi

et al

Material examined:

Diagnostic features:

Size:

Distribution and habitat:

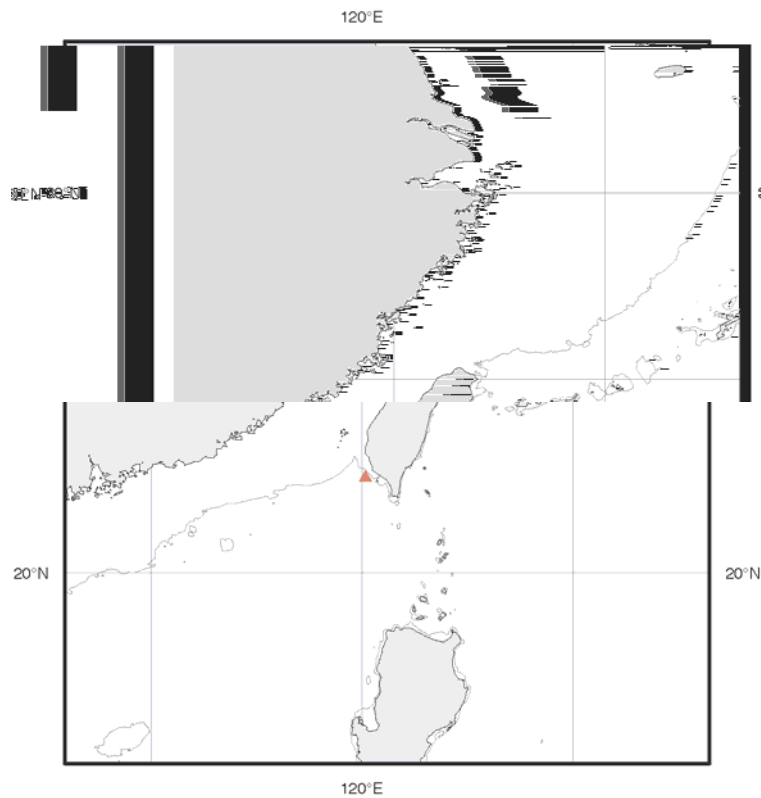


Fig. 81. Distribution of *Myxine kuoi*.

Interest to fishery:

Remarks: *Myxine kuoi*

Common names:

Myxine mccoskeri Wisner and McMillan, 1995

Myxine mccoskeri

et al

Material examined:

Pillsbury

Diagnostic features:

Size:

Distribution and habitat:

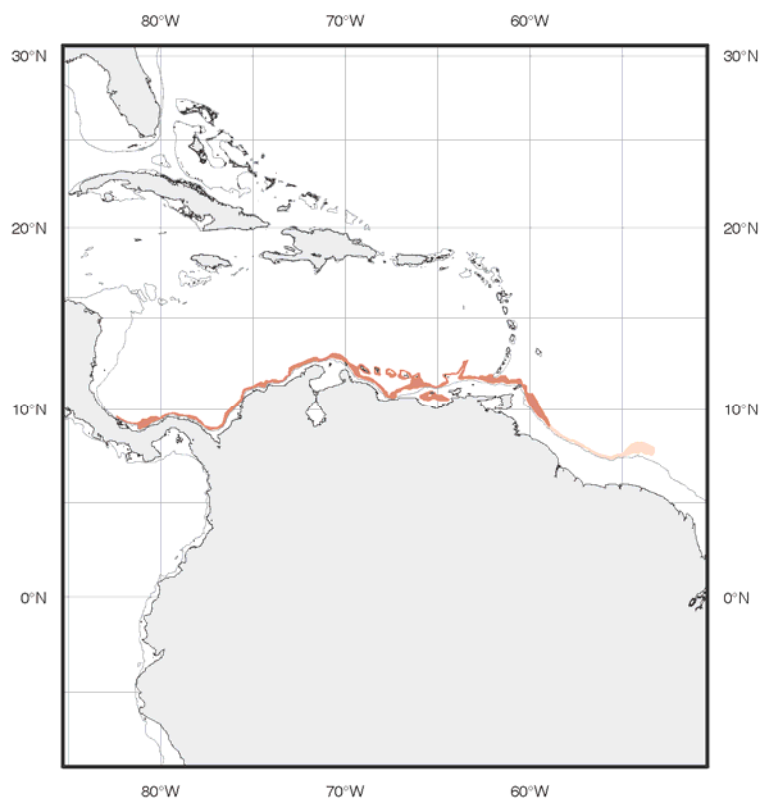


Fig. 82. Distribution of *Myxine mccoskeri*.

Interest to fishery:

Remarks:

Myxine

M. mcoskeri

Common names:

Myxine mcmillanae Hensley, 1991

Myxine mcmillanae

Myxine

Myxine sotoi

et al

Myxine jespersenae

Material examined:

Oregon

Pillsbury

Diagnostic features:

Size:

Distribution and habitat:

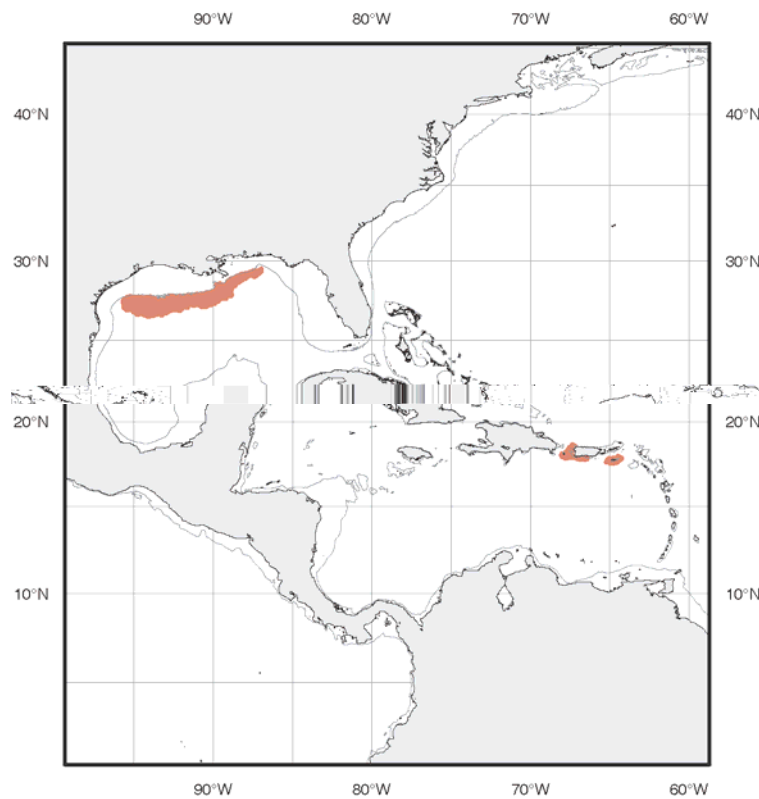


Fig. 83. Distribution of *Myxine mcmillanae*.

Interest to fishery:

Remarks:

Common names:

***Myxine paucidens* Regan, 1913**

Myxine paucidens

Hyalonema

et al

et al

Myxine australis

Hyalonema

Challenger

Hyalonema

Challenger

Material examined:

Hyalonema

Hyalonema

Sōyō Maru

Diagnostic features:

Size:

Distribution and habitat:

Hyalonema

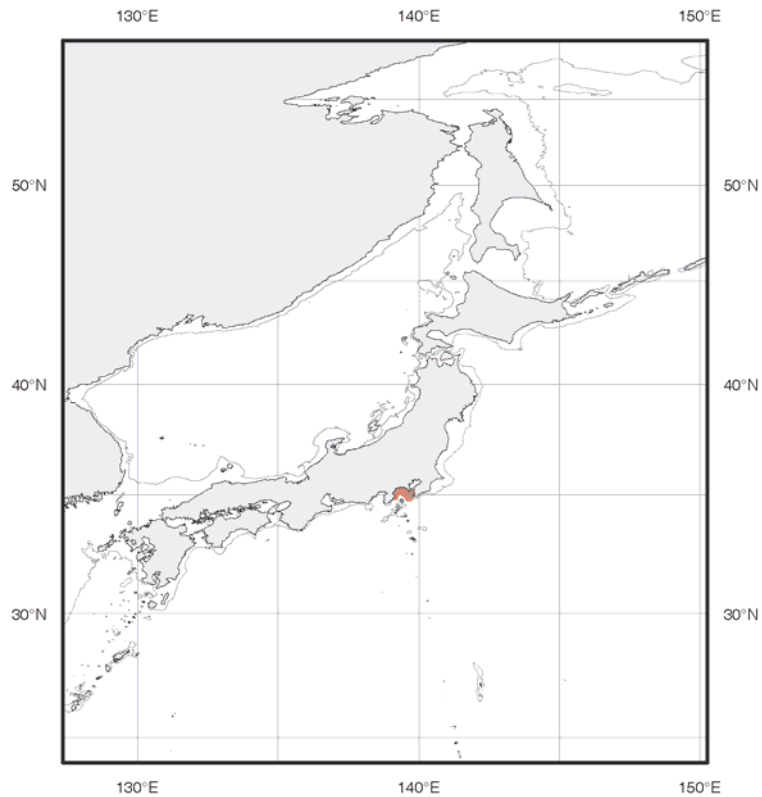


Fig. 84. Distribution of *Myxine paucidens*.

