North Pacific Fisheries Commission

NPFC-2024-SC09-OP05

A review of deep-water shark species (superorder Selachimorpha) known or likely to occur within the North Pacific Fisheries Commission's Convention Area, including preliminary identification keys.

Introduction

The North Pacific Ocean is one of the world's most expansive and dynamic oceanic regions, covering a vast area bounded by Asia to the west, North America to the east and the Aleutian Island chain and Bering Sea to the north (Figure 1).

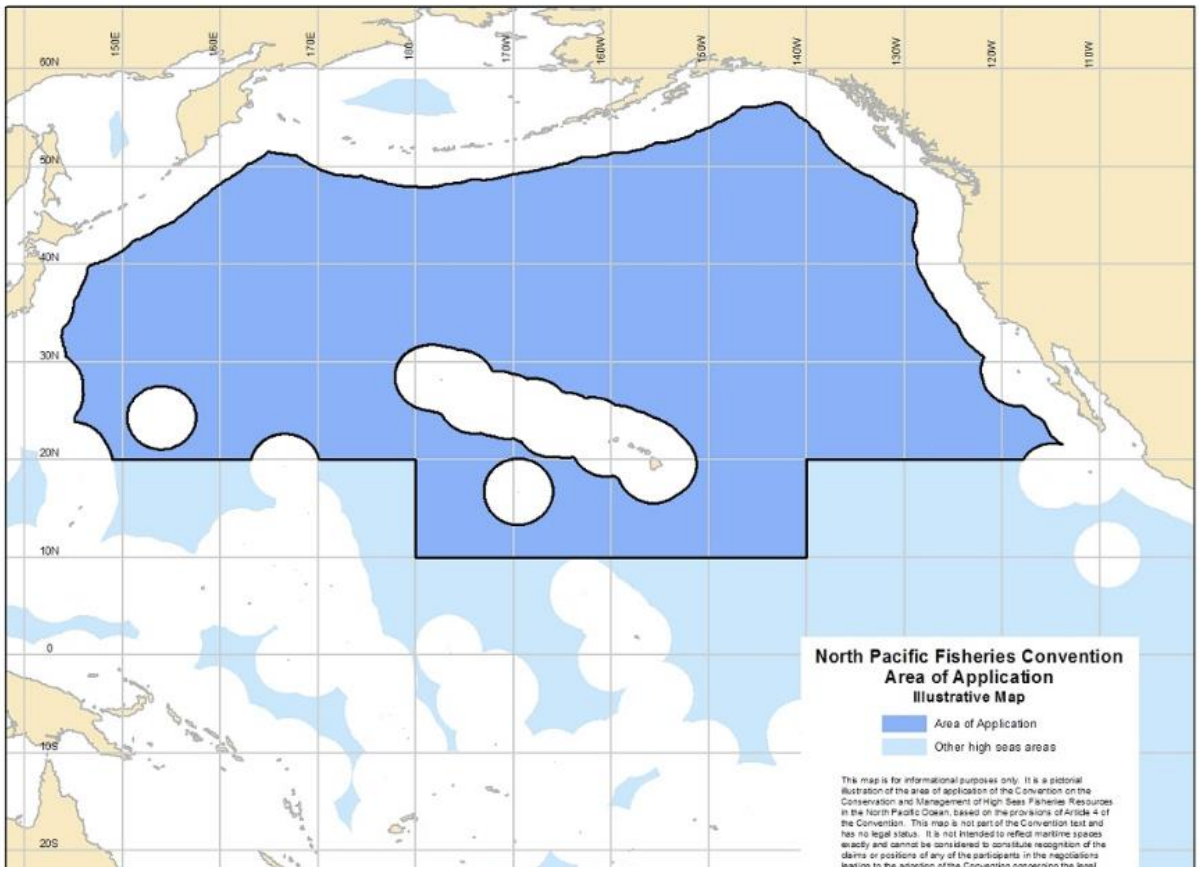


Figure 1 - Map of the North Pacific Fisheries Commission Convention Area

The seafloor of the eastern North Pacific is characterized by a series of fracture zones that predominantly run east to west. In contrast, the northern, central, and western regions feature ridge systems and deep-ocean trenches. Among these underwater formations, the Emperor Seamount chain stands out as the most significant, stretching over 2 000 Km from the Aleutian Islands to the Hawaiian Ridge in the central Pacific.

Bottom fishing in the Northwestern North Pacific has primarily focused on seamounts within this chain, including Nintoku, Jingu, Ojin, Koko, Kimmei, Yuryaku, Kammu, Colahan, and C-H Seamounts. The deep-sea bottom trawl fishery predominantly targeted the North Pacific armorhead (*Pentaceros wheeleri*) and splendid alfonsino (*Beryx splendens*), and the primary

target species of the bottom gillnet fisheries have been splendid alfonsino, oreo (*Allocyttus folletti*), and mirror dory (*Zenopsis nebulosa*).

In the Northeastern Pacific Ocean, a longline fishery using both longline hook and longline trap gear has fished four seamount aggregations, Eickelberg, Warwick, Cobb, and Brown Bear seamounts. Since the fishery began, sablefish (*Anoplopoma fimbria*) has been the primary target species for both longline hook and longline trap harvesters.

As bottom fishing continues to target various species across the seamounts of the North Pacific, it underscores the importance of sustainable fishing practices and species management in this ecologically sensitive region. The adoption of Conservation and Management Measure 2023-14 on sharks by the NPFC reflects a growing awareness of the need to protect vulnerable marine species, particularly in areas fished for commercially valuable. This measure emphasizes the necessity for fishing vessels to record and maintain logs of any shark catches, identifying the species whenever possible to ensure effective monitoring and conservation efforts.

Recognizing this critical need, the Deep-sea Fisheries Project (DSF) has proposed to assist the NPFC in developing robust identification tools for shark species in the region. As a key partner in this initiative, the DSF aims to enhance the ability of fishers to accurately identify and report shark species, thereby contributing to more informed management decisions and conservation strategies.

A key first step towards this goal was to prepare a comprehensive list of deep-water shark species that inhabit depths ranging from approximately 200 m to over 2000 m, specifically those known or likely to occur on the seamounts where fisheries take place. By sharks, this report refers specifically to members of the superorder Selachimorpha, excluding rays and chimaeras. These groups are not included due to their greater identification challenges and the assumption that their catches are relatively low. This focus allows for a more thorough analysis of shark data, while rays and chimaeras will be considered in a later stage of this work.

Given the scarcity of confirmed records of shark species in the convention area (CA), it was necessary to make informed assumptions about their potential presence.

Two key factors were considered in these assumptions:

1. Geographical distribution of records – If a species had documented occurrences on both the eastern and western boundaries of the CA, its presence on deep-water features within the CA was considered more probable.

2. Depth range – Species with a known preference for the continental shelf or upper slope (typically above 200 m) and infrequent occurrence at greater depths were deemed less likely to inhabit the deep-sea environments of the seamount chains within the CA.

These considerations allowed for a more informed estimation of species distribution, even in the absence of extensive occurrence data.

This report presents a summary of the work conducted to obtain the species list, which will serve as a basis for the preparation of the identification tools. Each species account includes information on geographical and depth distribution, a distribution map, and notes on identification for fishery observers or non-experts. These notes indicate expected identification difficulty and provide recommendations on the appropriate taxonomic level for inclusion.

Species lists are provided by area of occurrence together with a list of taxa selected for inclusion in the identification keys.

Finally, preliminary identification keys are provided at the end of the document, along with a graphic representation of the key to order. The most suitable type of identification tool—whether printed or electronic, incorporating photos or illustrations, and designed for use by both experts and non-experts—will be discussed in collaboration with the Deep-sea Fisheries Programme to best meet the needs of the NPFC.

Results

The table below presents an overview of the deep-water shark order, families, and species documented in the North Pacific. For each family, the number of species is indicated based on available records from the Global Biodiversity Information Facility. These records encompass the North Pacific region, including the Exclusive Economic Zones (EEZs) of bordering countries, the NPFC Convention Area (Areas Beyond National Jurisdiction), and other oceans.

	Deep-water species in the North Pacific	Deep-water species in NPFC CA	Species Worldwide
Hexanchiformes			
Hexanchidae	3	1	5
Chlamydoselachidae	1	1	2
Lamniformes			
Mitsukurinidae	1	0	1
Odontaspididae	2	0	2
Pseudocarchariidae	1	1	1
Alopiidae	1	1	3
Carcharhiniformes			
Scyliorhinidae*	0	0	37
Pentanchidae	20	4	111
Pseudotriakidae	1	1	5
Squaliformes			
Dalatiidae	6	3	10
Etmopteridae	15	8	52
Somniosidae	6	3	17
Centrophoridae	7	0	17
Squalidae	9	1	42
Echinorhiniformes			
Echinorhinidae	2	1	2
Pristiophoriformes			
Pristiophoridae	1	0	10
TOTAL	**76**	**25**	**317**

Overall, 76 species of deep-water sharks occur in the North Pacific, of which 26 have records from the Convention Area of the NPFC.

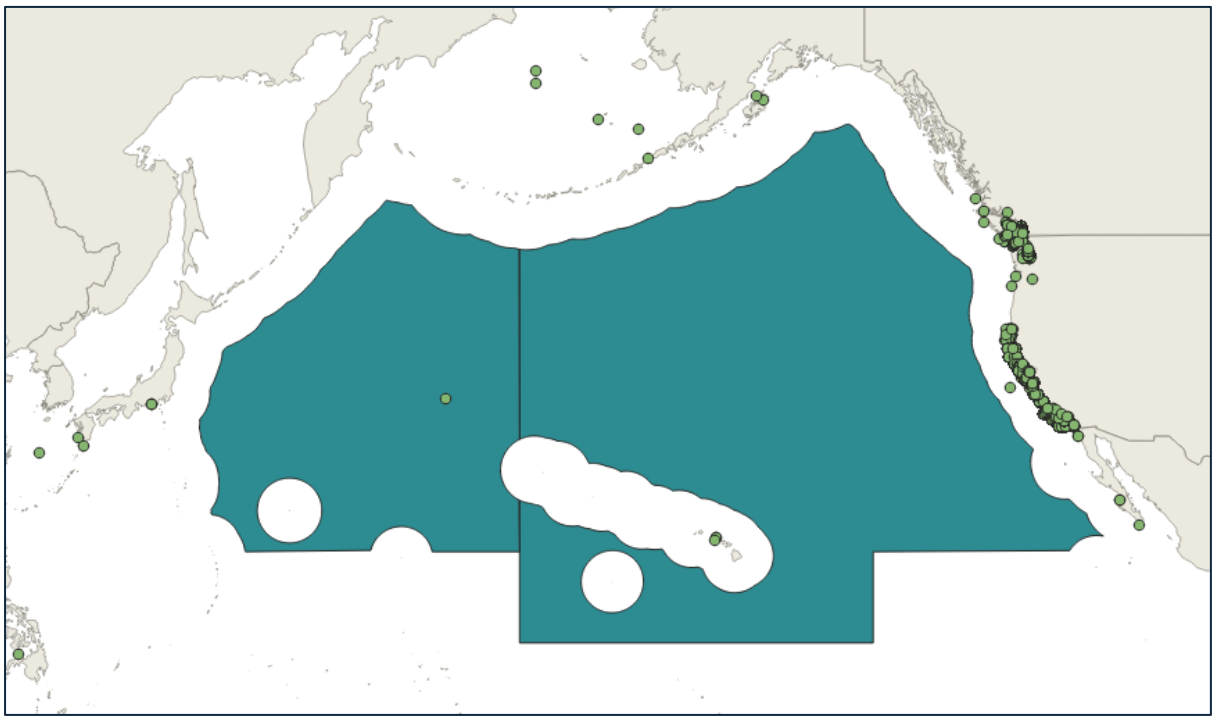
Hexanchiformes

Hexanchidae

There are five known species of cow sharks (family Hexanchidae) worldwide, most of which have patchy distributions. In the North Pacific, records exist for three species, though two of them are only documented in the deep waters off southern Japan.

Hexanchus griseus

The Bluntnose Sixgill Shark (*Hexanchus griseus*) is the most frequently recorded member of the Hexanchidae family, both globally and in the North Pacific. It has been documented along both the eastern and western Pacific coasts, as well as in Hawaii and higher latitudes. Its presence in the Convention Area of the North Pacific Fisheries Commission (NPFC) is highly probable.



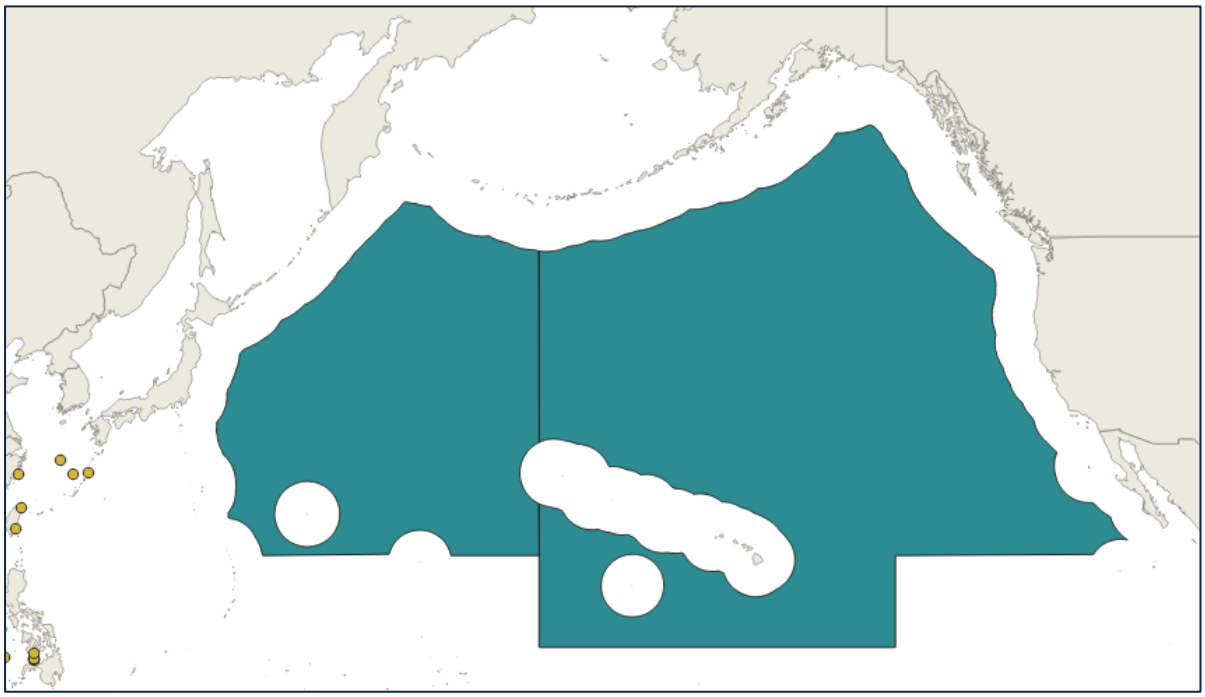
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to genus is very easy, thanks to its distinctive morphology and unique features. Identification to species is easy although there is a potential for misidentification with the closely related *Hexanchus nakamurai*. Moreover, *H. nakamurai* has only been recorded in waters south of Japan and has no known occurrences in other parts of the North Pacific. Another species, *Chlamydoselachus anguineus* has an important feature in common with *H. griseus*, the number of gill slits (6). However, its body shape is very different and unmistakable.

Overall, the likelihood of accurate species identification is high and the species should be included in an ID tool at the species level.

Hexanchus nakamurai

The Bigeye Sixgill Shark (*Hexanchus nakamurai*) has only been documented in the North Pacific along the western coast, south of Japan. Its presence in the western sectors of the CA of the NPFC is possible.



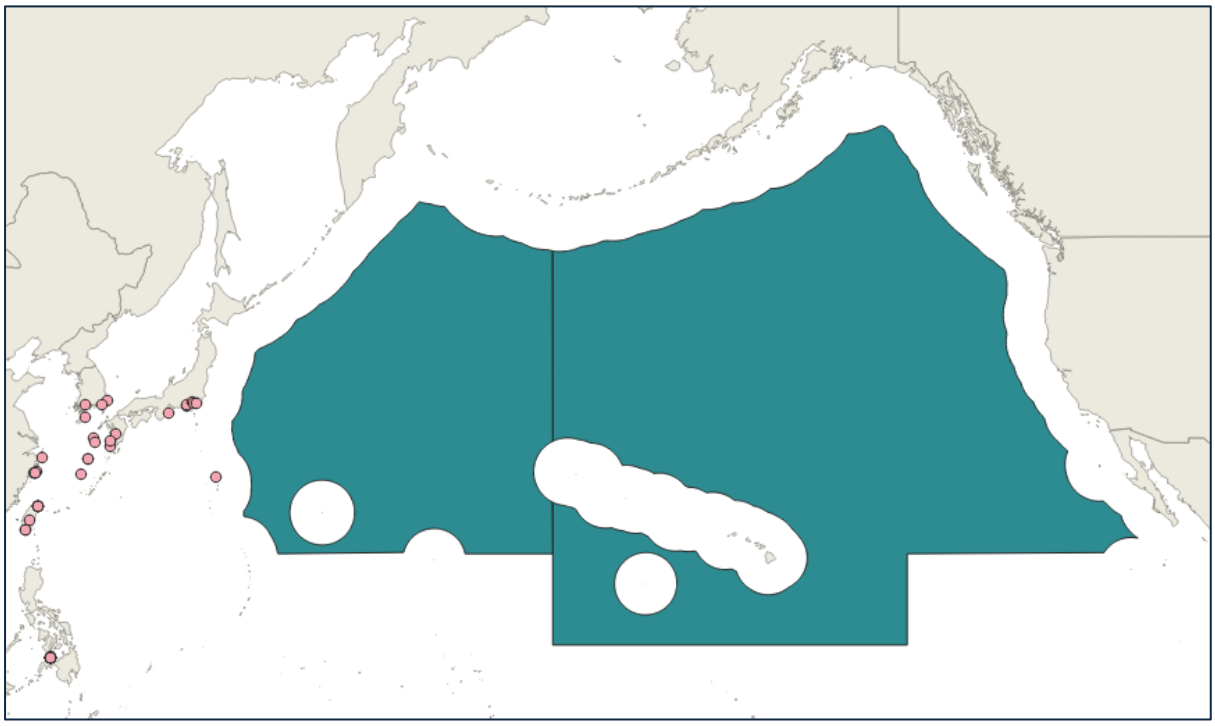
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to genus is very easy, thanks to its distinctive morphology and unique features. Identification to species is easy although there is a potential for misidentification with the closely related *Hexanchus griseus*. The characters used to distinguish these two species are macroscopic and non-experts are likely to be able to identify them with relative ease. No records from the ABNJ. Given its distribution just outside the CA, it is expected that most *Hexanchus* records are of *H. griseus*.

Overall, the likelihood of accurate species identification is high and the species should be included in an ID tool at the species level, with notes on its distribution outside the CA.

Heptranchias perlo

The Sharpnose sevengill shark (*Heptranchias perlo*) has only been documented in the North Pacific along the western coast, south of Japan. Its presence in the western sectors of the CA of the NPFC is possible.



Notes on Species Identification by Fishery Observers or Non-Experts

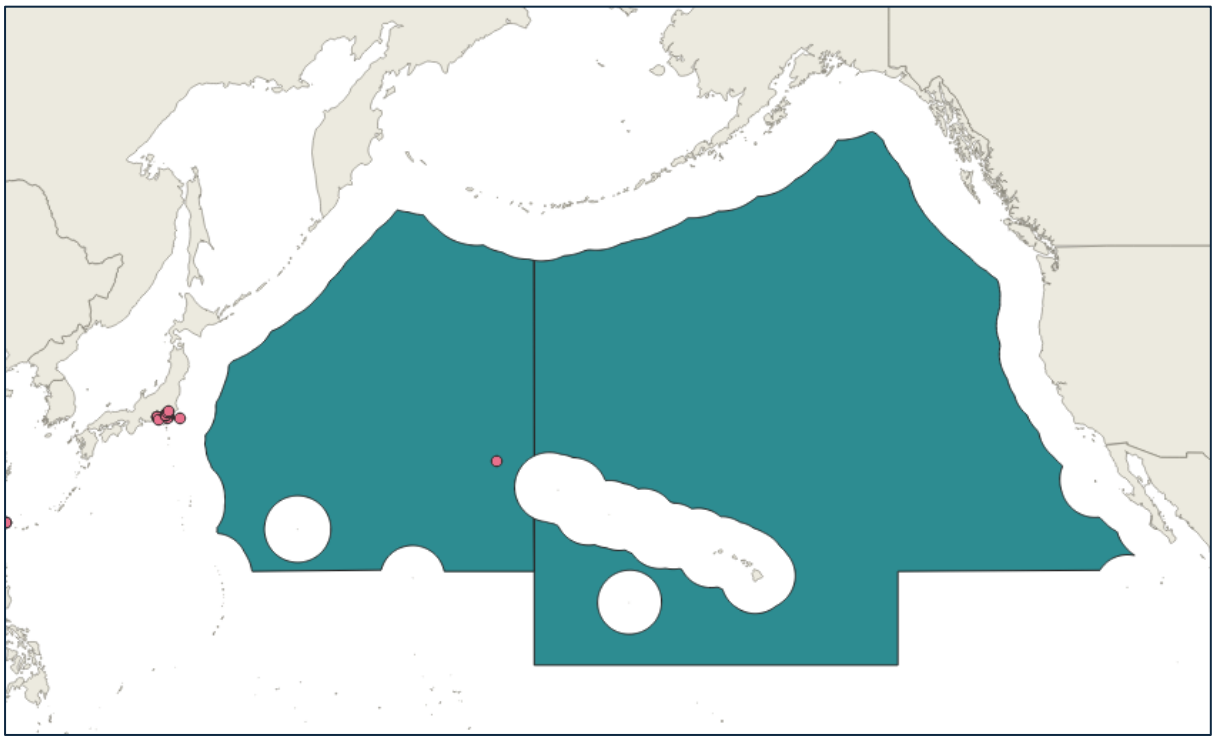
The identification of this shark to genus and species is very easy, thanks to its unique feature – the only species with 7 gill slits. Likely to occur in the ABNJ, but no official records are known yet.

Overall, the likelihood of accurate species identification is high and the species should be included in an ID tool at the species level, with notes on its distribution outside the CA.

Chlamydoselachidae

Chlamydoselachus anguineus

The Frilled shark (*Chlamydoselachus anguineus*) has records in the North Pacific along the western coast, with one record from the CA of the NPFC.



Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to genus and species is very easy, thanks to its morphology and unique features.

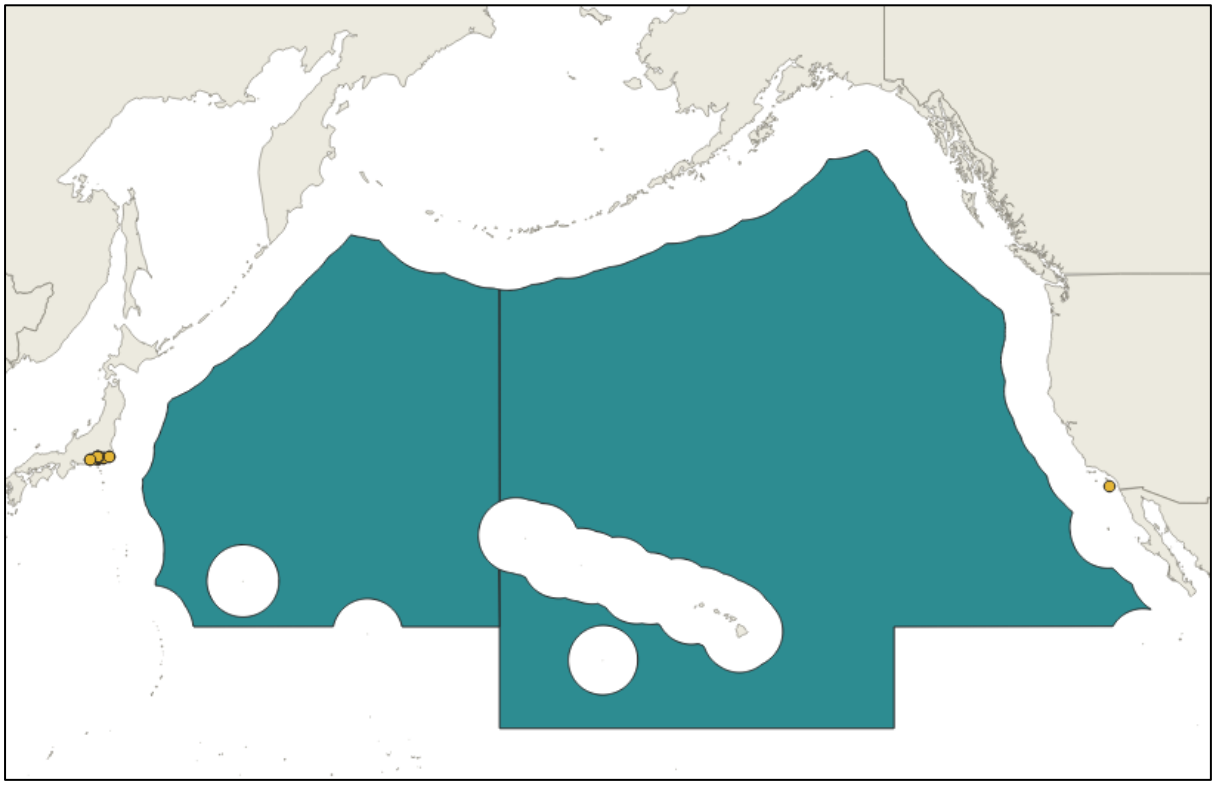
Overall, the likelihood of accurate species identification is high and the species should be included in an ID tool at the species level.

Lamniformes*

Mitsukurinidae

Mitsukurina owstonii

The Goblin shark (*Mitsukurina owstonii*) has records in the North Pacific along both the western and eastern coasts, but none from the NPFC's CA.



Notes on Species Identification by Fishery Observers or Non-Experts

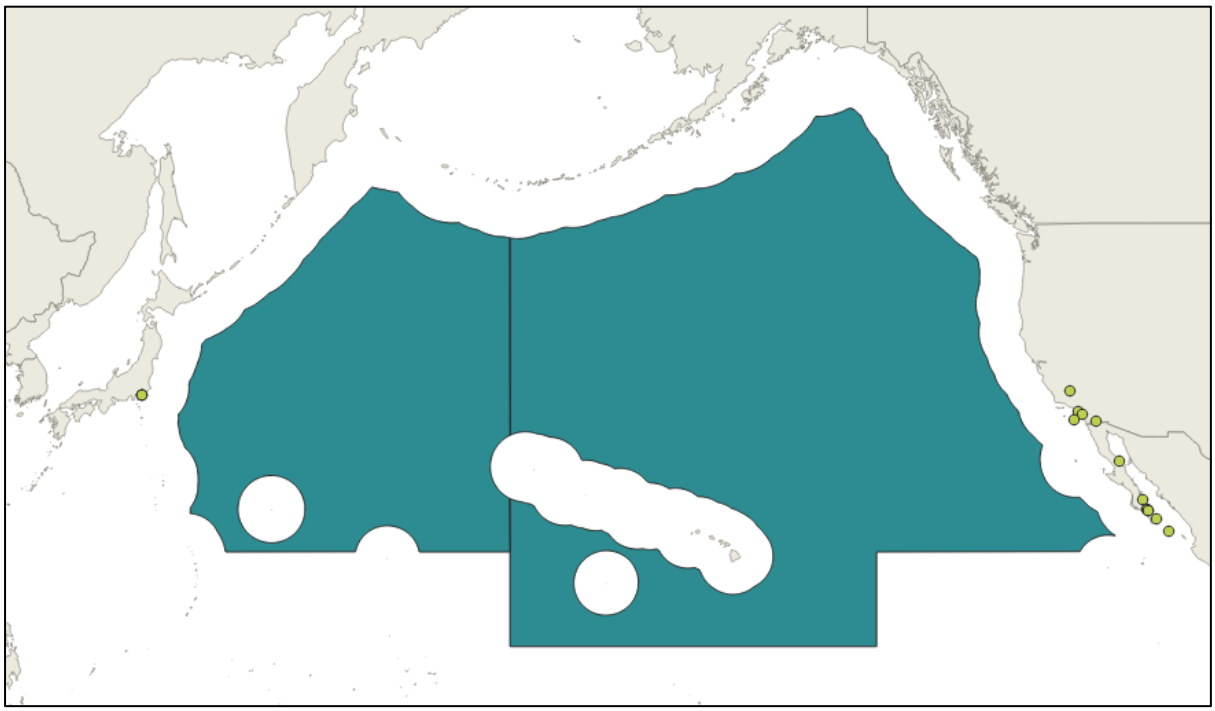
The identification of this shark to genus and species is very easy, thanks to its morphology and unique features. Its presence in the area is probable. No records from the ABNJ. Being a rare species, catches are expected to be sporadic.

Overall, the likelihood of accurate species identification is high and the species should be included in an ID tool at the species level.

Odontaspididae

Odontaspis ferox

The Smalltooth sand tiger shark (*Odontaspis ferox*) has records in the North Pacific along both the western and eastern coasts, but none from the NPFC's CA.



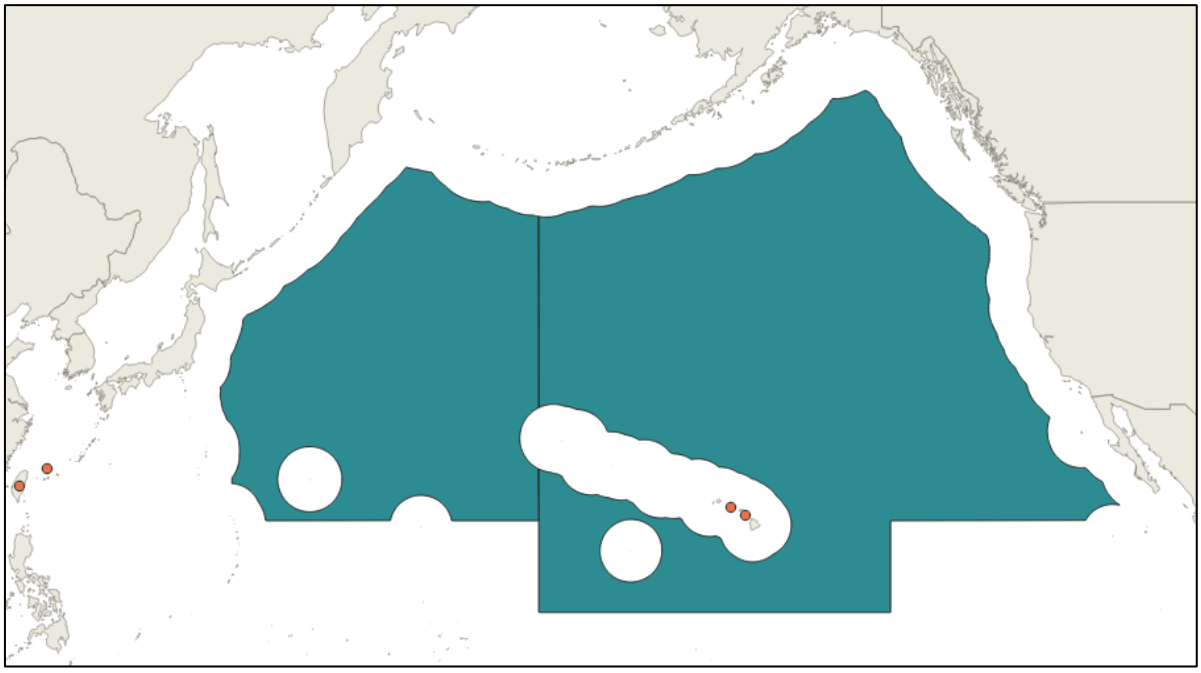
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus level is relatively straightforward due to its stout-bodied appearance. However, distinguishing it at the species level is more challenging, as the only notable difference between it and the other *Odontaspis* species in the region is a characteristic visible on the teeth. While its presence in the area is likely, it is an uncommon species, so encounters are expected to be infrequent. No records from the ABNJ.

Overall, the likelihood of accurate genus identification is high, and both species should be included in an ID tool at the genus level.

Odontaspis noronhai

The Bigeye sandtiger shark (*Odontaspis noronhai*) has records in the North Pacific off the coast of Hawaii and Taiwan, Province of China.



Notes on Species Identification by Fishery Observers or Non-Experts

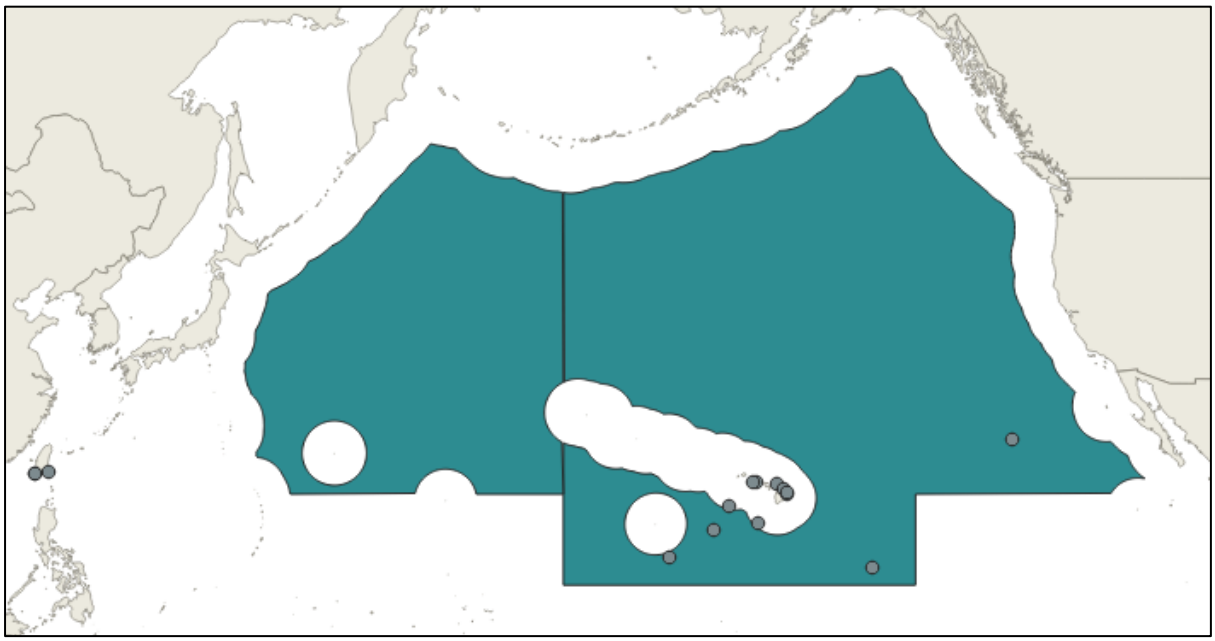
The identification of this shark to the genus level is relatively straightforward due to its stout-bodied appearance. However, distinguishing it at the species level is more challenging, as the only notable difference between it and the other *Odontaspis* species in the region is a characteristic visible on the teeth. While its presence in the area is likely, it is an uncommon species in the catches of bottom fisheries, so encounters are expected to be infrequent.

Overall, the likelihood of accurate genus identification is high, and both species should be included in an ID tool at the genus level.

Pseudocarchariidae

Pseudocarcharias kamoharai

The crocodile shark (*Pseudocarcharias kamoharai*) has scattered records in the North Pacific off the coast of Hawaii, the USA, and south of Taiwan, Province of China.



Notes on Species Identification by Fishery Observers or Non-Experts

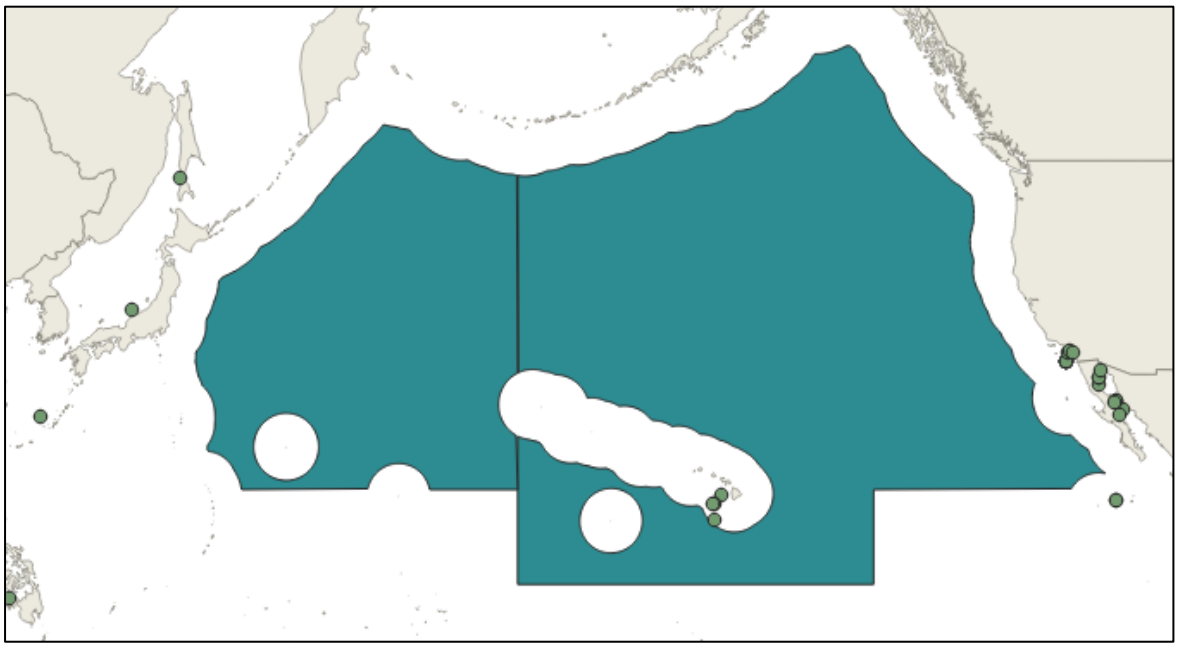
The identification of this shark to the species level is relatively straightforward, thanks to its morphology and unique features. Its presence in the area is confirmed. This species is not demersal, and it is often caught by pelagic longline fisheries. Catches are expected to be sporadic.