Interest to fishery:

Remarks:

Notomyxine tridentiger

Common names:

Myxine pequenoi Wisner and McMillan, 1995

Myxine pequenoi

et al

Material examined:

Akebono Maru 72

Diagnostic features:

Size:

Distribution and habitat:

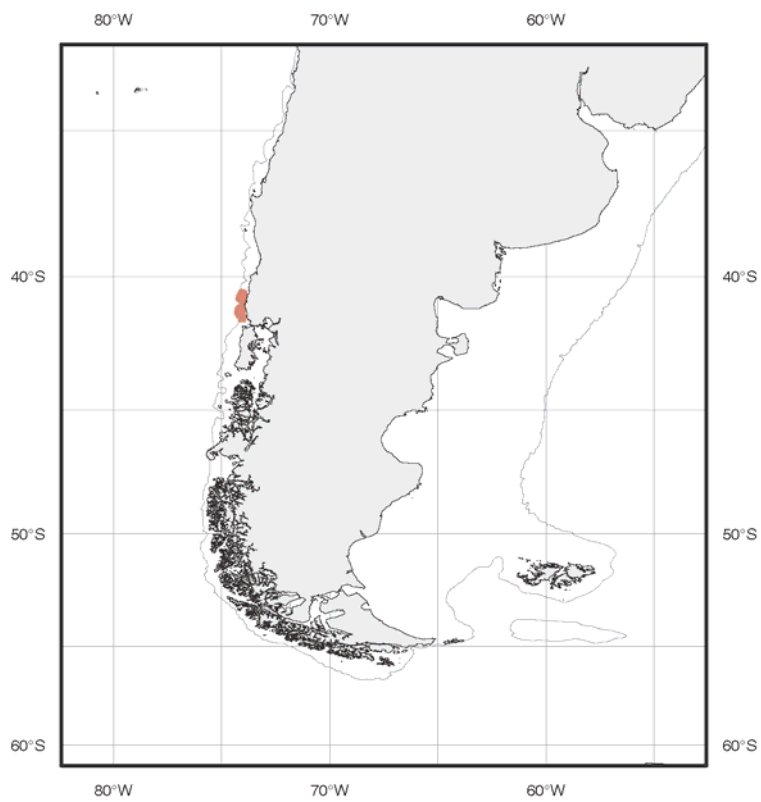


Fig. 85. Distribution of *Myxine pequenoi*.

Interest to fishery:

Remarks:

Common names:

Myxine robinsorum Wisner and McMillan, 1995

Myxine robinsi

Myxine robinsorum

et al

Material examined:

Diagnostic features:

Size:

Distribution and habitat:



Fig. 86. Distribution of *Myxine robinsorum*.

Interest to fishery:

Remarks:

robinsi

robinsorum

Common names:

Myxine sotoi Mincarone, 2001

Myxine sotoi

et al

et al

et al

Myxine jespersenae

Material examined:

Prof. W. Besnard

Prof. W.

Besnard

Diagnostic features:

Size:

Distribution and habitat:

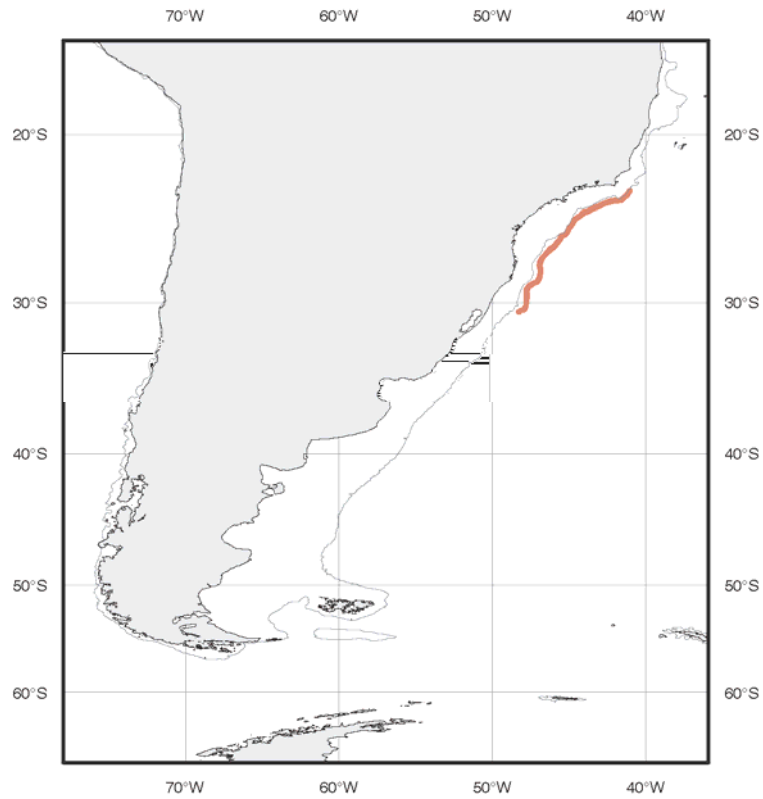


Fig. 87. Distribution of *Myxine sotoi*.

Interest to fishery:

Remarks:

Common names:

***Notomyxine* Nani and Gneri, 1951**

Notomyxine

Myxine tridentiger

Diagnostic features:

Distribution:

Species:

Notomyxine tridentiger

Notomyxine tridentiger (Garman, 1899)

Myxine tridentiger

Myxine

Myxine australis

a

Myxine australis tridentiger

Myxine olivacea tridentiger

Notomyxine tridentiger

Notomyxine

Notomyxini tridentiger

Material examined:

Bahia Blanca

1° de

Mayo

Bahia Blanca



Fig. 88 *Notomyxine tridentiger* (after Nani and Gneri, 1951).

Diagnostic features:

Size:

Distribution and habitat:

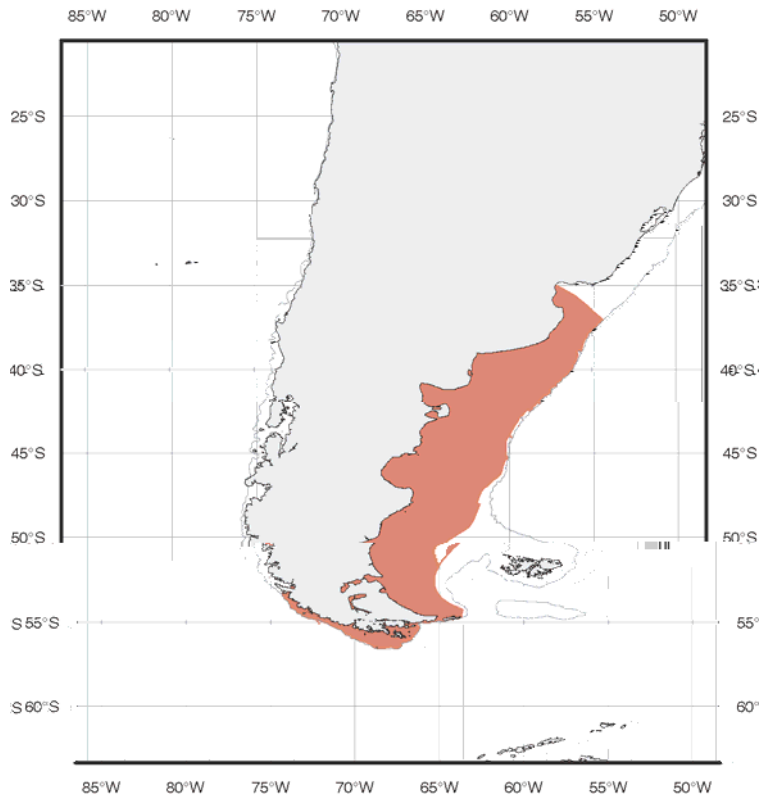


Fig. 89 Distribution of *Notomyxine tridentiger*.