Overall, the likelihood of accurate species identification is high, and this species should be included in an ID tool at the species level.

Alopiidae

Alopias superciliosus

The Bygeye thresher (*Alopias superciliosus*) has scattered records in the North Pacific off the coast of Hawaii, the USA, Japan, ans Taiwan, Province of China.



Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the species level is very easy, thanks to its morphology and unique features. Its presence in the area is confirmed. This species is not truly demersal, and it is often caught by pelagic longline fisheries. Catches are expected to be sporadic.

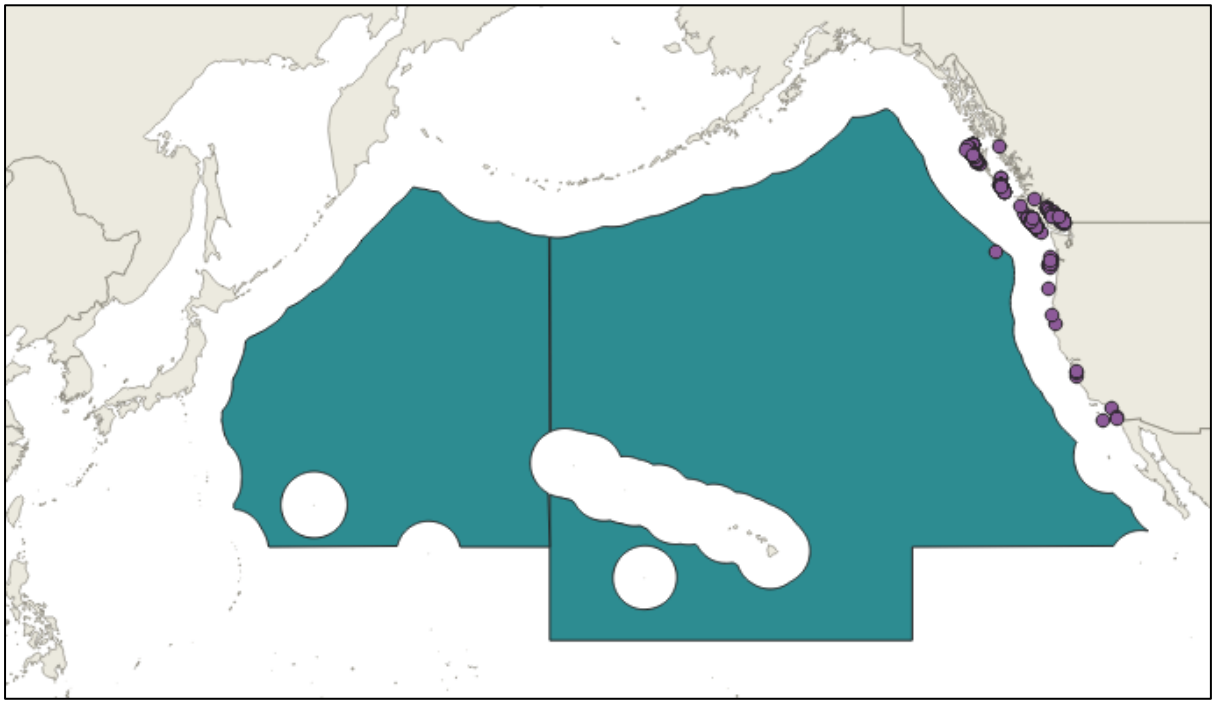
Overall, the likelihood of accurate species identification is high, and this species should be included in an ID tool at the species level.

Carcharhiniformes

Pentanchidae

Apristurus brunneus

The Brown catshark (*Apristurus brunneus*) is a common species with numerous records off the West coast of the USA.



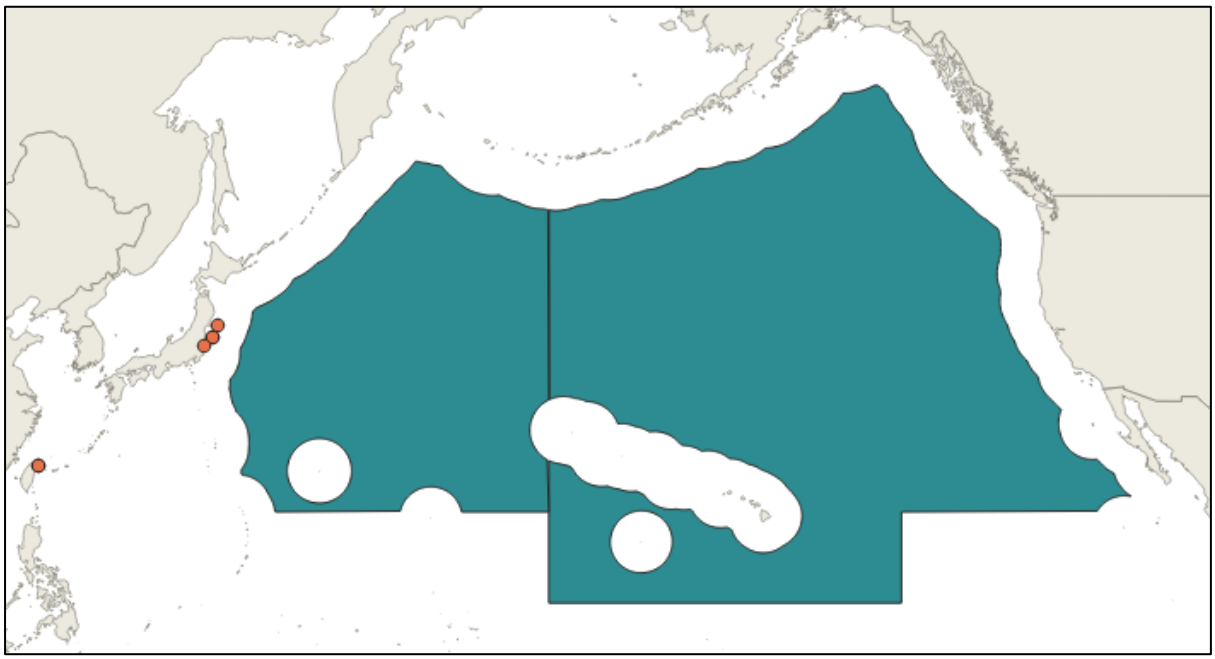
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus level is relatively easy, but to species is nearly impossible due to the high number of species belonging to this genus and uncertainty about which ones occur in the region. Species in this genus have been assigned to three sub-groups called “clades”. The *Apristurus brunneus* clade includes species that have slender bodies, short snouts, and upper labial furrows that are longer than lowers. Assigning species to the different clades is not easy. Its presence in the eastern sector of the area is confirmed, although there is only one record from the ABNJ.

Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus japonicus

The Japanese catshark (*Apristurus japonicus*) is a common species off Japan, at depths around 900 m.



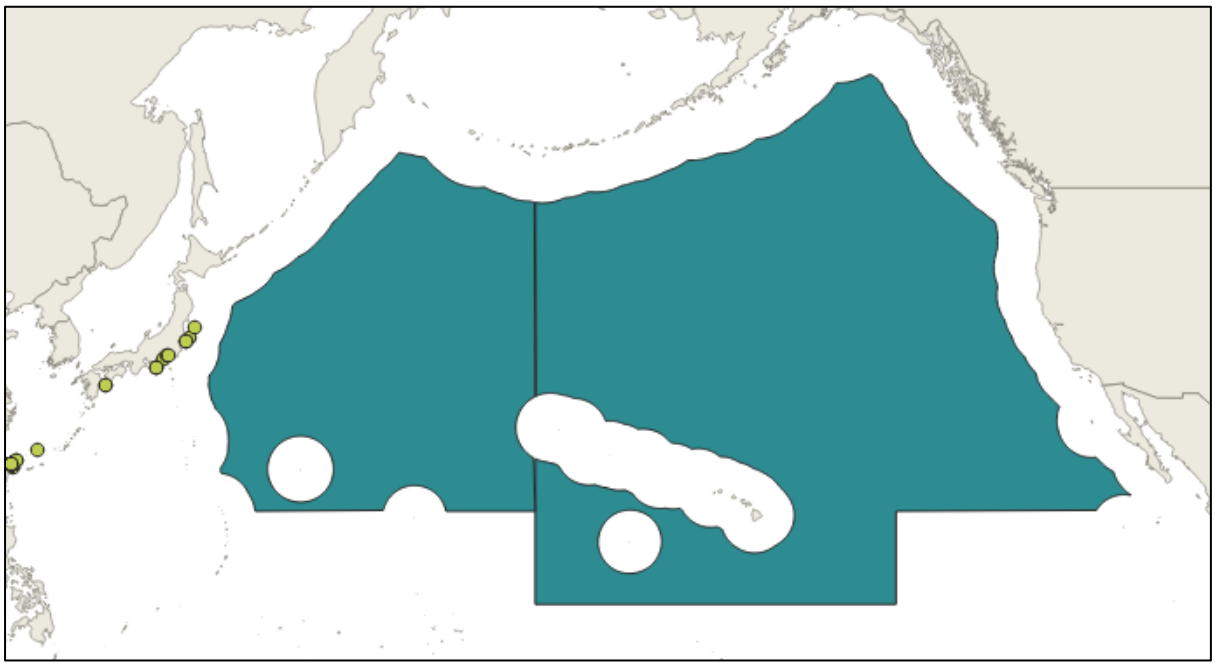
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus level is relatively easy, but to species is nearly impossible due to the high number of species belonging to this genus and uncertainty about which ones occur in the region. It belongs to the *Apristurus brunneus* clade. Its presence in the western sector of the area is likely, although there are no records from the ABNJ.

Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus macrorhynchus

The Flathead catshark (*Apristurus macrorhynchus*) is a common species off Japan, at depths down to 1150 m.



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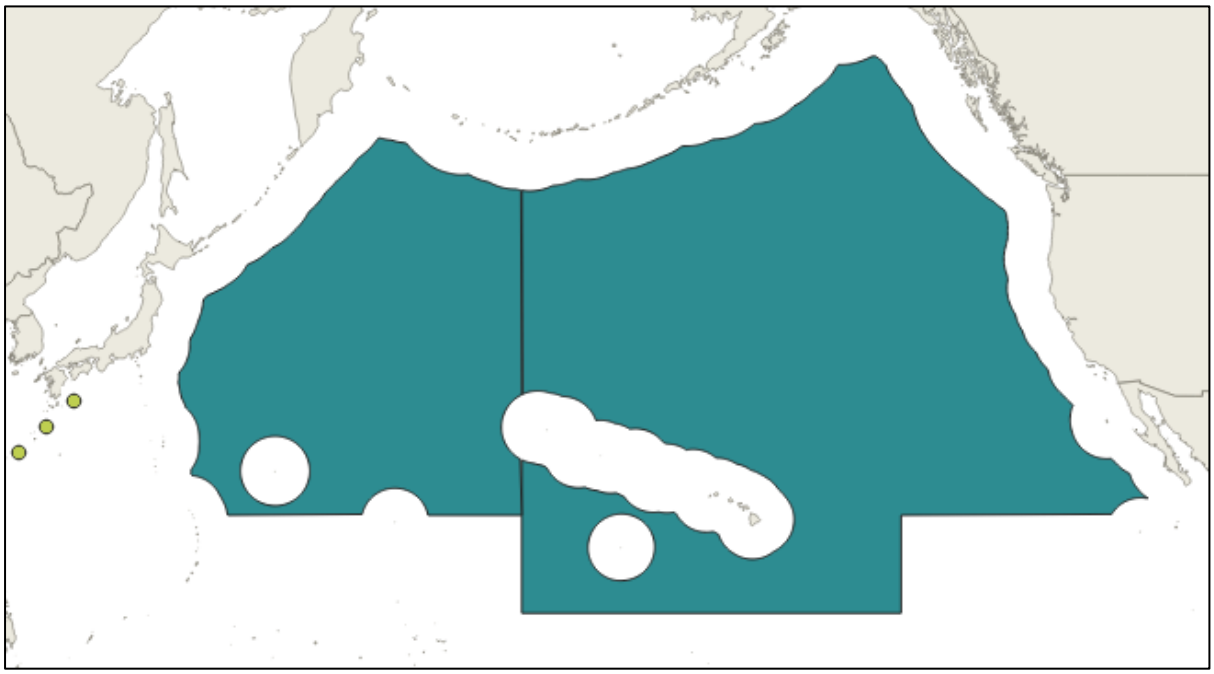
Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus macrostomus

The Broadmouth catshark (*Apristurus macrostomus*) is a relatively common species off the northwest Pacific coast, especially off north of Taiwan, Province of China, at depths down to 1050 m.



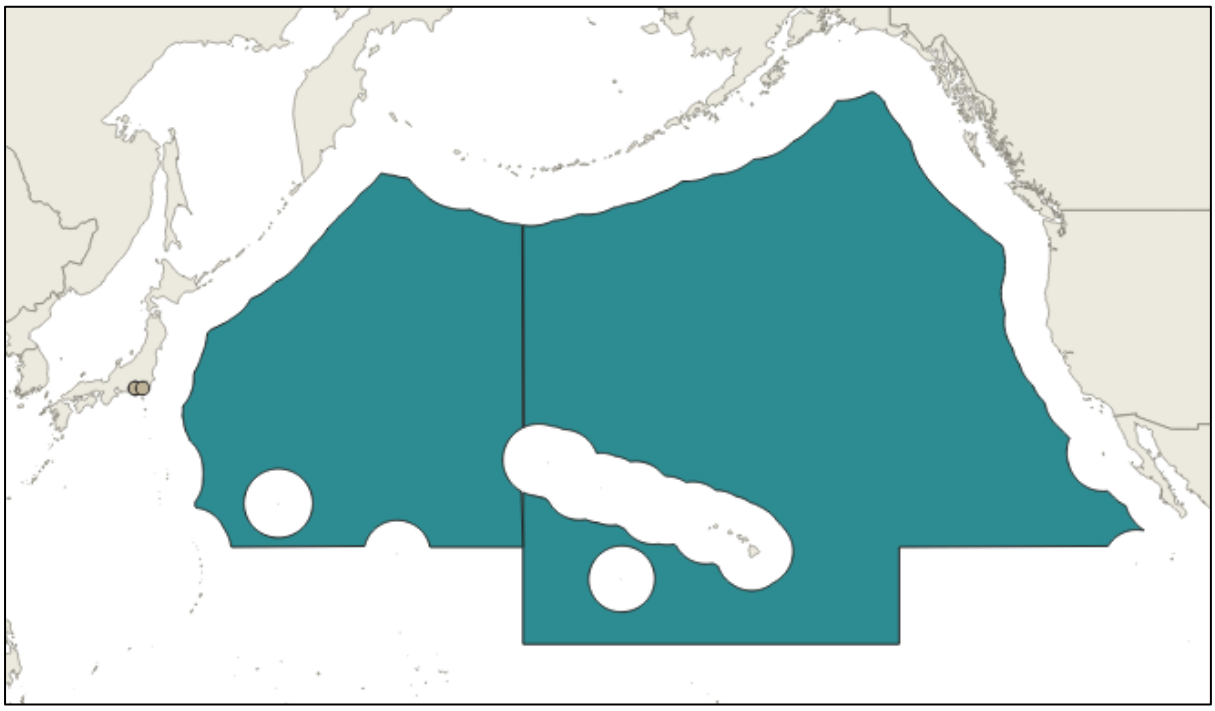
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus level is relatively easy, but to species is nearly impossible due to the high number of species belonging to this genus and uncertainty about which ones occur in the region. It belongs to the *Apristurus brunneus* clade. Its presence in the western sector of the area is unlikely, as it is more abundant south of the CA. No records from the ABNJ.

Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus platyrhynchus

The Spatulasnout catshark (*Apristurus platyrhynchus*) is a relatively common species off the Pacific coast, but more in equatorial and tropical areas.



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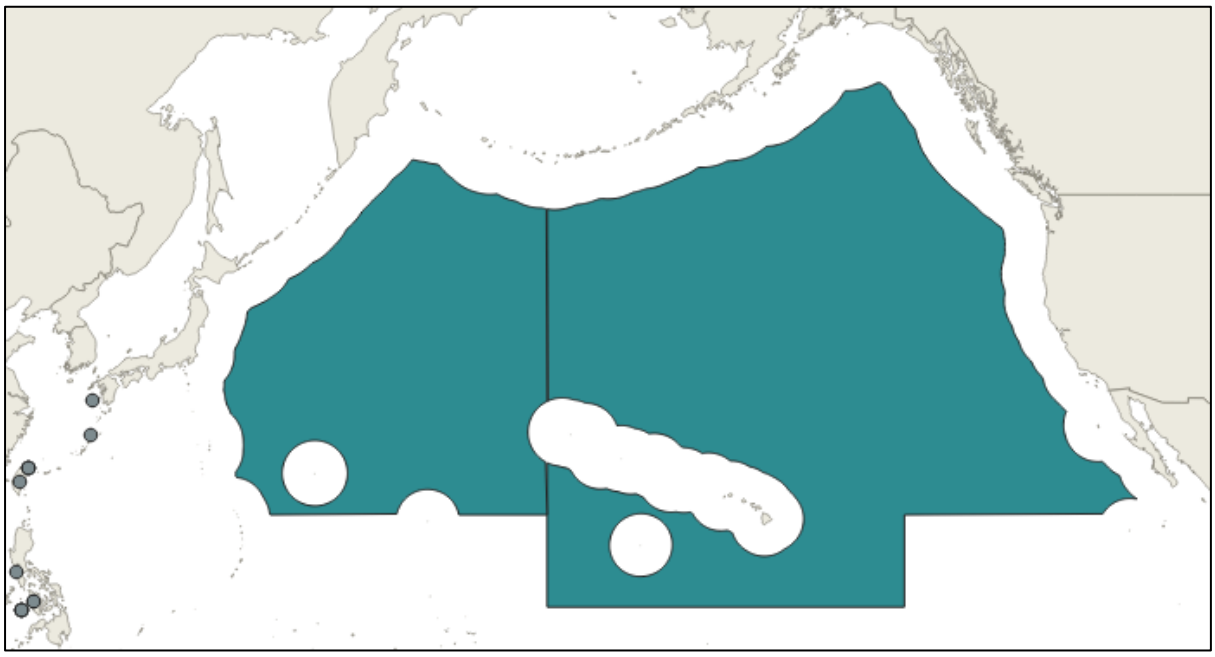
Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus herklotsi

The Longfin catshark (*Apristurus herklotsi*) is documented from off Japan, and south to the China Seas.