Interest to fishery:

Remarks:

M. australis

M. tridentiger

Myxine affinis

Myxine knappi

Common names:

Nemamyxine Richardson, 1958

Nemamyxine

Nemamyxine elongata

Diagnostic features:

Distribution:

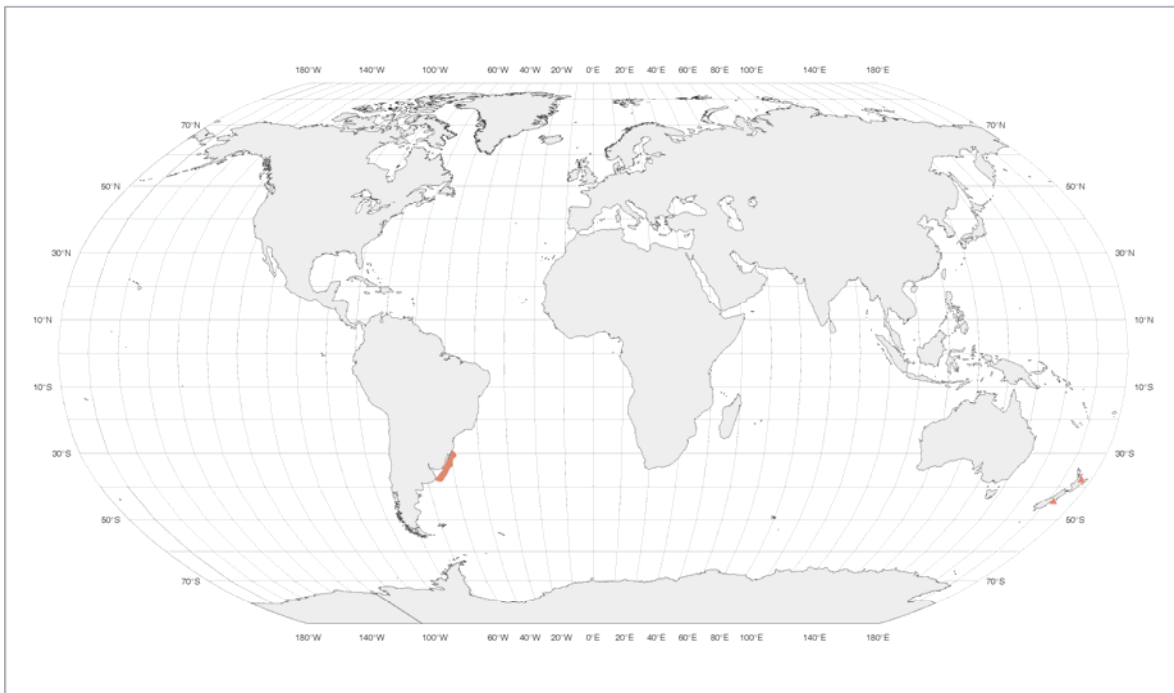


Fig. 90. Global distribution of the genus *Nemamyxine*.

Species:

Nemamyxine elongata

Nemamyxine kreffti

Key to Species of *Nemamyxine*

Nemamyxine elongata

Nemamyxine krefftii

Nemamyxine elongata Richardson, 1958

Nemamyxine elongata

Nemamyxine krefftii et al

Nemamyxine krefftii

Material examined:

Sapun Gora

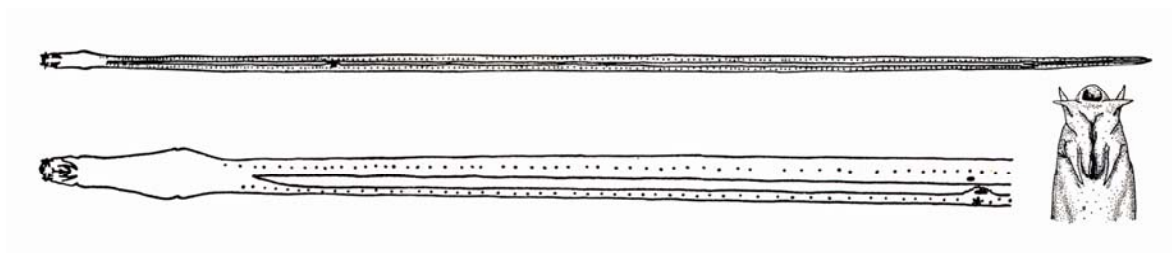


Fig. 91 *Nemamyxine elongata* (after Richardson, 1958).

Diagnostic features:

Size:

Distribution and habitat:

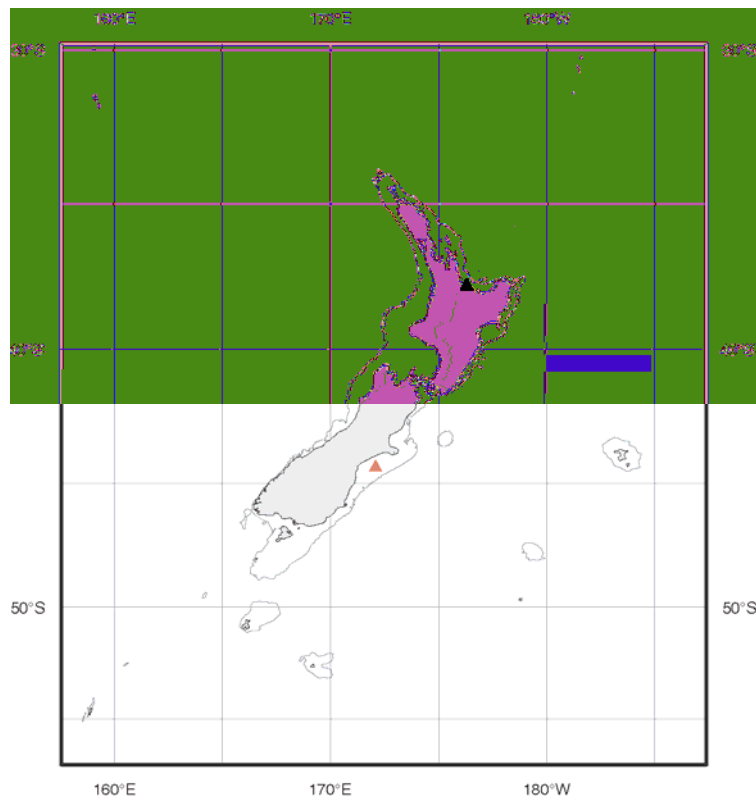


Fig. 92. Distribution of *Nemamyxine elongata*.

Interest to fishery:

Remarks:

Common names:

Nemamyxine kreffti McMillan and Wisner, 1982

Nemamyxine kreffti

Myxine affinis-australis

Material examined:

Walter Herwing

Urophycis

Iporanga

Tito

Prof. W. Besnard

Prof. W. Besnard

Diagnostic features:

Size:

Distribution and habitat:

Prof W Besnard

Walther Herwig

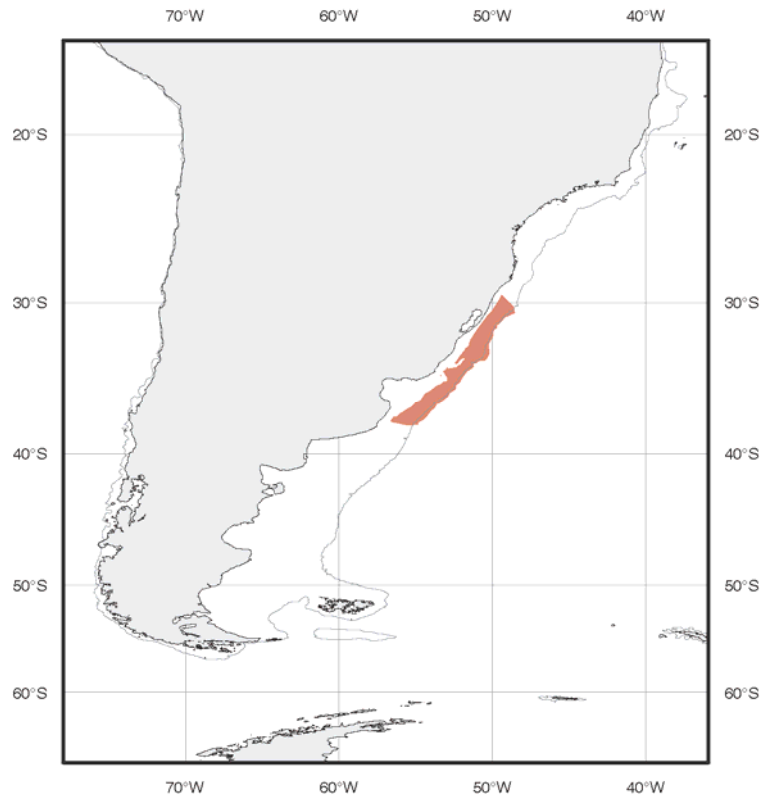


Fig. 93. Distribution of *Nemamyxine krefftii*.

Interest to fishery:

Remarks:

N. krefftii

Common names:

***Neomyxine* Richardson, 1953**

Neomyxine

Myxine biniplicata

Diagnostic features:

Distribution:

Species:

Neomyxine biniplicata

Neomyxine biniplicata (Richardson and Jowett, 1951)

Myxine biniplicata

Neomyxine biniplicata

Nemamyxine elongata

et al

Neomyxine biplinicata

Material examined:

James Cook

James Cook

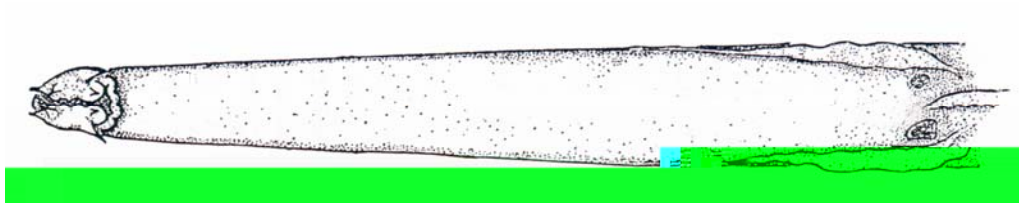


Fig. 94 *Neomyxine biniplicata* (modified from Richardson and Jowett, 1951).