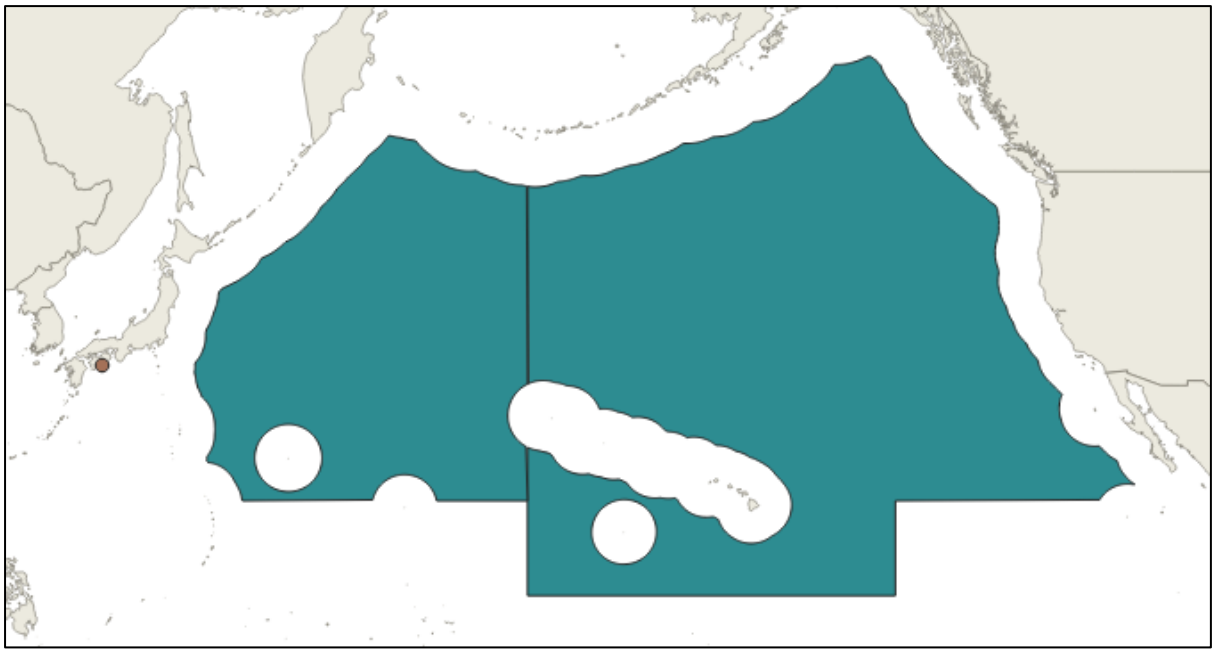
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus level is relatively easy, but to species is nearly impossible due to the high number of species belonging to this genus and uncertainty about which ones occur in the region. It belongs to the *Apristurus longicephalus* clade which includes species that have extremely long snouts. Its presence in the western sector of the area is unlikely, as it is more abundant south of the CA. No records from the ABNJ.

Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus longicephalus

The Longhead catshark (*Apristurus longicephalus*) is documented from off Japan.



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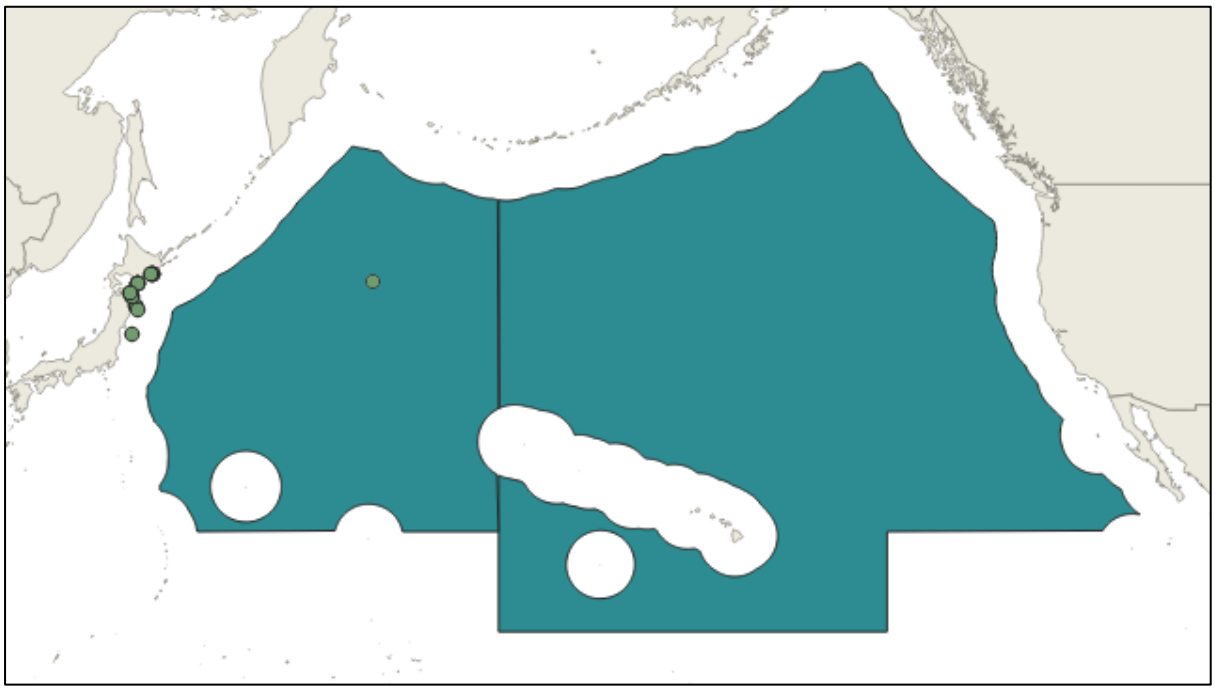
Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus fedorovi

The Stout catshark (*Apristurus fedorovi*) is a rare species off northern Japan, with records from the Emperor seamount



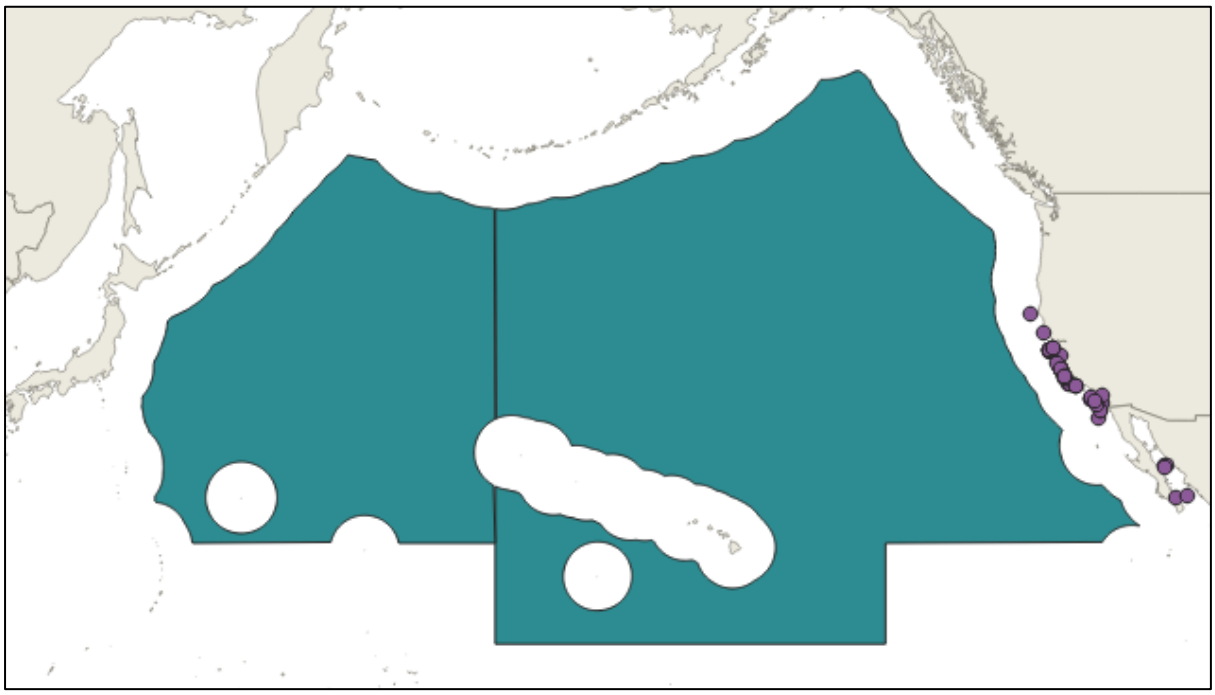
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus level is relatively easy, but to species is nearly impossible due to the high number of species belonging to this genus and uncertainty about which ones occur in the region. It belongs to the *Apristurus spongiceps* clade which includes species that have stout bodies, short snouts, and upper labial furrows that are equal or less than lowers. Its presence in the western sector of the area is confirmed.

Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus kampae

The Longnose catshark (*Apristurus kampae*) is a relatively common species off the western coast of the USA.



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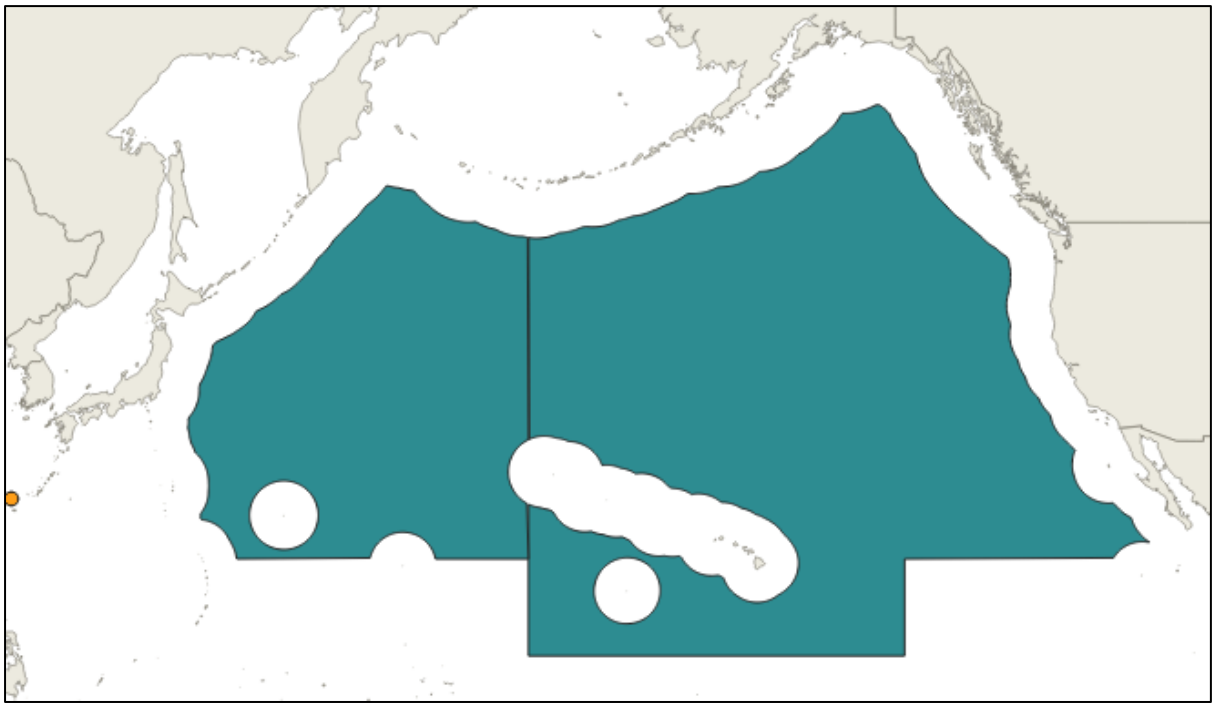
Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus pinguis

The Bulldog catshark (*Apristurus pinguis*) is documented from south of Japan.



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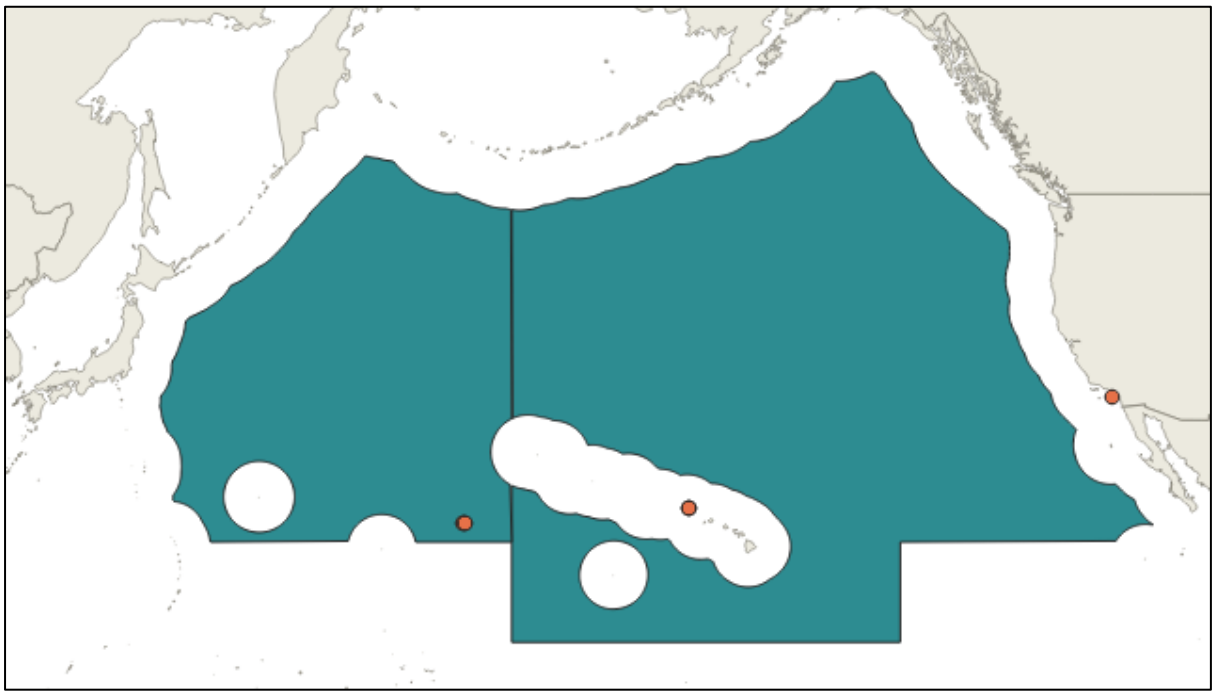
Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Apristurus spongiceps

The Spongehead catshark (*Apristurus spongiceps*) is a rare species documented from off Hawaii, USA.



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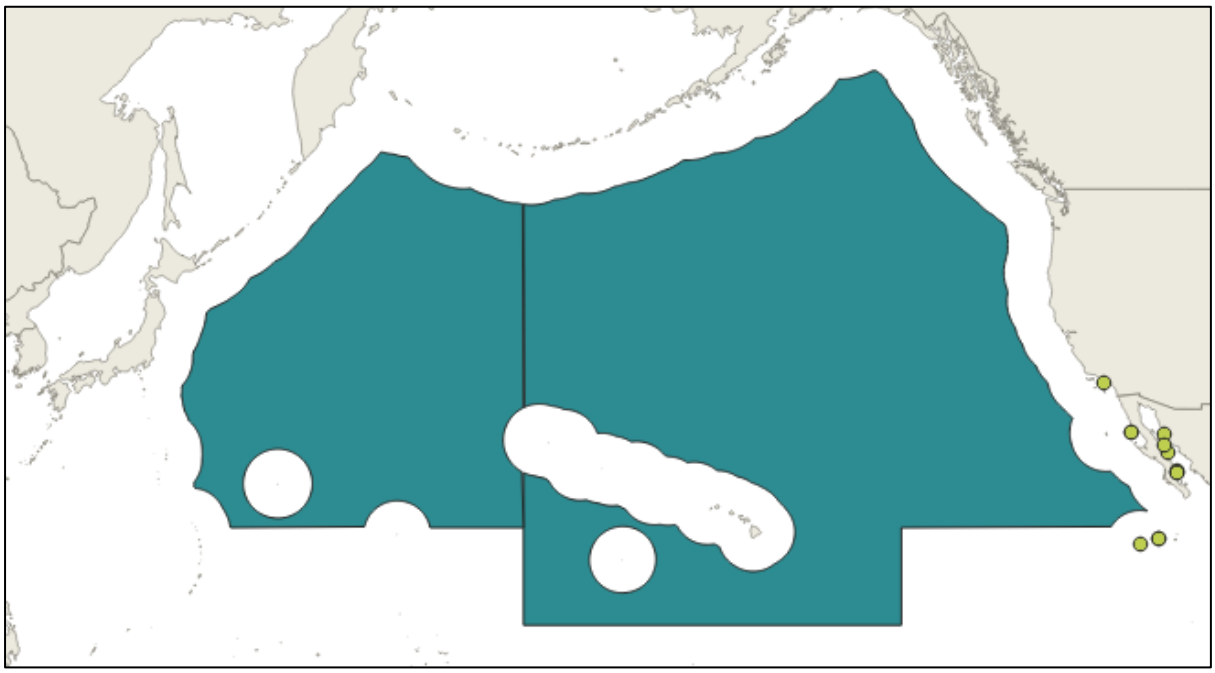
The identification of this shark to the genus level is relatively easy, but to species is nearly impossible due to the high number of species belonging to this genus and uncertainty about which ones occur in the region. It belongs to the *Apristurus spongiceps* clade. Its presence in area is confirmed.

Overall, the likelihood of accurate genus identification is high, and this species should be included in an ID tool at the genus level.

Cephalurus cephalus

The Lollipop catshark (*Cephalurus cephalus*) is a common species documented from the southern sectors of the northeast Pacific.



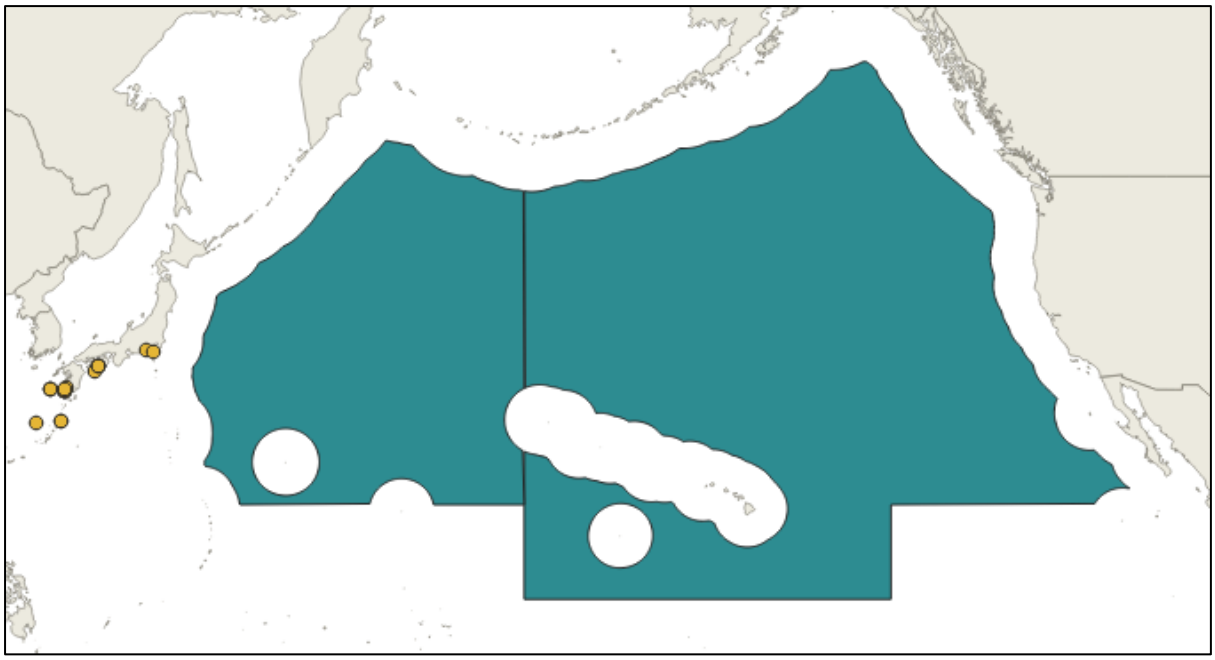
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the species level is relatively easy. Its presence in the eastern sectors of the CA is probable.