Diagnostic features:

Size:

Distribution and habitat:

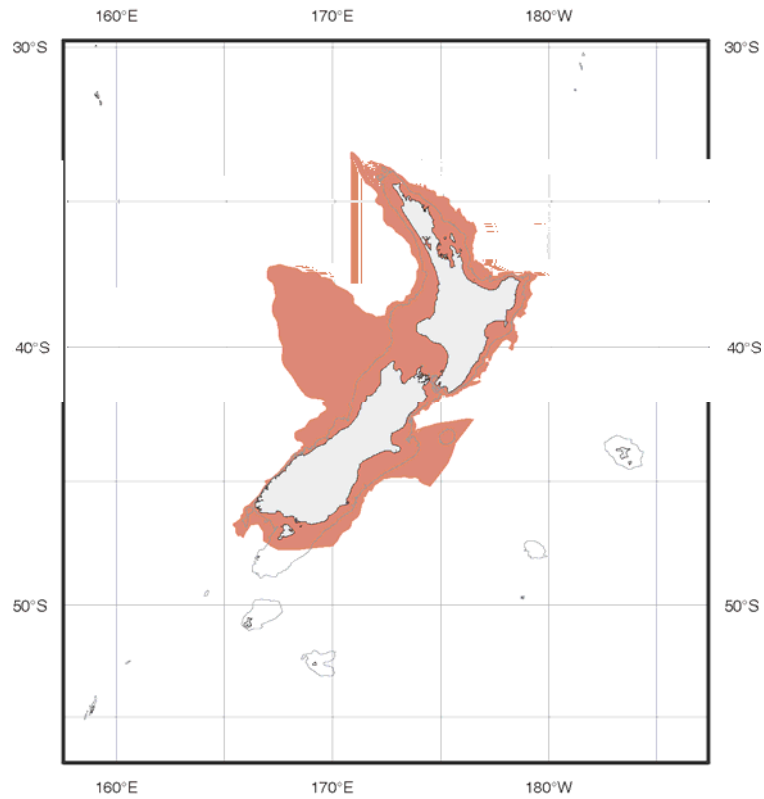


Fig. 95. Distribution of *Neomyxine biniplicata*.

Interest to fishery:

Remarks:

Myxine biniplicata

Neomyxine

M. biniplicata

Common names:

3. LIST OF NOMINAL SPECIES OF MYXINIDAE

NOMINAL SPECIES	PRESENT ALLOCATION
<i>acutifrons</i> Myxine	<i>Myxine australis</i>
<i>affinis</i> Myxine	<i>Myxine affinis</i>
<i>ancon</i> <i>Quadratus</i>	<i>Paramyxine ancon</i>
<i>atami</i> <i>Paramyxine</i>	<i>Paramyxine atami</i>
<i>atlantica</i> Myxine	<i>Myxine glutinosa</i>
<i>australis</i> Myxine	<i>Myxine australis</i>
<i>banksii</i> <i>Homea</i>	<i>Eptatretus cirrhatus</i>
<i>biniplicata</i> Myxine	<i>Neomyxine biniplicata</i>
<i>bischoffii</i> <i>Bdellostoma</i>	<i>Eptatretus bischoffii</i>
<i>burgeri</i> <i>Bdellostoma</i>	<i>Eptatretus burgeri</i>
<i>capensis</i> Myxine	<i>Myxine capensis</i>
<i>caribbeaus</i> <i>Eptatretus</i>	<i>Eptatretus caribbeaus</i>
<i>carlhubbsi</i> <i>Eptatretus</i>	<i>Eptatretus carlhubbsi</i>
<i>cheni</i> <i>Paramyxine</i>	<i>Paramyxine cheni</i>
<i>chinensis</i> <i>Eptatretus</i>	<i>Paramyxine chinensis</i>
<i>circifrons</i> Myxine	<i>Myxine circifrons</i>
<i>cirrhatus</i> <i>Petromyzon</i>	<i>Eptatretus cirrhatus</i>
<i>coecus</i> <i>Gastrobranchus</i>	<i>Myxine glutinosa</i>
<i>curtissjamesi</i> <i>Polistotrema</i>	<i>Eptatretus deani</i>
<i>deani</i> <i>Polistotrema</i>	<i>Eptatretus deani</i>
<i>debueni</i> Myxine	<i>Myxine debueni</i>
<i>decatrema</i> <i>Heptatretus</i>	<i>Eptatretus bischoffii</i>
<i>dorsum</i> Myxine	<i>Myxine knappi</i>
<i>elongata</i> <i>Nemamyxine</i>	<i>Nemamyxine elongata</i>
<i>eos</i> <i>Eptatretus</i>	<i>Eptatretus eos</i>
<i>fernholmi</i> <i>Eptatretus</i>	<i>Eptatretus fernholmi</i>
<i>fernholmi</i> Myxine	<i>Myxine fernholmi</i>
<i>fernholmi</i> <i>Paramyxine</i>	<i>Paramyxine fernholmi</i>
<i>formosana</i> Myxine	<i>Myxine formosana</i>
<i>forsteri</i> <i>Bdellostoma</i>	<i>Eptatretus cirrhatus</i>
<i>fritzi</i> <i>Eptatretus</i>	<i>Eptatretus fritzi</i>
<i>garmani</i> Myxine	<i>Myxine garmani</i>
<i>glutinosa</i> Myxine	<i>Myxine glutinosa</i>
<i>goliath</i> <i>Eptatretus</i>	<i>Eptatretus goliath</i>
<i>grouseri</i> <i>Eptatretus</i>	<i>Eptatretus grouseri</i>
<i>heptatrema</i> <i>Bdellostoma</i>	<i>Eptatretus cirrhatus</i>
<i>heterotrema</i> <i>Bdellostoma</i>	<i>Eptatretus hexatrema</i>
<i>hexatrema</i> <i>Bdellostoma</i>	<i>Eptatretus hexatrema</i>
<i>hubbsi</i> Myxine	<i>Myxine hubbsi</i>
<i>hubbsoides</i> Myxine	<i>Myxine hubbsoides</i>
<i>indrambaryai</i> <i>Eptatretus</i>	<i>Eptatretus indrambaryai</i>
<i>ios</i> Myxine	<i>Myxine ios</i>
<i>jespersenae</i> Myxine	<i>Myxine jespersenae</i>
<i>knappi</i> Myxine	<i>Myxine knappi</i>
<i>krefftii</i> <i>Nemamyxine</i>	<i>Nemamyxine krefftii</i>

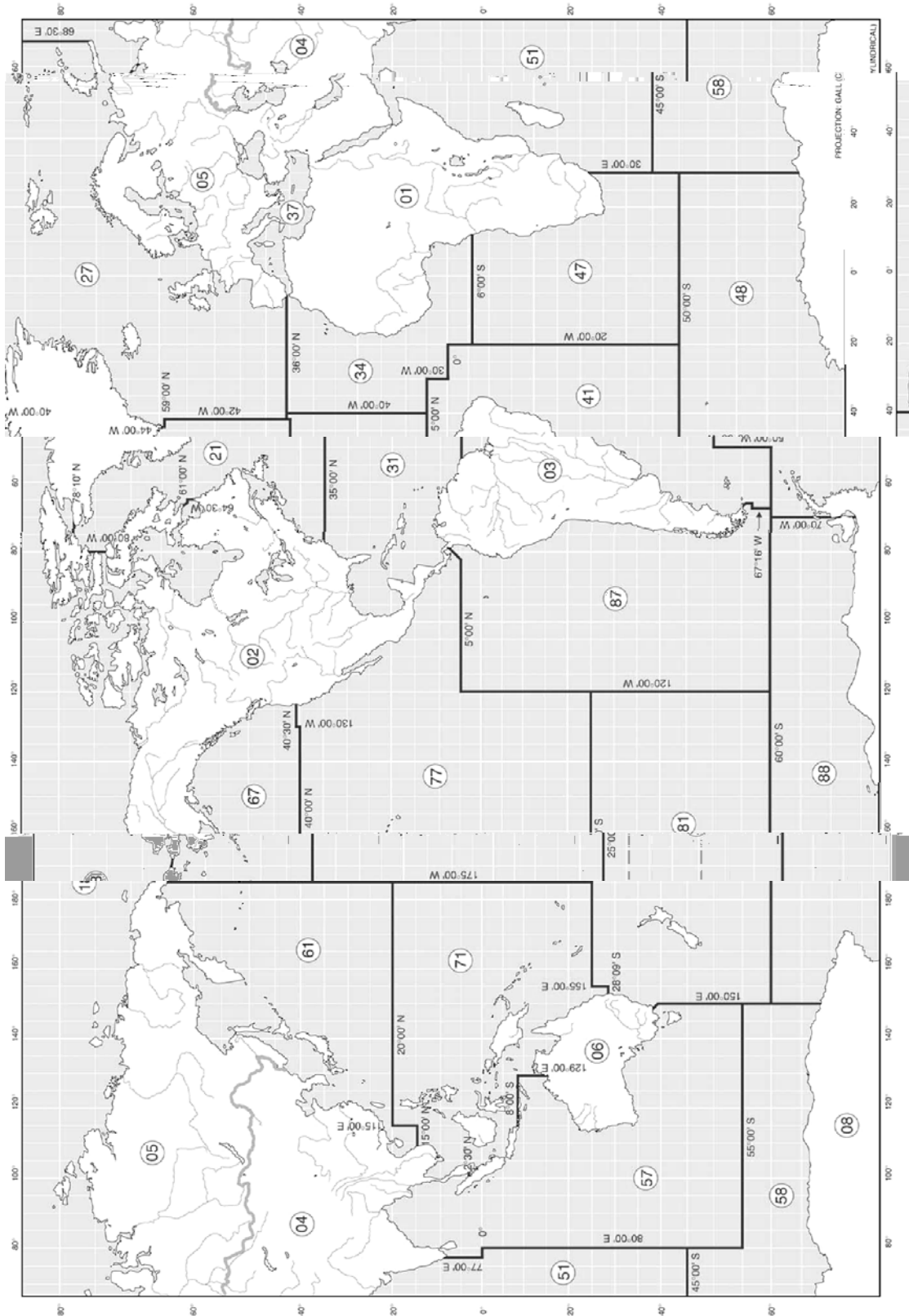
et al

NOMINAL SPECIES

PRESENT ALLOCATION

<i>kuoi</i> Myxine	<i>Myxine kuoi</i>
<i>lakeside</i> Eptatretus	<i>Eptatretus lakeside</i>
<i>laurahubbsi</i> Eptatretus	<i>Eptatretus carlhubbsi</i>
<i>limosa</i> Myxine	<i>Myxine glutinosa</i>
<i>longipinnis</i> Eptatretus	<i>Eptatretus longipinnis</i>
<i>mcconnaugheyi</i> Eptatretus	<i>Eptatretus mcconnaugheyi</i>
<i>mccoskeri</i> Eptatretus	<i>Eptatretus mccoskeri</i>
<i>mccoskeri</i> Myxine	<i>Myxine mccoskeri</i>
<i>mcmillanae</i> Myxine	<i>Myxine mcmillanae</i>
<i>mendozai</i> Eptatretus	<i>Eptatretus mendozai</i>
<i>menezesi</i> Eptatretus	<i>Eptatretus menezesi</i>
<i>minor</i> Eptatretus	<i>Eptatretus minor</i>
<i>moki</i> Paramyxine	<i>Paramyxine moki</i>
<i>multidens</i> Eptatretus	<i>Eptatretus multidens</i>
<i>myxine</i> Petromyzon	<i>Myxine glutinosa</i>
<i>nanii</i> Eptatretus	<i>Eptatretus nanii</i>
<i>nelsoni</i> Paramyxine	<i>Paramyxine nelsoni</i>
<i>octatrema</i> Heptatretus	<i>Eptatretus octatrema</i>
<i>okinoseana</i> Homea	<i>Eptatretus okinoseanus</i>
<i>paucidens</i> Myxine	<i>Myxine paucidens</i>
<i>pequenoii</i> Myxine	<i>Myxine pequenoii</i>
<i>polytrema</i> Bdellostoma	<i>Eptatretus polytrema</i>
<i>profundus</i> Heptatretus	<i>Eptatretus profundus</i>
<i>robinsi</i> Myxine	<i>Myxine robinsorum</i>
<i>sheni</i> Paramyxine	<i>Paramyxine sheni</i>
<i>sinus</i> Eptatretus	<i>Eptatretus sinus</i>
<i>sotoi</i> Myxine	<i>Myxine sotoi</i>
<i>springeri</i> Paramyxine	<i>Paramyxine springeri</i>
<i>stoutii</i> Bdellostoma	<i>Eptatretus stoutii</i>
<i>strahani</i> Eptatretus	<i>Eptatretus strahani</i>
<i>taiwanae</i> Paramyxine	<i>Paramyxine taiwanae</i>
<i>tridentiger</i> Myxine	<i>Notomyxine tridentiger</i>
<i>walkeri</i> Paramyxine	<i>Paramyxine walkeri</i>
<i>wayuu</i> Eptatretus	<i>Paramyxine wayuu</i>
<i>wisneri</i> Eptatretus	<i>Eptatretus wisneri</i>
<i>wisneri</i> Paramyxine	<i>Paramyxine wisneri</i>
<i>yangi</i> Paramyxine	<i>Paramyxine yangi</i>

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CAPÍTULO IV

Conclusões

Michael M. Mincarone

CONCLUSÕES

Os resultados obtidos através da revisão taxonômica foram, tanto quanto possível, incorporados no formato e padrão editorial estabelecidos pelos editores da FAO (Capítulo III). Entretanto, o formato do referido catálogo exclui aspectos importantes que dizem respeito às conclusões gerais deste estudo, as quais seguem abaixo relacionadas.

- A família Myxinidae Rafinesque, 1815, tem sido historicamente dividida em duas subfamílias, Eptatretinae Bonaparte 1850 e Myxininae Rafinesque 1815 (Nelson, 2006). Recentemente, Wisner (1999) descreveu duas novas subfamílias, Paramyxininae e Quadratinae, as quais abrigariam os gêneros *Paramyxine* Dean, 1904 e *Quadratus* Wisner, 1999, respectivamente. Ambas as subfamílias, e também o gênero *Quadratus*, foram estabelecidos com base na análise de poucos caracteres morfológicos considerados isoladamente. Na ausência de estudos filogenéticos que suportem a validade das subfamílias propostas por Wisner, ambas são aqui rejeitadas. Além disso, o nome Paramyxinidae já havia sido anteriormente proposto por Berg (1947), o que foi aparentemente ignorado por Wisner (1999).
- Da mesma forma, o gênero *Quadratus* Wisner, 1999 foi descrito com base na diferença de posição e no grau de proximidade entre as aberturas branquiais externas, um caráter subjetivo sujeito à extrema variação inter- e intra-específica. Na ausência de outros caracteres que justifiquem a validade do gênero, o mesmo é considerado sinônimo júnior de *Paramyxine*.
- Além dos caracteres usualmente utilizados na definição das subfamílias Eptatretidae e Myxinidae, a ramificação dos raios da nadadeira caudal (Fig. 1) constitui uma nova sinapomorfia para estes táxons, corroborando a atual classificação do grupo (Fig. 2).

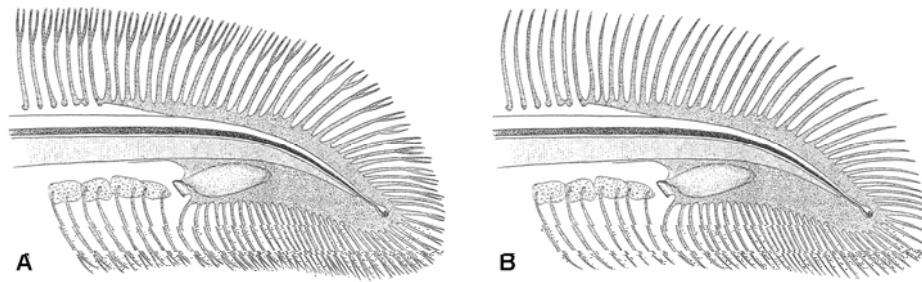


Figura 1. Ramificação dos raios da nadadeira caudal de peixe-bruxa. A – Subfamília Eptatretinae. B – Subfamília Myxininae.

Myxinidae

Eptatretinae

Eptatretus

Paramyxine

Myxininae

Myxine

Notomyxine

Nemamyxine

Neomyxine

Figura 2. Classificação da família Myxinidae

- Duas novas espécies foram descritas: *Eptatretus lakeside* Mincarone & McCosker, 2004, das Ilhas Galápagos; e *Eptatretus goliath* Mincarone & Stewart, 2006, da Nova Zelândia.
- *Eptatretus carlhubbsi* McMillan and Wisner, 1984 foi considerada sinônimo sênior de *Eptatretus laurahubbsae* McMillan and Wisner, 1984. *Eptatretus laurahubbsae* foi originalmente descrita com base em oito espécimes juvenis (240-375 mm TL) das Ilhas Juan Fernández, sudeste do Pacífico. Ela foi considerada diferente de *Eptatretus carlhubbsi* do Pacífico Norte por apresentar uma nadadeira ventral conspícua (ausente em *E. carlhubbsi*). Todos os demais caracteres se mostraram idênticos para ambas as espécies (Tab. 1). Entretanto, como previamente observado

por outros autores, a nadadeira ventral, usualmente bem desenvolvida em exemplares juvenis, tende a diminuir de tamanho e até mesmo desaparecer completamente em animais adultos. Com base nesta evidência, e na ausência de outros caracteres que distingam as espécies em questão, considera-se que os espécimes de *E. laurahubbsae* são na verdade juvenis de *E. carlhubbsi*.