Overall, the likelihood of accurate species identification is high, and this species should be included in an ID tool at the species level.

Galeus eastmani

The Gecko catshark (*Galeus eastmani*) is a common species documented from Japan.



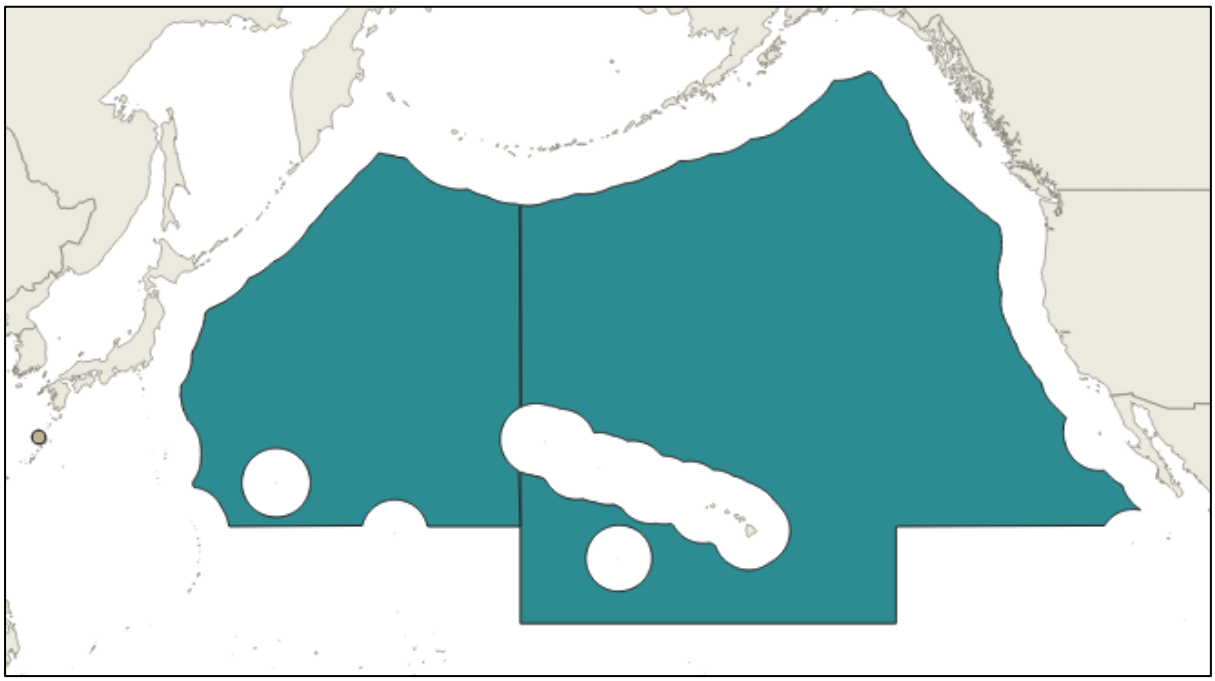
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus and species level is not easy. It closely resembles other genera within the Pentanchidae family. Its presence in the western sectors of the CA is possible.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Galeus longirostris

The Longnose sawtail catshark (*Galeus longirostris*) is a common species documented from south of Japan.



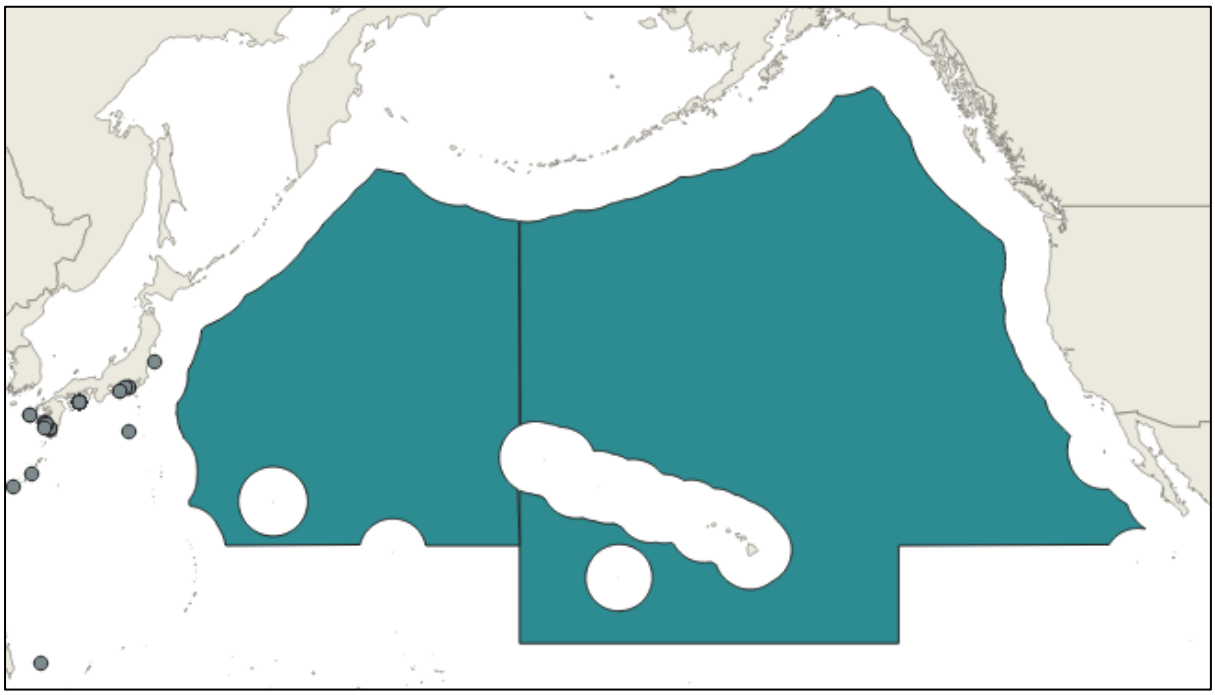
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus and species level is not easy. It closely resembles other genera within the Pentanchidae family. Its presence in the western sectors of the CA is unlikely.

Overall, the likelihood of accurate species identification is low and its presence in the area is unlikely. Therefore, this species should be included in an ID tool at the genus level.

Galeus nipponensis

The Broadfin sawtail catshark (*Galeus nipponensis*) is a common species documented from off Japan and Taiwan, Province of China.



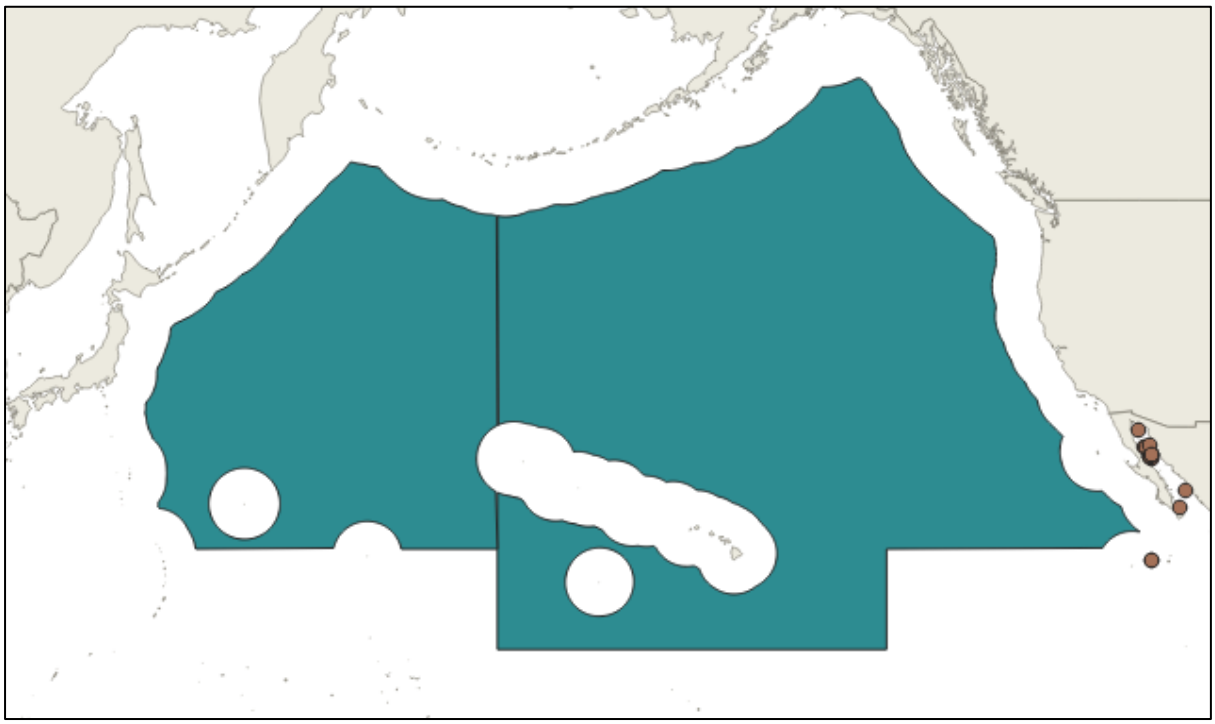
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus and species level is not easy. It closely resembles other genera within the Pentanchidae family. Its presence in the western sectors of the CA is probable.

Overall, the likelihood of accurate species identification is low and its presence in the area is unlikely. Therefore, this species should be included in an ID tool at the genus level.

Galeus piperatus

The Peppered catshark (*Galeus piperatus*) is a common species documented from off the Gulf of California, USA.



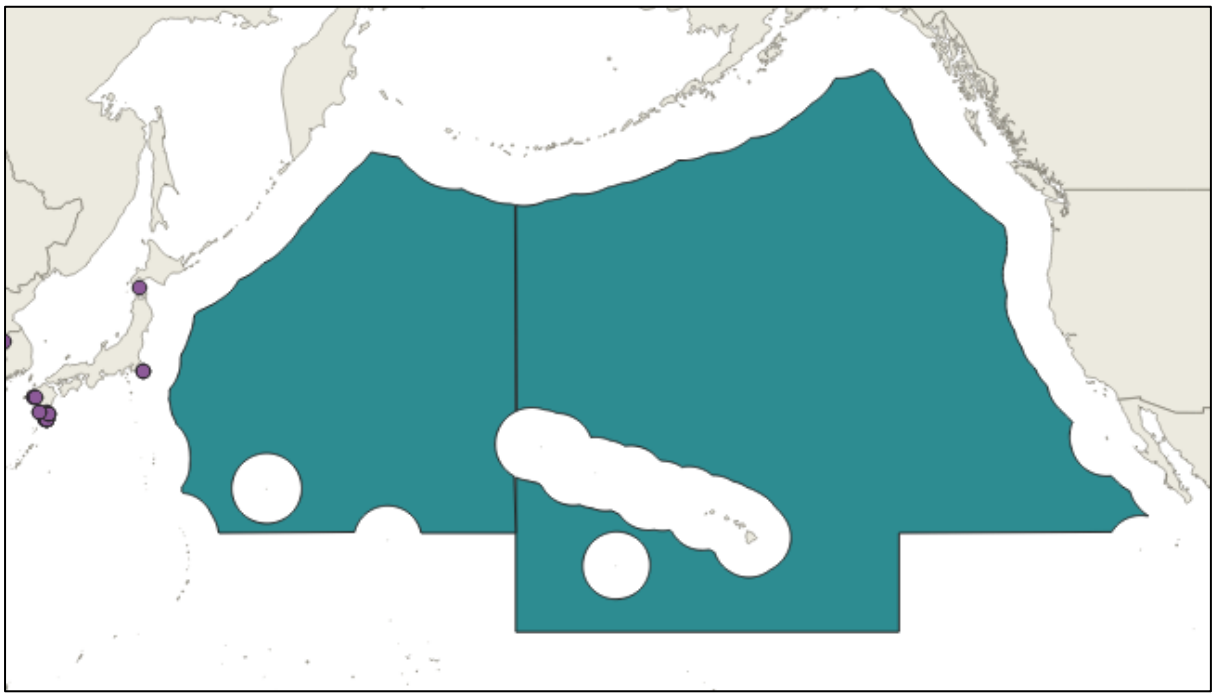
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus and species level is not easy. It closely resembles other genera within the Pentanchidae family. Its presence in the eastern sectors of the CA is probable.

Overall, the likelihood of accurate species identification is low and its presence in the area is unlikely. Therefore, this species should be included in an ID tool at the genus level.

Halaelurus buergeri

The Blackspotted catshark (*Halaelurus buergeri*) is a common species documented from off Japan and Taiwan, Province of China.



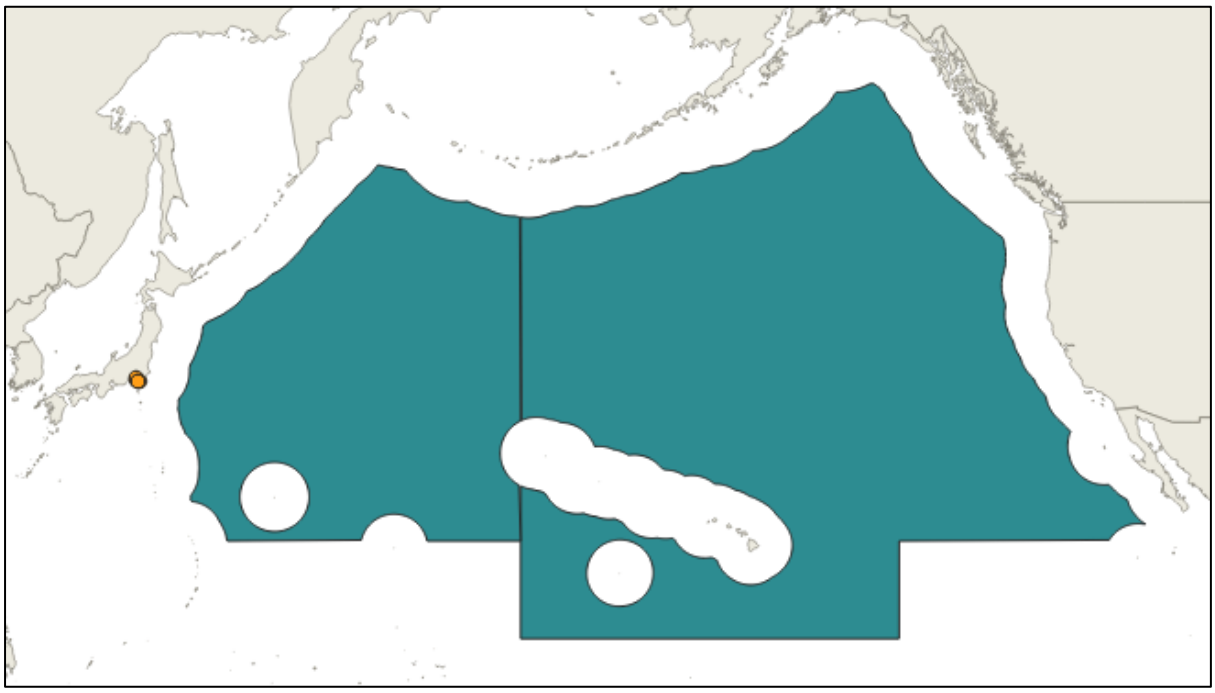
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus and species level is easy, as it is the only spotted catshark that could occur in the area. Its presence in the eastern sectors of the CA is possible.

Overall, the likelihood of accurate species identification is high, and this species should be included in an ID tool at the species level, if its presence is considered likely.

Parmaturus pilosus

The Salamander catshark (*Parmaturus pilosus*) is a species documented from off Japan and Taiwan, Province of China.



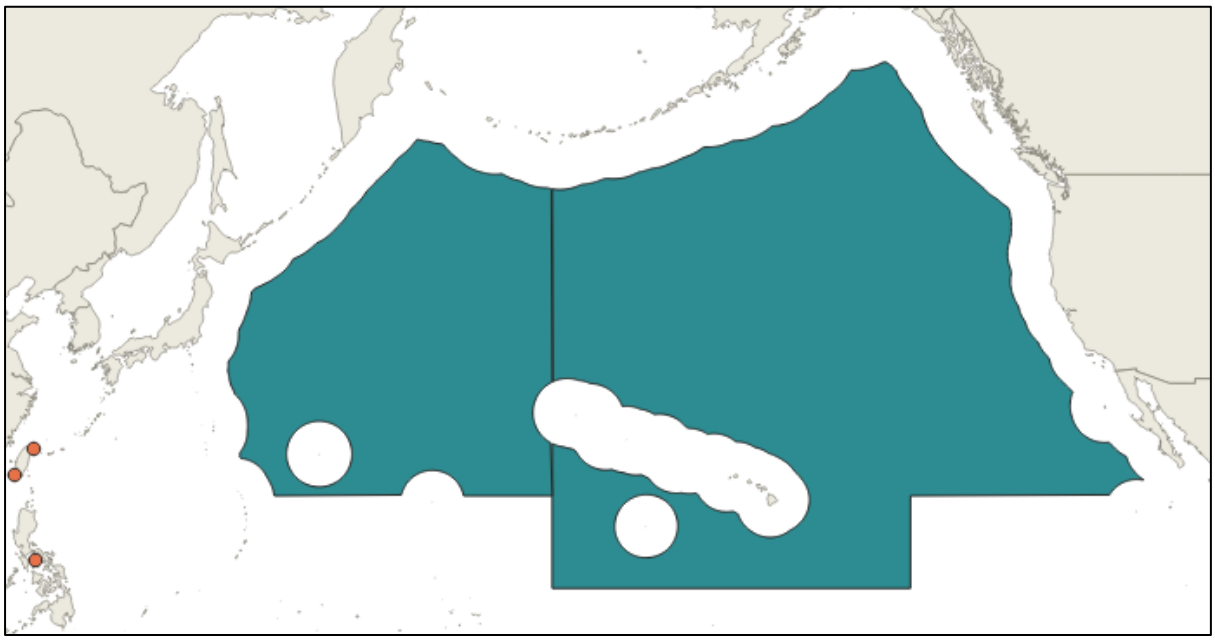
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus and species level is not easy. It closely resembles other genera within the Pentanchidae family. Its presence in the eastern sectors of the CA is possible.

Overall, the likelihood of accurate species identification is low and its presence in the area is unlikely. Therefore, this species should be included in an ID tool at the genus level, if considered part of the species list.

Parmaturus melanobranchus

The Blackgill catshark (*Parmaturus melanobranchus*) is a species documented from off southern Japan and Taiwan, Province of China.