- *Myxine glutinosa* Linnaeus, 1758 foi considerada sinônimo sênior de *Myxine limosa* Girard, 1859. A população do Atlântico Norte ocidental havia sido por algum tempo considerada como espécie (*Myxine limosa*) e Wisner and McMillan (1995) sugeriram o retorno desta prática com base no tamanho máximo dos espécimes (os do Atlântico Norte oriental são menores) e nas diferenças de coloração de espécimes preservados. Na ausência de caracteres morfológicos adicionais (Tab. 2), estas características parecem ser insuficientes para justificar a separação das populações do Atlântico Norte em duas espécies. Estudos moleculares mais conclusivos se fazem necessários para elucidar este complexo taxonômico.
- *Myxine knappi* Wisner and McMillan, 1995 foi considerada sinônimo sênior de *Myxine dorsum* Wisner and McMillan, 1995. Ambas as espécies foram descritas com base em poucos espécimes disponíveis (3 de *M. knappi* e 2 de *M. dorsum*). Alguns tipos de *M. knappi* (SIO 90-144) e *M. dorsum* (SIO 92-21) pertenciam antigamente ao mesmo lote (ZIN 721-966), mas foram doados à SIO separadamente e injustificadamente descritos como espécies distintas por Wisner & McMillan (1995). A análise do material tipo e de nove espécimes adicionais revelaram a ausência de evidências morfológicas que suportem diferenças entre as espécies (Tab. 3).
- Pela primeira vez são fornecidas chaves de identificação e mapas de distribuição para todas as espécies de Myxinidae, sendo que várias delas tiveram suas distribuições geográficas ampliadas, com destaque para: *Eptatretus multidentis*, previamente conhecida do norte da América do Sul e agora registrada ao largo do nordeste e sudeste do Brasil; *Eptatretus strahani*, anteriormente conhecida das Filipinas e registrada agora no noroeste da Austrália; e *Myxine ios*, conhecida da Irlanda e do noroeste da África e registrada ao largo da Angola.

- Como base nos resultados da revisão taxonômica, um novo arranjo nomenclatural é proposto para gêneros (Tab. 4) e espécies (Tab. 5). Das 82 espécies nominais descritas de Myxinidae, 69 são consideradas válidas, enquanto que 13 são sinônimos (Tab. 6).
- Os peixes-bruxa possuem distribuição global em ambientes marinhos, ocorrendo desde o sul do Ártico até a Península Antártica, com notável ausência de registros no Oceano Índico, com distribuição vertical que se estende desde a superfície até aproximadamente 2800 m, embora Martini (1998) tenha registros fotográficos de espécimes a 5000 m. A diversidade de espécies de peixe-bruxa é visivelmente assimétrica em relação à localização geográfica (Fig. 3), seguindo o padrão já observado para outros grupos de peixes marinhos, ou seja, maior diversidade no Pacífico ocidental, seguida pelo Atlântico ocidental, Pacífico oriental, Atlântico oriental, e Índico.

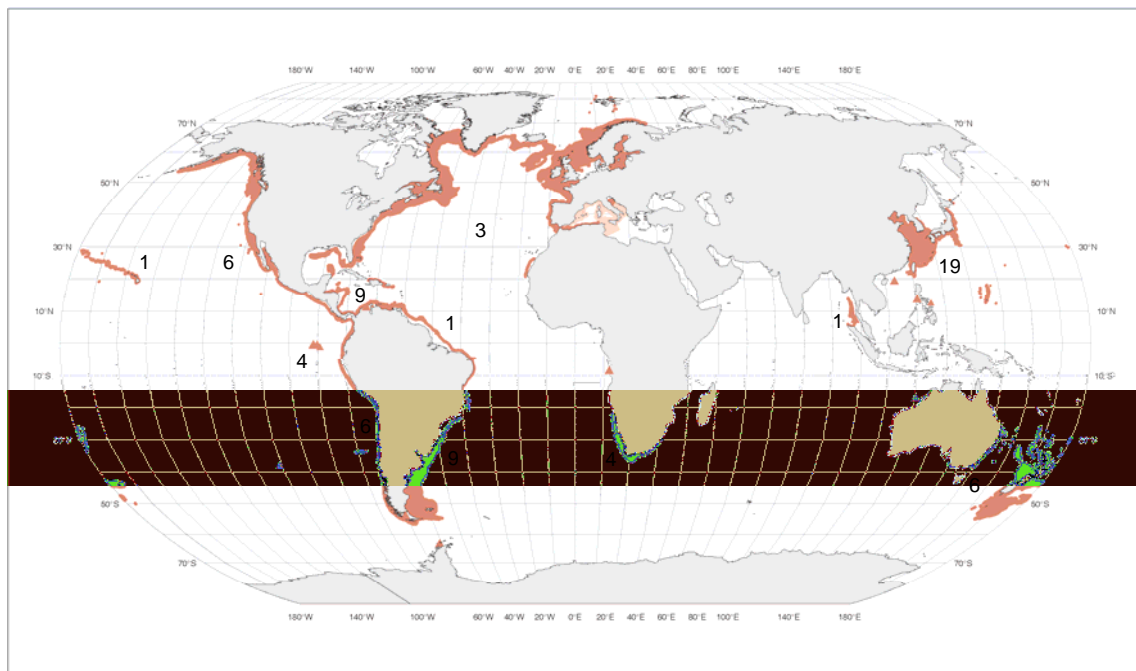


Figura 3. Diversidade de Myxinidae para regiões geográficas selecionadas. Números no mapa representam o número de espécies em cada região.

- De uma perspectiva histórica, as descrições das espécies de peixes-bruxa iniciaram em um ritmo muito lento, permanecendo assim de 1758 até aproximadamente 1900. Um pequeno aumento no ritmo das descrições foi observado entre 1904 e 1930. Porém, a partir de 1975 é que a frequência de descrição de novas espécies aumentou consideravelmente (Fig. 4).

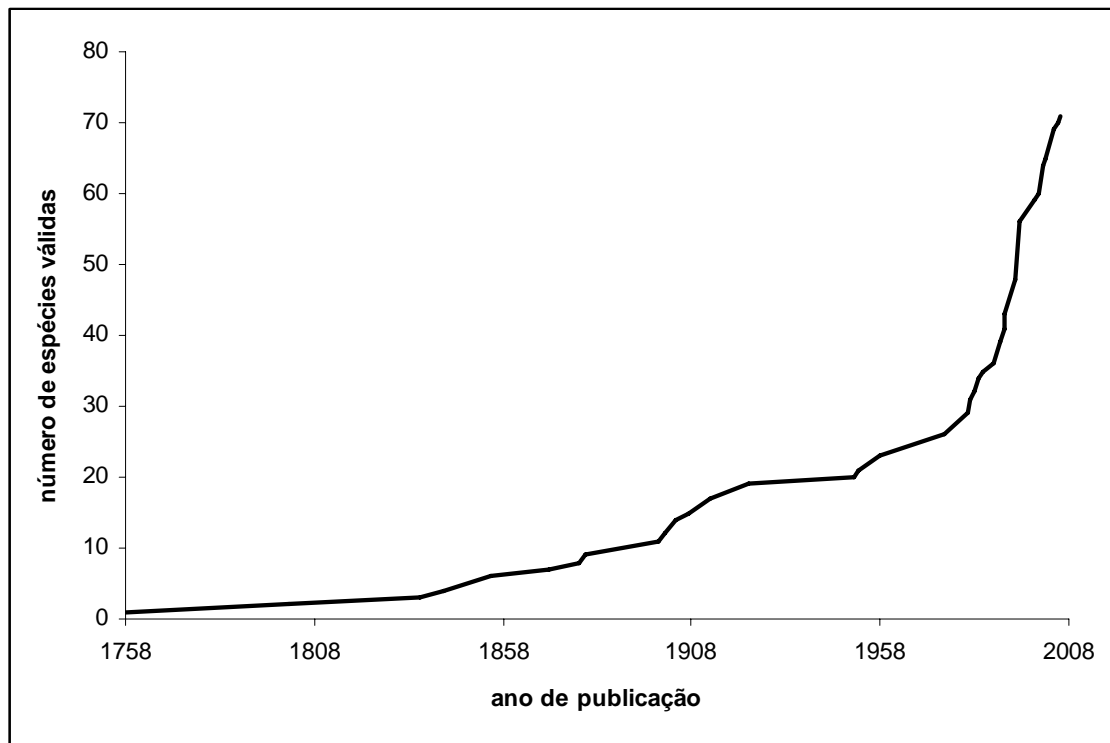


Figura 4. Curva acumulativa da diversidade temporal de espécies de Myxinidae, considerando o número de espécies válidas e seus respectivos anos de publicação.

- Quando analisamos o número de espécies válidas de Myxinidae descritas em intervalos de 50 anos desde 1758 (Fig. 5), notamos que apenas 21 espécies (30% da diversidade conhecida) foram descritas em um período de 200 anos (1758-1957), enquanto que a grande maioria das espécies (70%) foram descobertas nos últimos 50 anos. Isso é reflexo de explorações científicas em novas regiões geográficas, mas principalmente do uso de novas tecnologias empregadas nas últimas décadas, as quais permitiram a captura de espécimes em ambientes profundos antes inexplorados. A inclinação da curva acumulativa de diversidade temporal (Fig. 4) indica que o número de espécies de Myxinidae ainda está longe de ser completamente conhecido. O recente exame de uma pequena coleção do oeste da

Austrália revelou a ocorrência de três espécies novas, ainda em fase de descrição e não incluídas no presente trabalho. Cruzeiros de pesquisa direcionados a regiões pouco ou não exploradas (por exemplo, o oeste do Oceano Índico) podem sem dúvida revelar espécies ainda não descritas.

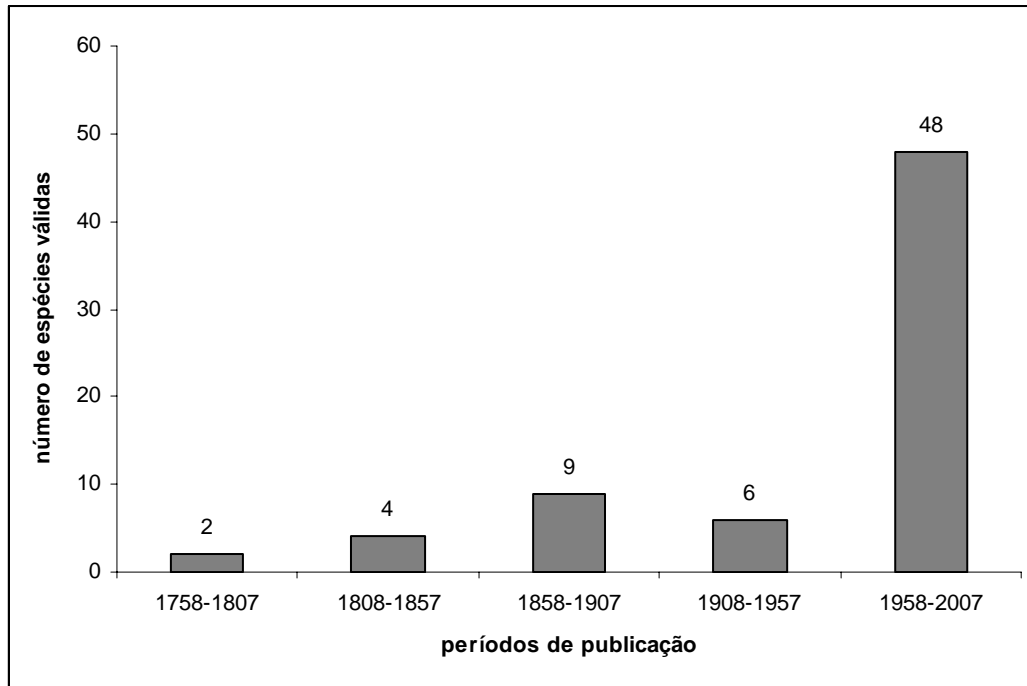


Figura 5. Número de espécies válidas de Myxinidae descritas em intervalos de aproximadamente 50 anos.

Tabela 1. Contagens de dentes (cúspides) e poros de *Eptatretus carlhubbsi* (n=18) e *Eptatretus laurahubbsae* (n=16) (extraído de McMillan & Wisner, 1984).

	Cúspides anteriores										
	13	14	15	16	17						
<i>E. carlhubbsi</i>			5	10	3						
<i>E. laurahubbsae</i>	1	1	4	7	3						
	Cúspides posteriores										
	11	12	13								
<i>E. carlhubbsi</i>	3	8	7								
<i>E. laurahubbsae</i>	1	10	4								
	Poros pré-branquiais										
	12	13	14	15	16	17	18	19	20		
<i>E. carlhubbsi</i>	1	7	2	5	2	1					
<i>E. laurahubbsae</i>			2	3	8	3					
	Poros branquiais										
	6	7	8								
<i>E. carlhubbsi</i>	4	12	2								
<i>E. laurahubbsae</i>	7	6	3								
	Poros do tronco										
	60	61	62	63	64	65	66	67	68	69	70
<i>E. carlhubbsi</i>	1	2			3		1	4	5		2
<i>E. laurahubbsae</i>	3	1	2	2		1	2	5			
	Poros caudais										
	12	13	14	15	16						
<i>E. carlhubbsi</i>	2	4	3	8	1						
<i>E. laurahubbsae</i>			2	12	2						

Tabela 2. Contagens de dentes (cúspides) e poros de *Myxine glutinosa* (n=143) e *Myxine limosa* (n=78) (extraído de Wisner & McMillan, 1995).

		Cúspides anteriores																				
		4	5	6	8																	
<i>M. glutinosa</i>		1	28	184	11																	
<i>M. limosa</i>			2	25	40	8																
		Cúspides posteriores																				
		5	6	7	8																	
<i>M. glutinosa</i>		2	66	151	5																	
<i>M. limosa</i>		1	10	38	26																	
		Poros pré-branquiais																				
		20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40
<i>M. glutinosa</i>		1	1	2	6	15	17	16	25	13	15	13	8	8	1		1	1				
<i>M. limosa</i>				1	2		1	8	10	6	10	10	7	9	6	7	5	2	2	1		1
		Poros do tronco																				
		50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	
<i>M. glutinosa</i>		2	4	5	14	17	14	20	12	26	12	9	3	3	2							
<i>M. limosa</i>				1		1	4	8	10	6	10	8	7	5	3	5	4	3	6	6	1	
		Poros caudais																				
		8	9	10	11	12	13	14	15	16												
<i>M. glutinosa</i>		1	2	16	22	47	37	16	2													
<i>M. limosa</i>		1	3		25	20	25	10		4												

Tabela 3. Contagens de dentes (cúspides) e poros de *Myxine knappi* e *Myxine dorsum* (extraído de Wisner & McMillan, 1995).

	Cúspides anteriores				<i>n</i>	
	6	7	8			
<i>M. knappi</i>	2		1		3	
<i>M. dorsum</i>		1	1		2	
	Cúspides posteriores				<i>n</i>	
	7	8	9			
<i>M. knappi</i>	1	1	1		3	
<i>M. dorsum</i>		2			2	
	Poros pré-branquiais				<i>n</i>	
	31	32				
<i>M. knappi</i>	1	1			2	
<i>M. dorsum</i>	1	1			2	
	Poros do tronco					<i>n</i>
	61	62	63	64	65	
<i>M. knappi</i>	1				1	2
<i>M. dorsum</i>					2	2
	Poros caudais				<i>n</i>	
	11	12	13			
<i>M. knappi</i>	1		1		2	
<i>M. dorsum</i>	2				2	

Tabela 4. Lista de gêneros de Myxinidae e atual arranjo taxonômico.

Gêneros nominais	Gêneros válidos
<i>Anopsus</i> Rafinesque 1815	<i>Myxine</i>
<i>Bdellostoma</i> Müller 1836	<i>Eptatretus</i>
<i>Dodecatrema</i> Fowler 1947	

Tabela 5. Lista de espécies de Myxinidae e atual arranjo taxonômico.