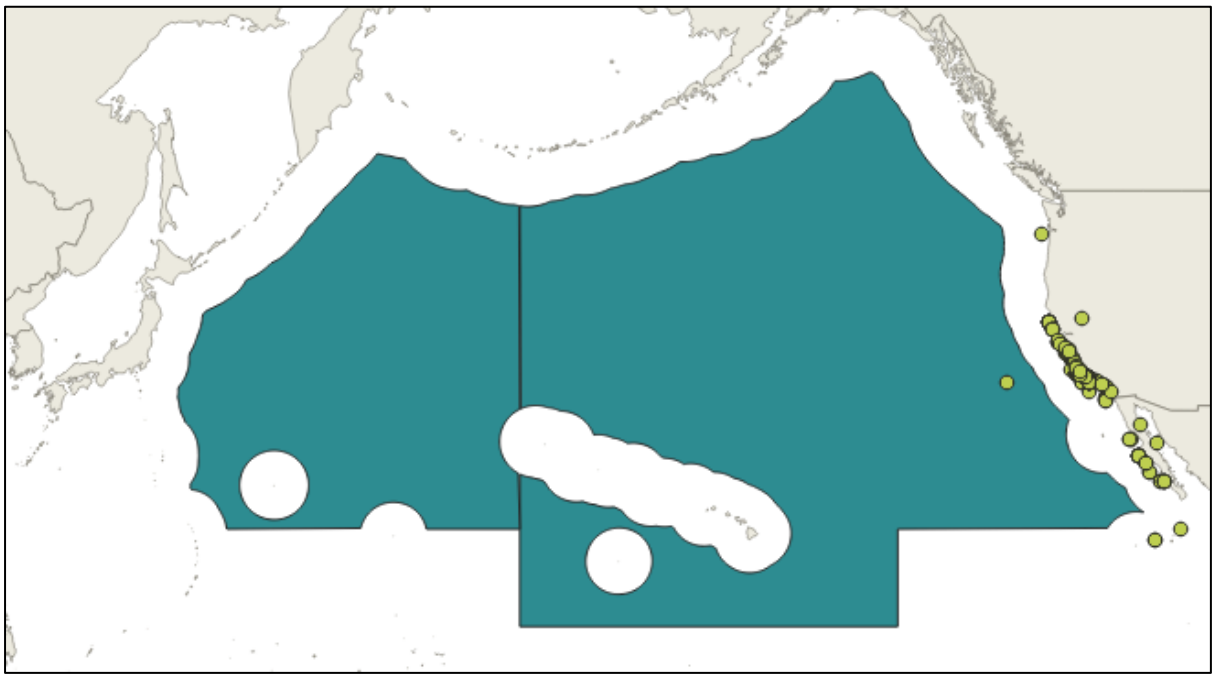
Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the genus and species level is not easy. It closely resembles other genera within the Pentanchidae family. Its presence in the eastern sectors of the CA is unlikely.

Overall, the likelihood of accurate species identification is low and its presence in the area is unlikely. Therefore, this species should be included in an ID tool at the genus level, if considered part of the species list.

Parmaturus xaniurus

The Filetail catshark (*Parmaturus xaniurus*) is a species documented from the western coast of the USA.



Notes on Species Identification by Fishery Observers or Non-Experts

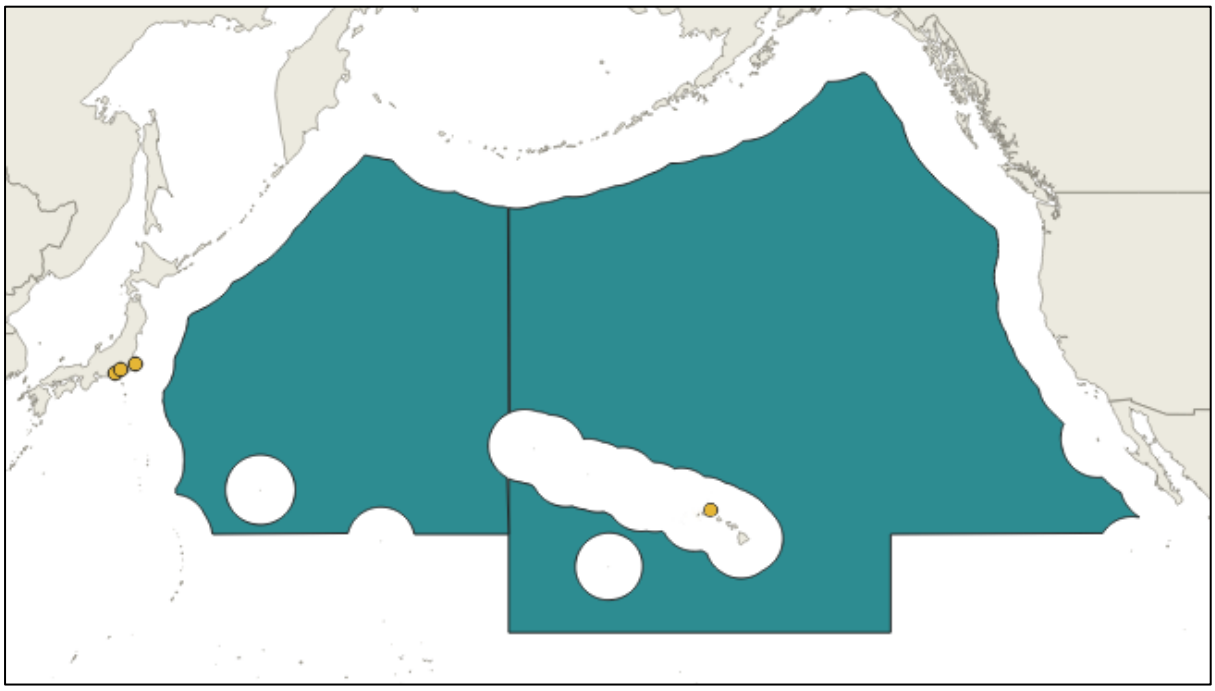
The identification of this shark to the genus and species level is not easy. It closely resembles other genera within the Pentanchidae family. Its presence in the eastern sectors of the CA is confirmed.

Overall, the likelihood of accurate species identification is low. Therefore, this species should be included in an ID tool at the genus level.

Pseudotriakidae

Pseudotriakis microdon

The False catshark (*Pseudotriakis microdon*) is a sporadic species with records off the coast of Japan and Hawaii, USA.



Notes on Species Identification by Fishery Observers or Non-Experts

The identification of this shark to the species level is easy, thanks to its morphology and unique features. Its presence in the area is very likely. Catches are expected to be sporadic.

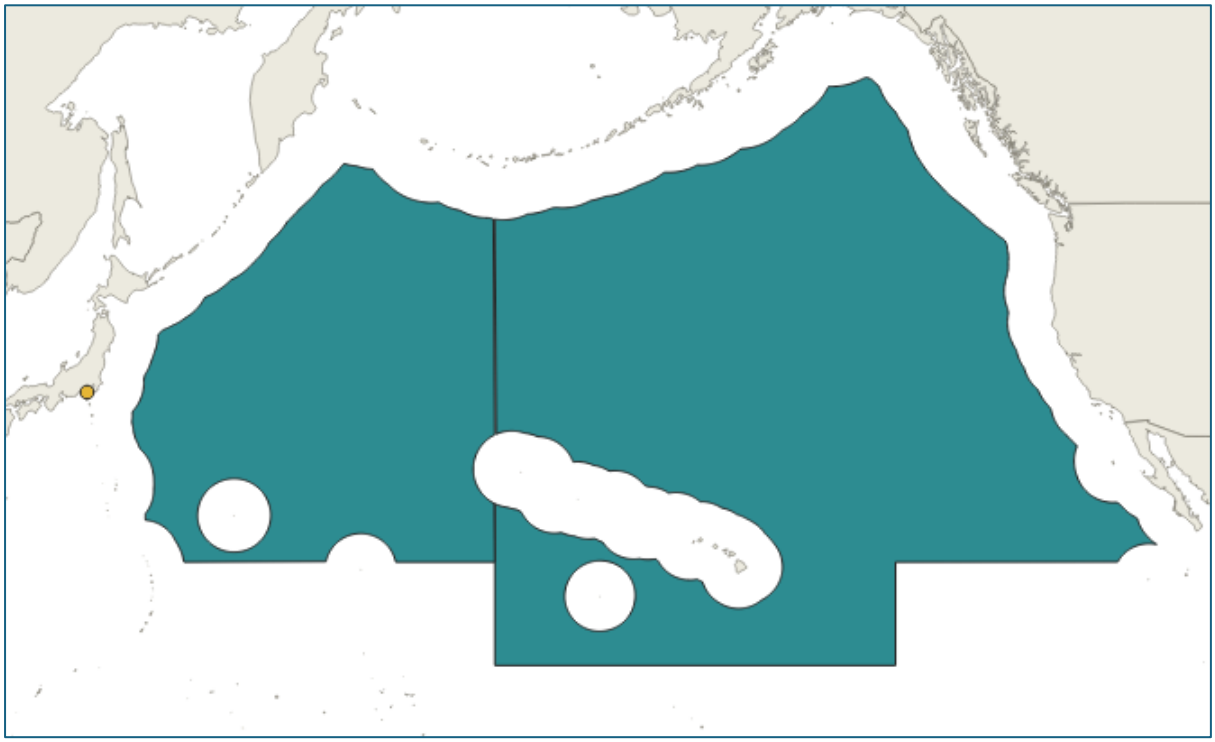
Overall, the likelihood of accurate species identification is high, and this species should be included in an ID tool at the species level.

Echinorhiniformes

Echinorhinidae

Echinorhinus brucus

The Bramble shark (*Echinorhinus brucus*) is a deep-water species with records off the coast of Japan.



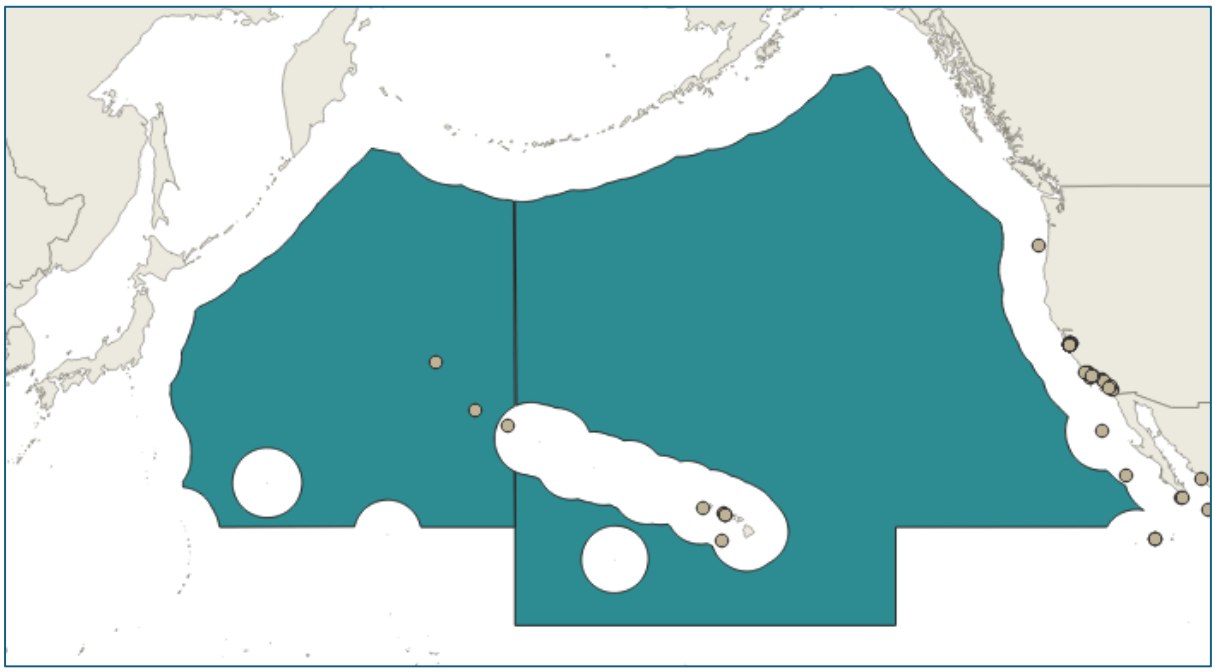
Notes on Species Identification by Fishery Observers or Non-Experts

Identifying this shark to the genus level is straightforward due to its distinct morphology and unique features. However, distinguishing it at the species level may pose challenges for non-experts, particularly because another Echinorhinid species, Echinorhinus cookei, is also present in the area. While its presence in the region is possible, there are only a few recorded sightings, primarily off the coast of Japan, with no documented occurrences along the east coast. Consequently, catches of this species are expected to be rare.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Echinorhinus cookei

The Prickly shark (*Echinorhinus cookei*) is a relatively common deep-water species with records in the ABNJ, off Hawaii and the coast of the USA.



Notes on Species Identification by Fishery Observers or Non-Experts

Identifying this shark to the genus level is straightforward due to its distinct morphology and unique features. However, distinguishing it at the species level may pose challenges for non-experts, particularly because another Echinorhinid species, Echinorhinus brucus, is also present in the area. Its presence in the region is confirmed and consequently, catches of this species are expected to be common.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level, with notes on species identification.

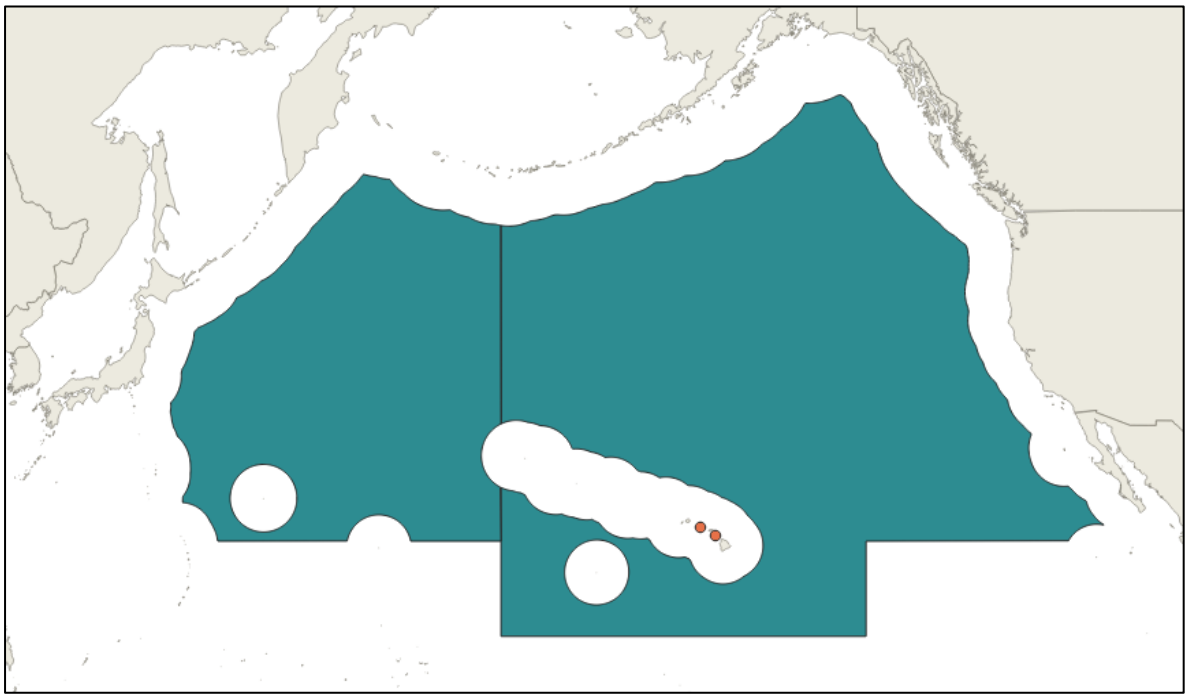
Squaliformes

Squalidae

Members of the Squalidae family are typically found on continental and insular shelves, as well as on the upper slopes near the seafloor, and along submarine ridges and seamounts that extend close to the surface. However, they are largely replaced by members of other Squaliform families at depths greater than 700 to 1 000 meters. Their presence in the deep waters of oceanic seamounts should be considered possible, but not likely. Only one species was caught in the convention area, *Squalus boretzi*.

Cirrhigaleus asper

The Roughskin spurdog (*Cirrhigaleus asper*) is a upper and outer continental and insular shelf species with records off the coast of Hawaii, USA.



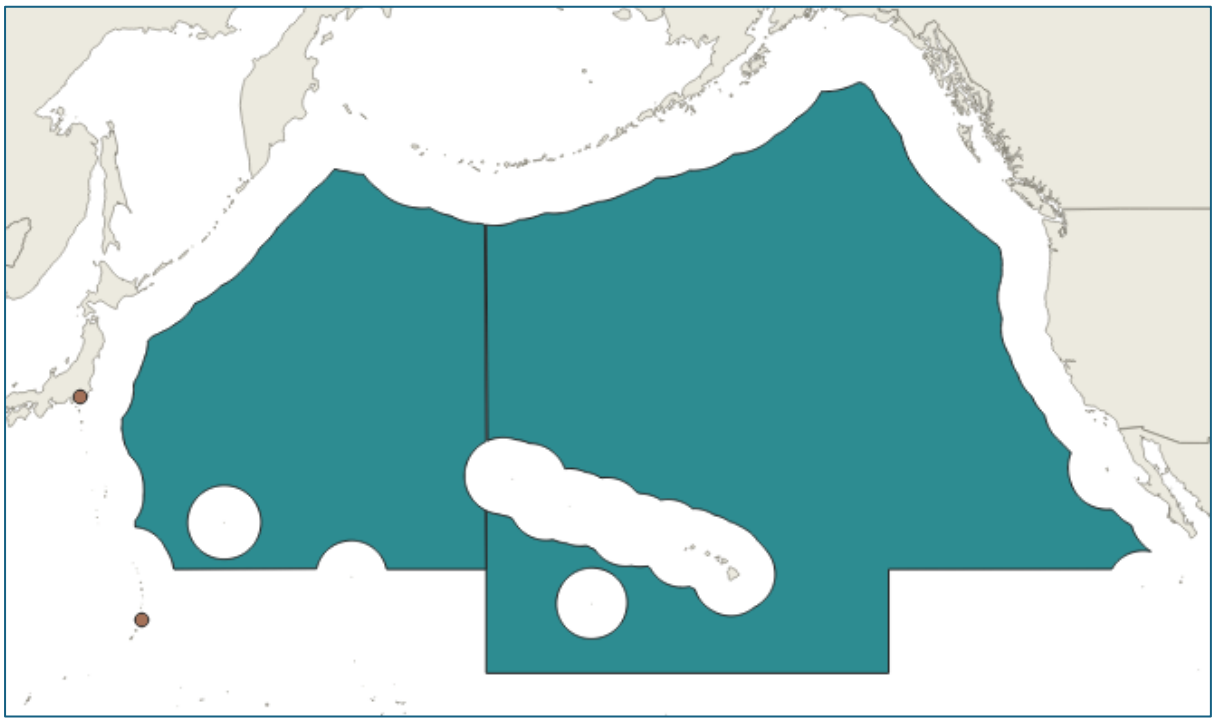
Notes on Species Identification by Fishery Observers or Non-Experts

Identifying this shark to the genus level can be challenging for non-experts, especially since another genus in the Squalidae family, *Squalus*, closely resembles it. The distinguishing features between these genera require specialized knowledge and expertise to accurately identify. Although its presence in the region is confirmed, there are no records from the ABNJ. Consequently, its occurrence in the deep waters of oceanic seamounts should be considered improbable.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level.

Cirrhigaleus barbifer

The mandarin dogfish (*Cirrhigaleus barbifer*) is a upper and outer continental and insular shelf species with records off the coast of Japan



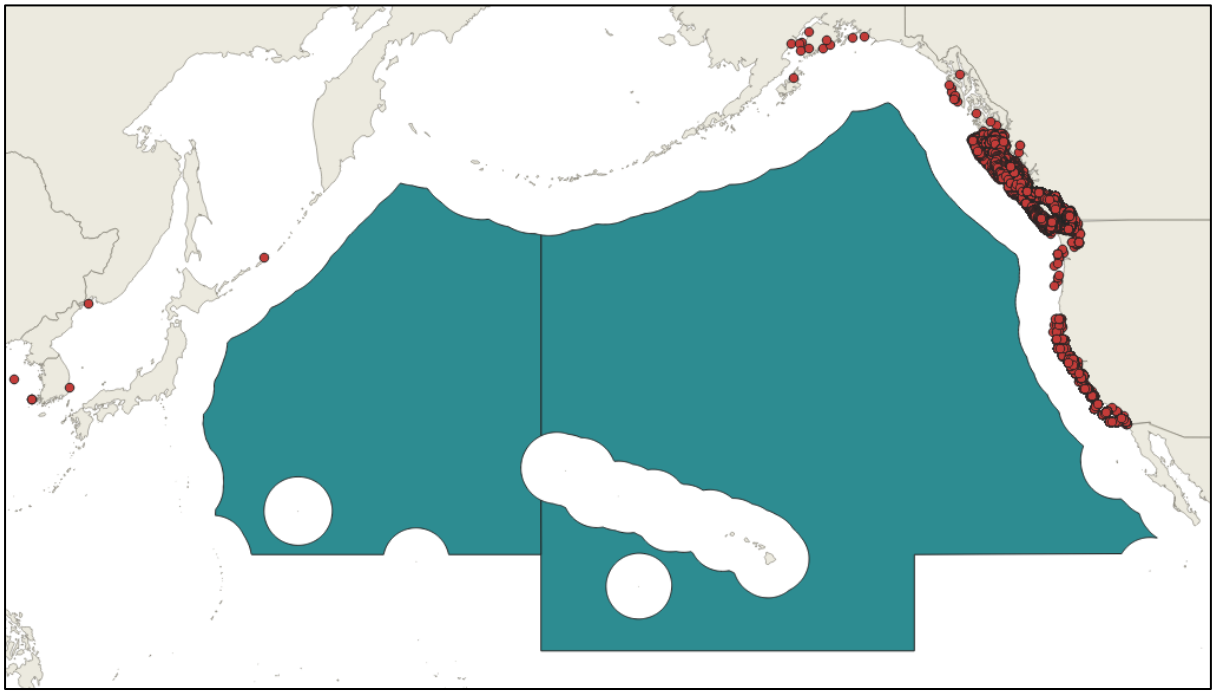
Notes on Species Identification by Fishery Observers or Non-Experts

Identifying this shark to the genus level can be challenging for non-experts, especially since another genus in the Squalidae family, *Squalus*, closely resembles it. The distinguishing features between these genera require specialized knowledge and expertise to accurately identify. Although its presence in the region is confirmed, there are no records from the ABNJ. Consequently, its occurrence in the deep waters of oceanic seamounts should be considered improbable.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level.

Squalus sucklei

The North Pacific Spiny Dogfish (*Squalus suckleyi*) is an upper and outer continental and insular shelf species, occasionally down to 1200 m, with several records in the area. It is demersal on the continental shelf, but can be pelagic in oceanic waters.



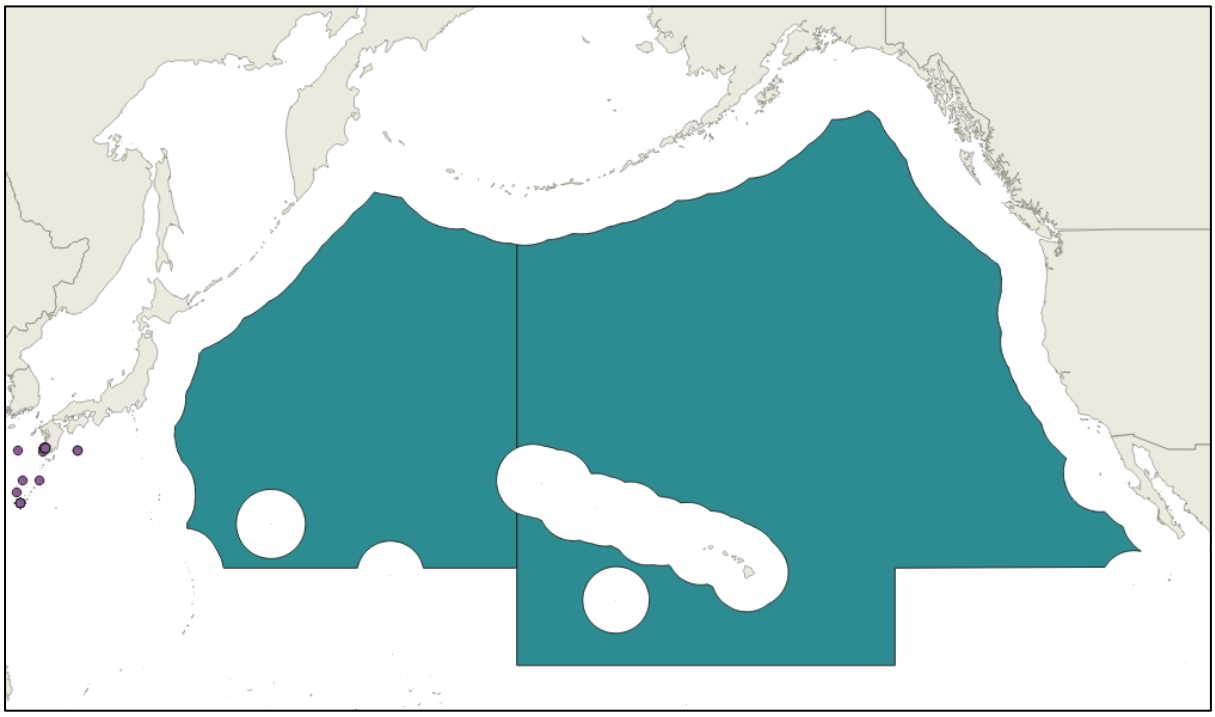
Notes on Species Identification by Fishery Observers or Non-Experts

This species of *Squalus* is the only one that can be identified by a non-expert due to the presence of white spots on flanks. Its presence in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered possible as it is very abundant where it is known to occur.

Overall, the likelihood of accurate genus and species identification is high, and this species could be included in an ID tool at the species level. However, the likelihood of being caught on the deep seamount is uncertain. It could be caught by the longliners.

Squalus brevirostris

The Japanese shortnose spurdog (*Squalus brevirostris*) is an upper continental shelf species, with records from southern Japan. It seems to be a more shallow water species, with records down to 163 m.



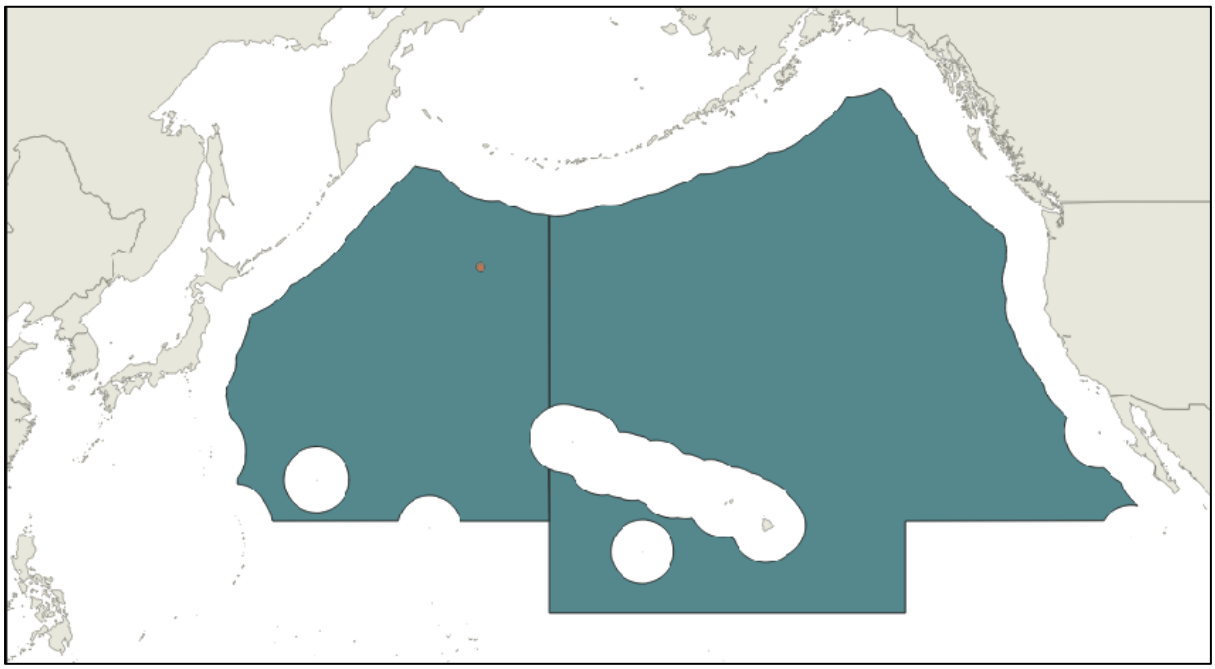
Notes on Species Identification by Fishery Observers or Non-Experts

This species of *Squalus* falls into those species that are difficult to identify at the species level and whose occurrence in the deep waters of oceanic seamounts should be considered improbable.

Overall, the likelihood of accurate genus and species identification is low, and its presence in the area is unlikely. The species should be included in an ID tool at the family level.

Squalus boretzi

The Emperor dogfish (*Squalus boretzi*) is the only *Squalus* caught on the Emperor seamount at depths of around 500 m.



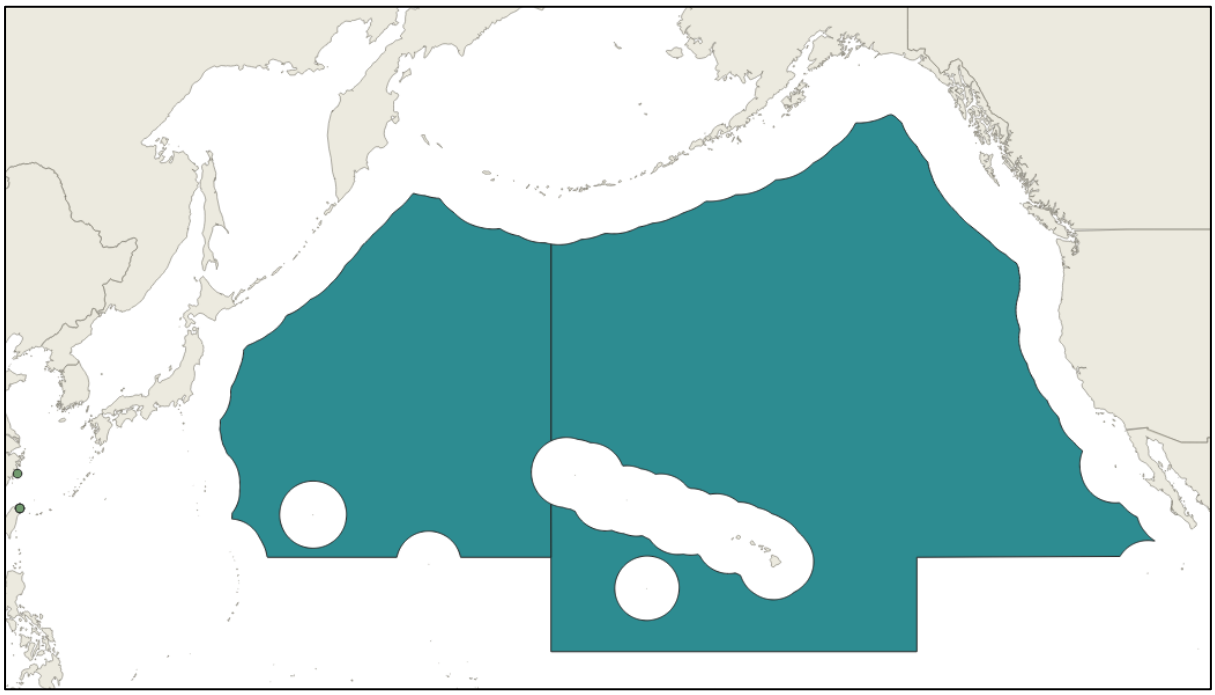
Notes on Species Identification by Fishery Observers or Non-Experts

This species of *Squalus* falls into those species that are difficult to identify at the species level but its occurrence on the Emperor seamount is confirmed with several individuals caught.

Overall, the likelihood of accurate genus and species identification is low, but its presence is confirmed. The species should be included in an ID tool at the family level, with notes on its occurrence.

Squalus formosus

The Taiwan spurdog (*Squalus formosus*) is a medium-sized species with records south of Japan on the continental shelve and upper slope, less than 300 m depth.



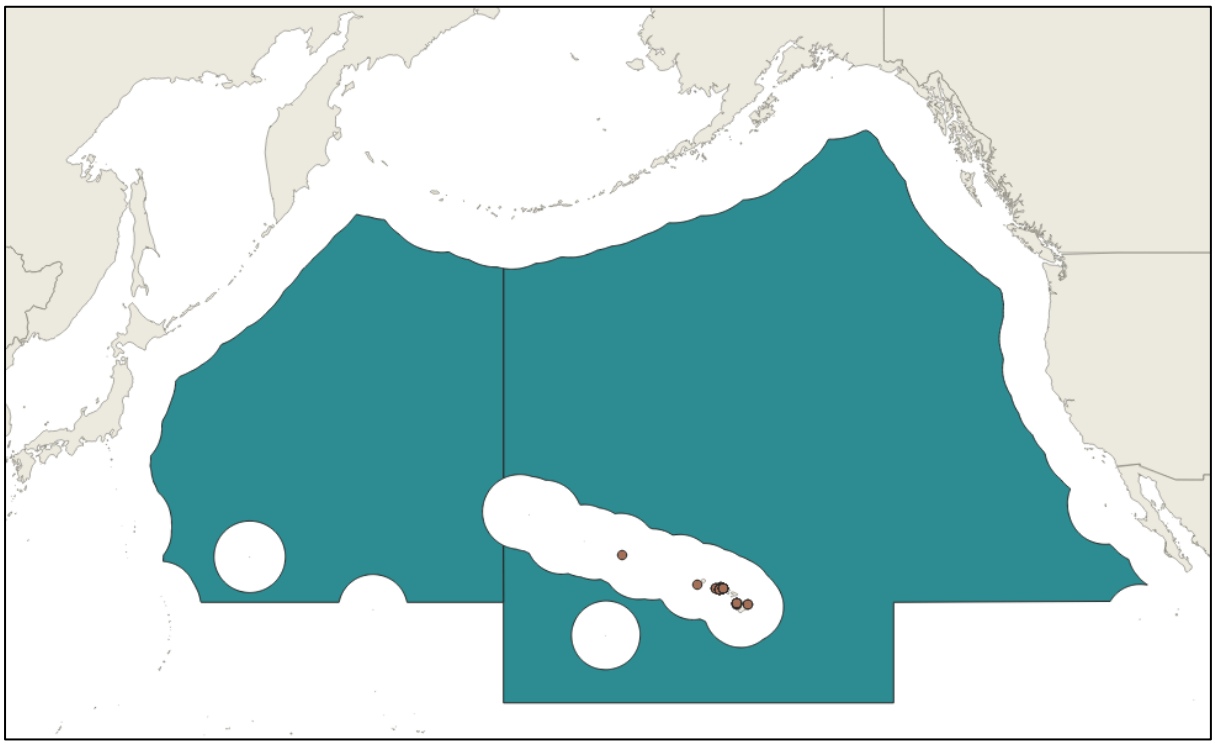
Notes on Species Identification by Fishery Observers or Non-Experts

This species of *Squalus* falls into those species that are difficult to identify at the species level and whose occurrence in the area is unlikely.

Overall, the likelihood of accurate genus and species identification is low, and its presence in the area unlikely. The species should be included in an ID tool at the family level.

Squalus hawaiiensis

The Hawaiian spurdog (*Squalus hawaiiensis*) is a large-sized species with records off Hawaii down to 500 m depth, on seamounts and insular slopes.



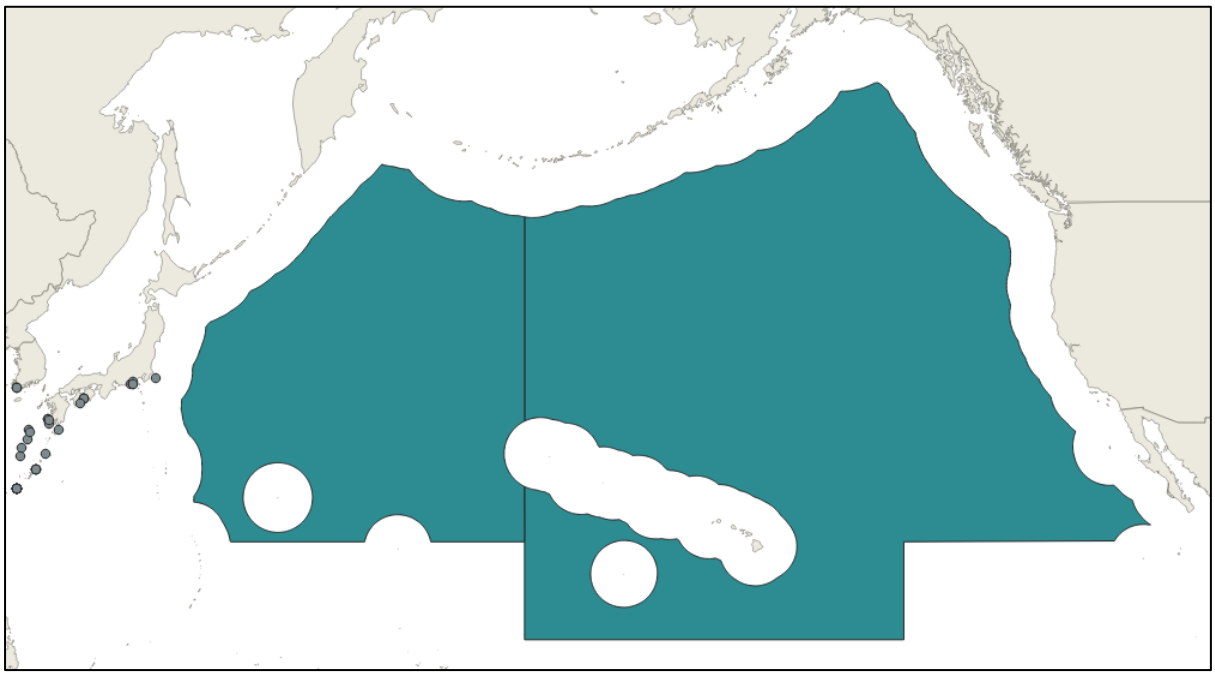
Notes on Species Identification by Fishery Observers or Non-Experts

This species of *Squalus* falls into those species that are difficult to identify at the species level but whose occurrence in the area is likely.