Espécies nominais	Atual arranjo
<i>acutifrons</i> , <i>Myxine</i> Garman, 1899	<i>Myxine australis</i>
<i>affinis</i> , <i>Myxine</i> Günther, 1870	<i>Myxine affinis</i>
<i>ancon</i> , <i>Quadratus</i> Mok, Saavedra-Diaz and Acero P., 2001	<i>Paramyxine ancon</i>
<i>atami</i> , <i>Paramyxine</i> Dean, 1904	<i>Paramyxine atami</i>
<i>atlantica</i> , <i>Myxine</i> Regan, 1913	<i>Myxine glutinosa</i>
<i>australis</i> , <i>Myxine</i> Jenyns, 1842	<i>Myxine australis</i>
<i>banksii</i> , <i>Homea</i> Fleming, 1822	<i>Eptatretus cirrhatus</i>
<i>biniplicata</i> , <i>Myxine</i> Richardson and Jowett, 1951	<i>Neomyxine biniplicata</i>
<i>bischoffii</i> , <i>Bdellostoma</i> Schneider, 1880	<i>Eptatretus bischoffii</i>
<i>burgeri</i> , <i>Bdellostoma</i> Girard, 1855	<i>Eptatretus burgeri</i>
<i>capensis</i> , <i>Myxine</i> Regan, 1913	<i>Myxine capensis</i>
<i>caribbeaus</i> , <i>Eptatretus</i> Fernholm, 1982	<i>Eptatretus caribbeaus</i>
<i>carlhubbsi</i> , <i>Eptatretus</i> McMillan and Wisner, 1984	<i>Eptatretus carlhubbsi</i>
<i>cheni</i> , <i>Paramyxine</i> Shen and Tao, 1975	<i>Paramyxine cheni</i>
<i>chinensis</i> , <i>Eptatretus</i> Kuo and Mok, 1994	<i>Paramyxine chinensis</i>
<i>circifrons</i> , <i>Myxine</i> Garman, 1899	<i>Myxine circifrons</i>
<i>cirrhatus</i> , <i>Petromyzon</i> Forster, 1801	<i>Eptatretus cirrhatus</i>
<i>coecus</i> , <i>Gastrobranchus</i> Bloch, 1791	<i>Myxine glutinosa</i>
<i>curtissjamesi</i> , <i>Polistotrema</i> Townsend and Nichols, 1925	<i>Eptatretus deani</i>
<i>deani</i> , <i>Polistotrema</i> Evermann and Goldsborough, 1907	<i>Eptatretus deani</i>
<i>debueni</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine debueni</i>
<i>decatrema</i> , <i>Heptatretus</i> Regan, 1912	<i>Eptatretus bischoffii</i>
<i>dorsum</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine knappi</i>
<i>elongata</i> , <i>Nemamyxine</i> Richardson, 1958	<i>Nemamyxine elongata</i>
<i>eos</i> , <i>Eptatretus</i> Fernholm, 1991	<i>Eptatretus eos</i>
<i>fernholmi</i> , <i>Eptatretus</i> McMillan and Wisner, 2004	<i>Eptatretus fernholmi</i>
<i>fernholmi</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine fernholmi</i>
<i>fernholmi</i> , <i>Paramyxine</i> Kuo, Huang and Mok, 1994	<i>Paramyxine fernholmi</i>
<i>formosana</i> , <i>Myxine</i> Mok and Kuo, 2001	<i>Myxine formosana</i>
<i>forsteri</i> , <i>Bdellostoma</i> Müller, 1836	<i>Eptatretus cirrhatus</i>
<i>fritzi</i> , <i>Eptatretus</i> Wisner and McMillan, 1990	<i>Eptatretus fritzi</i>
<i>garmani</i> , <i>Myxine</i> Jordan and Snyder, 1901	<i>Myxine garmani</i>
<i>glutinosa</i> , <i>Myxine</i> Linnaeus, 1758	<i>Myxine glutinosa</i>
<i>goliath</i> , <i>Eptatretus</i> Mincarone and Stewart, 2006	<i>Eptatretus goliath</i>
<i>grouseri</i> , <i>Eptatretus</i> McMillan, 1999	<i>Eptatretus grouseri</i>
<i>heptatrema</i> , <i>Bdellostoma</i> Müller, 1836	<i>Eptatretus cirrhatus</i>
<i>heterotrema</i> , <i>Bdellostoma</i> Müller, 1836	<i>Eptatretus hexatrema</i>
<i>hexatrema</i> , <i>Bdellostoma</i> Müller, 1836	<i>Eptatretus hexatrema</i>
<i>hubbsi</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine hubbsi</i>
<i>hubbsoides</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine hubbsoides</i>
<i>indrambaryai</i> , <i>Eptatretus</i> Wongratana, 1983	<i>Eptatretus indrambaryai</i>
<i>ios</i> , <i>Myxine</i> Fernholm, 1981	<i>Myxine ios</i>
<i>jespersenae</i> , <i>Myxine</i> Møller <i>et al.</i> , 2005	<i>Myxine jespersenae</i>
<i>knappi</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine knappi</i>
<i>kreffti</i> , <i>Nemamyxine</i> McMillan and Wisner, 1982	<i>Nemamyxine kreffti</i>
<i>kuoi</i> , <i>Myxine</i> Mok, 2002	<i>Myxine kuoi</i>
<i>lakeside</i> , <i>Eptatretus</i> Mincarone and McCosker, 2004	<i>Eptatretus lakeside</i>
<i>laurahubbsi</i> , <i>Eptatretus</i> McMillan and Wisner, 1984	<i>Eptatretus carlhubbsi</i>
<i>limosa</i> , <i>Myxine</i> Girard, 1859	<i>Myxine glutinosa</i>
<i>longipinnis</i> , <i>Eptatretus</i> Strahan, 1975	<i>Eptatretus longipinnis</i>
<i>mcconnaugheyi</i> , <i>Eptatretus</i> Wisner and McMillan, 1990	<i>Eptatretus mccoonaugheyi</i>

Tabela 5. Continuação

<i>mccoskeri</i> , <i>Eptatretus</i> McMillan, 1999	<i>Eptatretus mccoskeri</i>
<i>mccoskeri</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine mccoskeri</i>
<i>mcmillanae</i> , <i>Myxine</i> Hensley, 1991	<i>Myxine mcmillanae</i>
<i>mendozaei</i> , <i>Eptatretus</i> Hensley, 1985	<i>Eptatretus mendozaei</i>
<i>menezesi</i> , <i>Eptatretus</i> Mincarone, 2000	<i>Eptatretus menezesi</i>
<i>minor</i> , <i>Eptatretus</i> Fernholm and Hubbs, 1981	<i>Eptatretus minor</i>
<i>moki</i> , <i>Paramyxine</i> McMillan and Wisner, 2004	<i>Paramyxine moki</i>
<i>multidens</i> , <i>Eptatretus</i> Fernholm and Hubbs, 1981	<i>Eptatretus multidens</i>
<i>myxine</i> , <i>Petromyzon</i> Walbaum, 1792	<i>Myxine glutinosa</i>
<i>nanii</i> , <i>Eptatretus</i> Wisner and McMillan, 1988	<i>Eptatretus nanii</i>
<i>nelsoni</i> , <i>Paramyxine</i> Kuo, Huang and Mok, 1994	<i>Paramyxine nelsoni</i>
<i>octatrema</i> , <i>Heptatretus</i> Barnard, 1923	<i>Eptatretus octatrema</i>
<i>okinoseana</i> , <i>Homea</i> Dean, 1904	<i>Eptatretus okinoseanus</i>
<i>paucidens</i> , <i>Myxine</i> Regan, 1913	<i>Myxine paucidens</i>
<i>pequenoii</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine pequenoii</i>
<i>polytrema</i> , <i>Bdellostoma</i> Girard, 1855	<i>Eptatretus polytrema</i>
<i>profundus</i> , <i>Heptatretus</i> Barnard, 1923	<i>Eptatretus profundus</i>
<i>robinsi</i> , <i>Myxine</i> Wisner and McMillan, 1995	<i>Myxine robinsorum</i>
<i>sheni</i> , <i>Paramyxine</i> Kuo, Huang and Mok, 1994	<i>Paramyxine sheni</i>
<i>sinus</i> , <i>Eptatretus</i> Wisner and McMillan, 1990	<i>Eptatretus sinus</i>
<i>sotoi</i> , <i>Myxine</i> Mincarone, 2001	<i>Myxine sotoi</i>
<i>springeri</i> , <i>Paramyxine</i> Bigelow and Schroeder, 1952	<i>Paramyxine springeri</i>
<i>stoutii</i> , <i>Bdellostoma</i> Lockington, 1878	<i>Eptatretus stoutii</i>
<i>strahani</i> , <i>Eptatretus</i> McMillan and Wisner, 1984	<i>Eptatretus strahani</i>
<i>taiwanae</i> , <i>Paramyxine</i> Shen and Tao, 1975	<i>Paramyxine taiwanae</i>
<i>tridentiger</i> , <i>Myxine</i> Garman, 1899	<i>Notomyxine tridentiger</i>
<i>walkeri</i> , <i>Paramyxine</i> McMillan and Wisner, 2004	<i>Paramyxine walkeri</i>
<i>wayuu</i> , <i>Eptatretus</i> Mok, Saavedra-Diaz and Acero P., 2001	<i>Paramyxine wayuu</i>
<i>wisneri</i> , <i>Eptatretus</i> McMillan, 1999	<i>Eptatretus wisneri</i>
<i>wisneri</i> , <i>Paramyxine</i> Kuo, Huang and Mok, 1994	<i>Paramyxine wisneri</i>
<i>yangi</i> , <i>Paramyxine</i> Teng, 1958	<i>Paramyxine yangi</i>

Tabela 6. Espécies nominais, número de espécies consideradas válidas no presente estudo e número de sinônimos para cada gênero de Myxinidae.

Gêneros	Espécies nominais	Espécies válidas	Sinonímias
<i>Eptatretus</i>	37	30	7
<i>Paramyxine</i>	14	14	0
<i>Myxine</i>	27	21	6
<i>Notomyxine</i>	1	1	0
<i>Nemamyxine</i>	2	2	0
<i>Neomyxine</i>	1	1	0
Total	82	69	13

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