Overall, the likelihood of accurate genus and species identification is low, but its presence in the area is likely. The species should be included in an ID tool at the family level, with notes on its distribution.

Squalus japonicus

The Japanese spurdog (*Squalus japonicus*) is a large-sized species with records off south of Japan down to 400 m depth, on continental shelves and upper slopes.



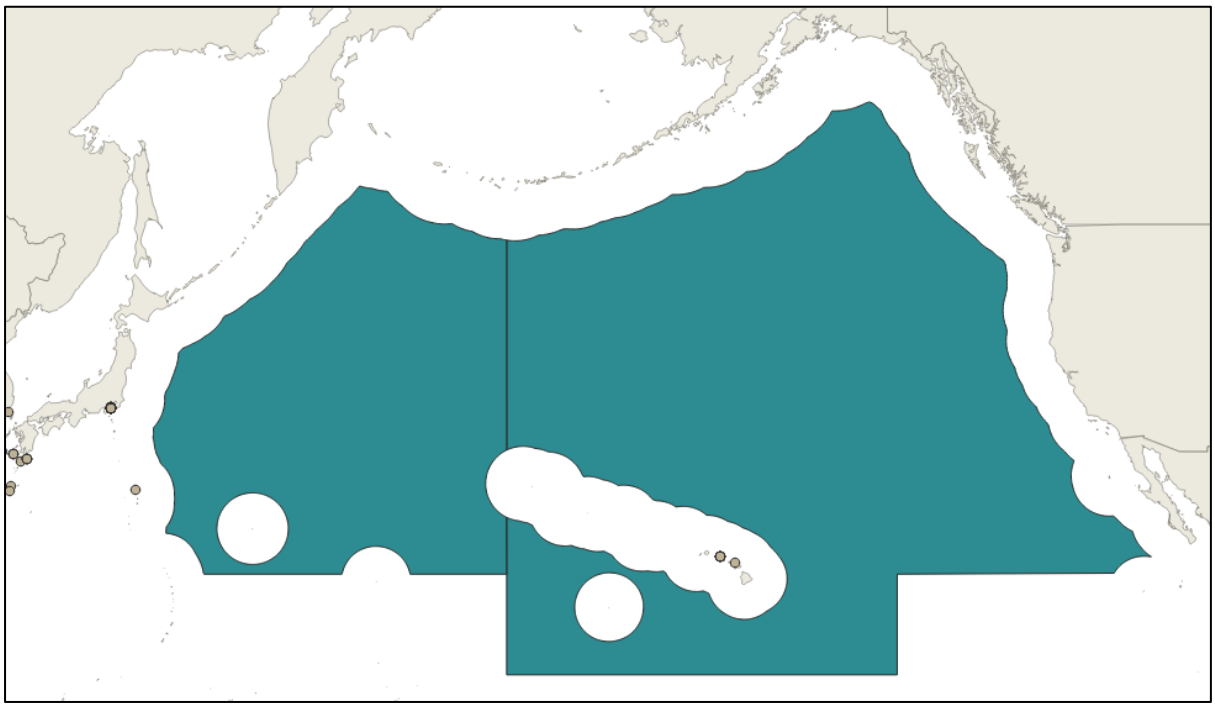
Notes on Species Identification by Fishery Observers or Non-Experts

This species of *Squalus* falls into those species that are difficult to identify at the species level but whose occurrence in the area is possible.

Overall, the likelihood of accurate genus and species identification is low, but its presence in the area is possible. The species should be included in an ID tool at the family level.

Squalus mitsukurii

The Shortspine spurdog (*Squalus mitsukurii*) is a large-sized species with records off Japan down to 500 m depth, on continental shelves and upper slopes.



Notes on Species Identification by Fishery Observers or Non-Experts

This species of *Squalus* falls into those species that are difficult to identify at the species level but whose occurrence in the area is probable.

Overall, the likelihood of accurate genus and species identification is low, but its presence in the area is likely due to its known abundance off Japan, and records off Hawaii. The species should be included in an ID tool at the family level, with notes on its distribution.

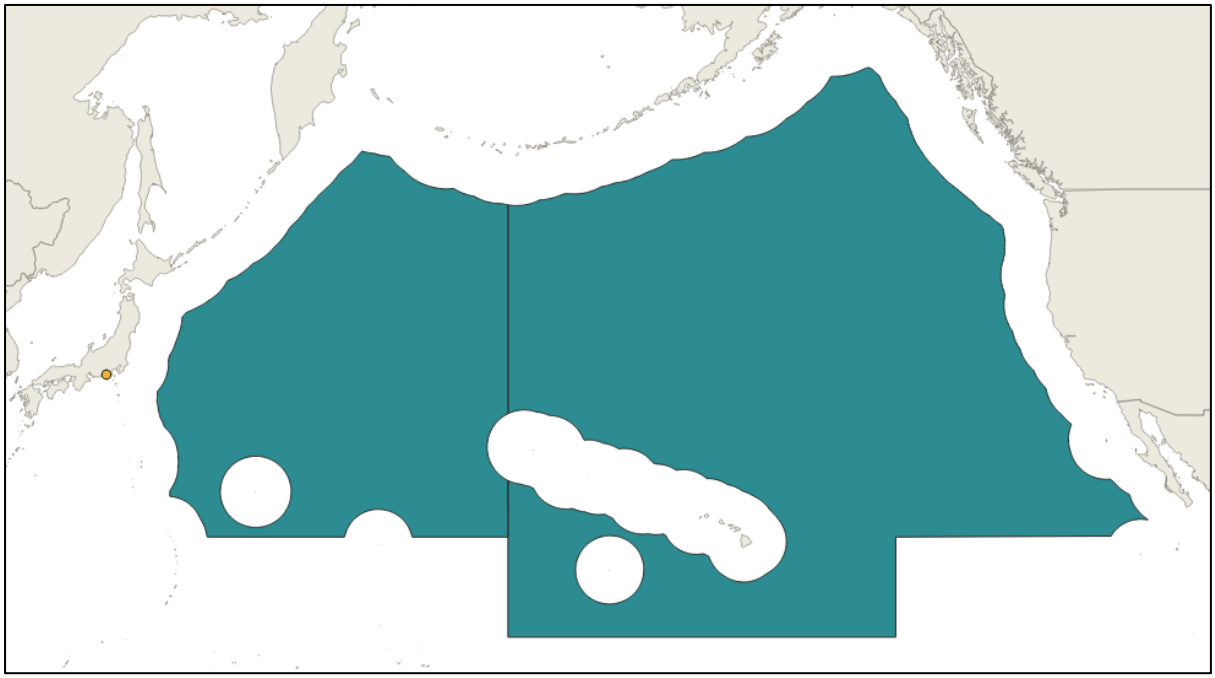
Centrophoridae

The Gulper sharks are one of the most problematic groups from a taxonomic standpoint and the exact number of species is uncertain. They are typically found in deep water on continental and insular shelves, as well as on the upper slopes near the seafloor, and along submarine ridges and seamounts. They are commonly caught at depths between 200 and 1 500 meters. Their presence in the deep waters of oceanic seamounts should be considered likely, although only x species have records form the convention area.

There are two genera of Centrophoridae: *Centrophorus* and *Deania*. Identification to genus is possible, although it can be challenging for non-experts. *Deania* species have long flat snouts, while *Centrophorus* species, short snouts. Identification to species is much more challenging, and it is unlikely that a non-expert can reach such level.

Centrophorus atromarginatus

The Dwarf gulper shark (*Centrophorus atromarginatus*) is an upper and outer continental and insular shelf species with records off the coast of Japan, down to 450 m.



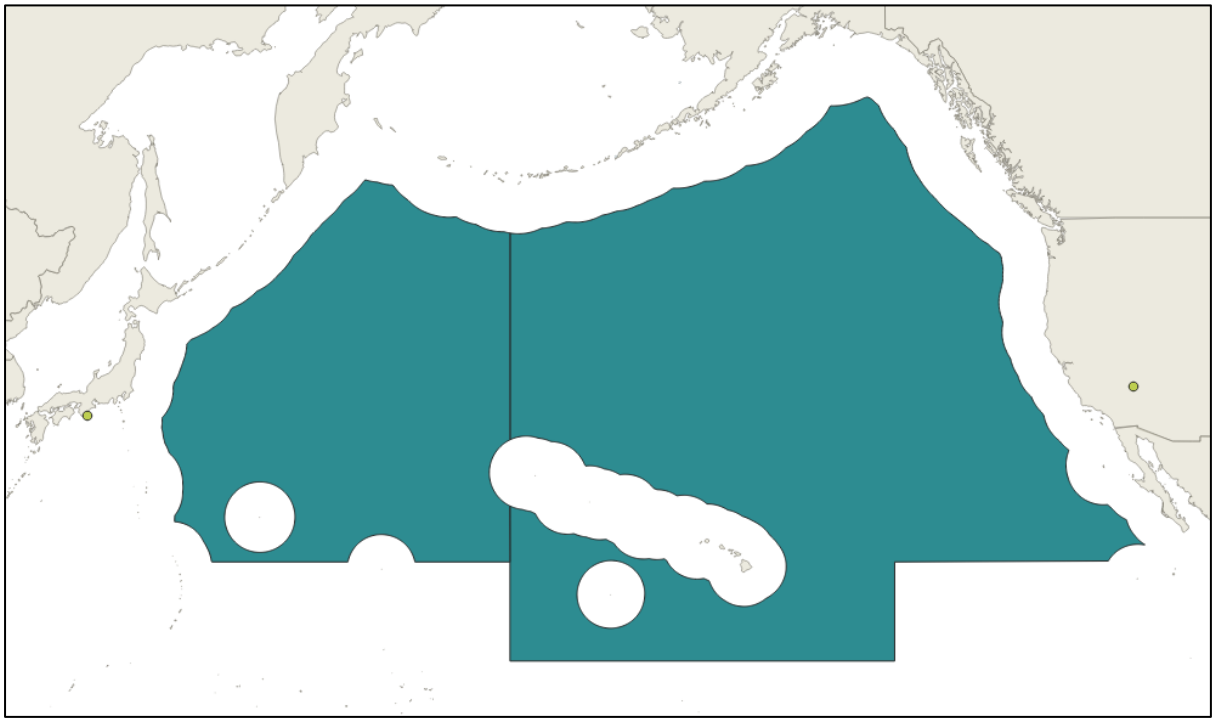
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. atromarginatus* in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered improbable.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Centrophorus granulosus

The gulper shark (*Centrophorus granulosus*) is a widespread species, but records in the area are scarce and confined to south of Japan. This is a deepwater species which usually occurs deeper than 600 m, with smaller individuals occurring in shallower waters.



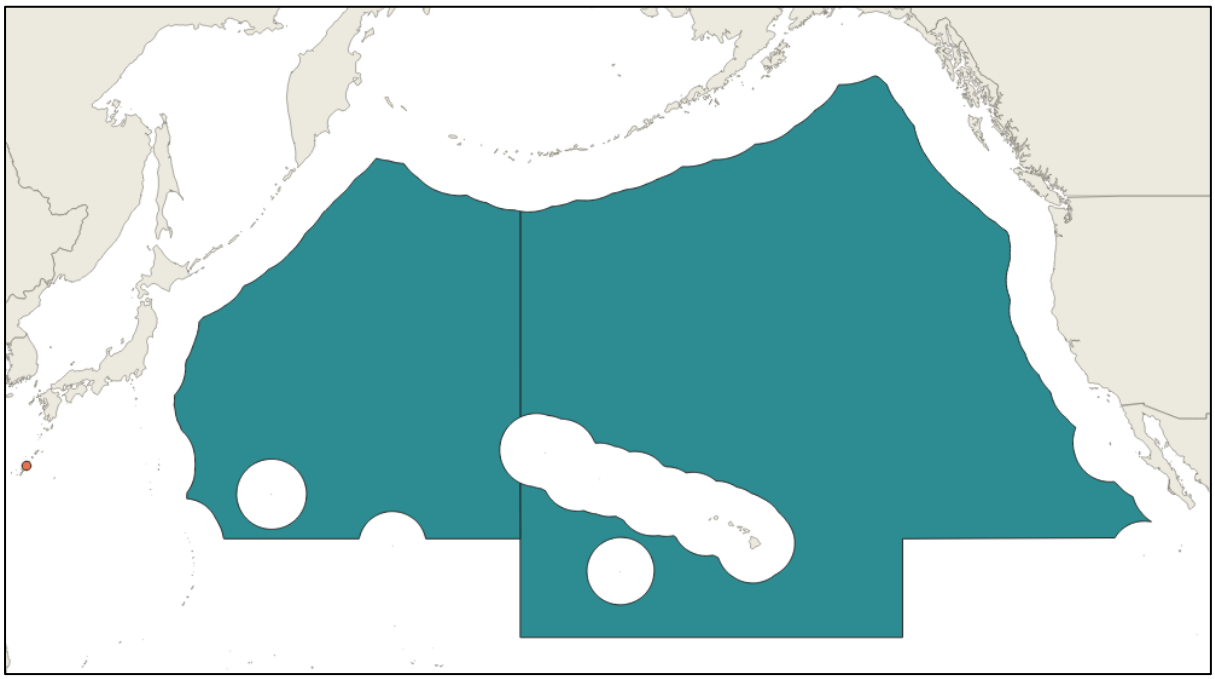
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. granulosus* in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered possible, but unlikely.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Centrophorus moluccensis

The smallfin gulper shark (*Centrophorus moluccensis*) is an upper and outer continental and insular shelf species with records off south of Japan, down to 850 m.



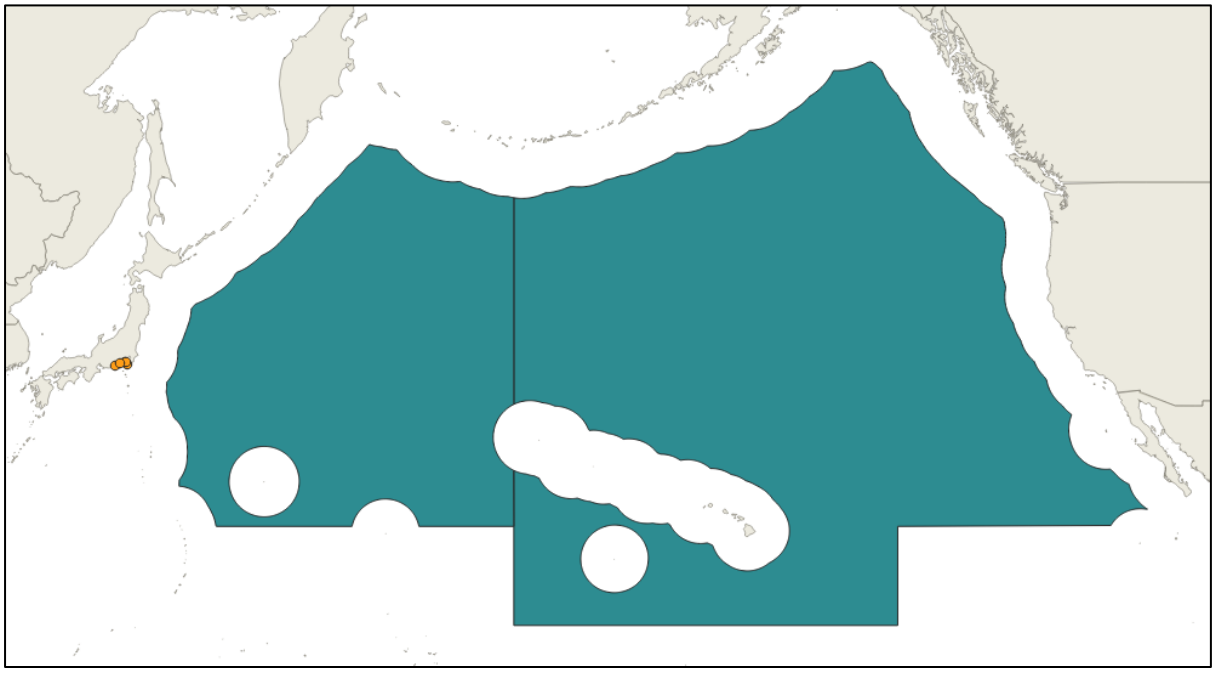
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. moluccensis* in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered improbable.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Centrophorus squamosus

The leafscale gulper shark (*Centrophorus squamosus*) is a widespread species, but records in the area are scarce and confined to south of Japan. It is known to be demersal and pelagic, commonly down to 1 250 m, but also deeper.



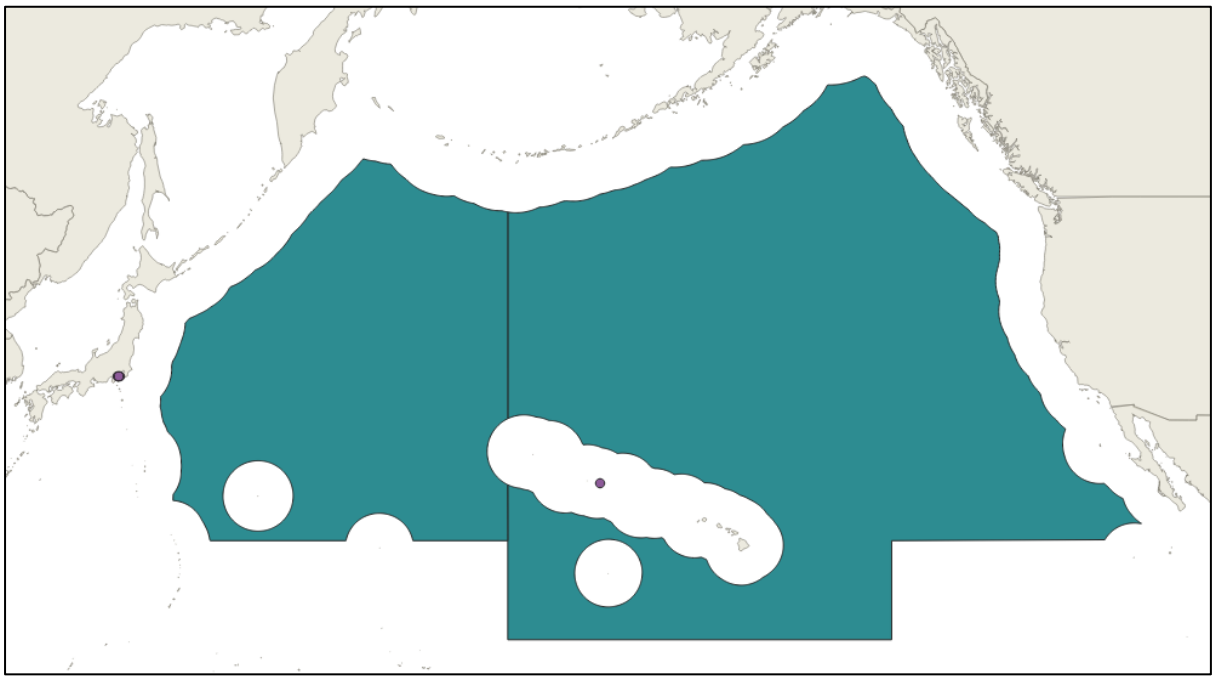
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. squamosus* in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered possible as this species is quite common where it is known to occur.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Centrophorus tessellatus

The mosaic gulper shark (*Centrophorus tessellatus*) is a rare species that is known to occur on the insular slopes down to 732 m.



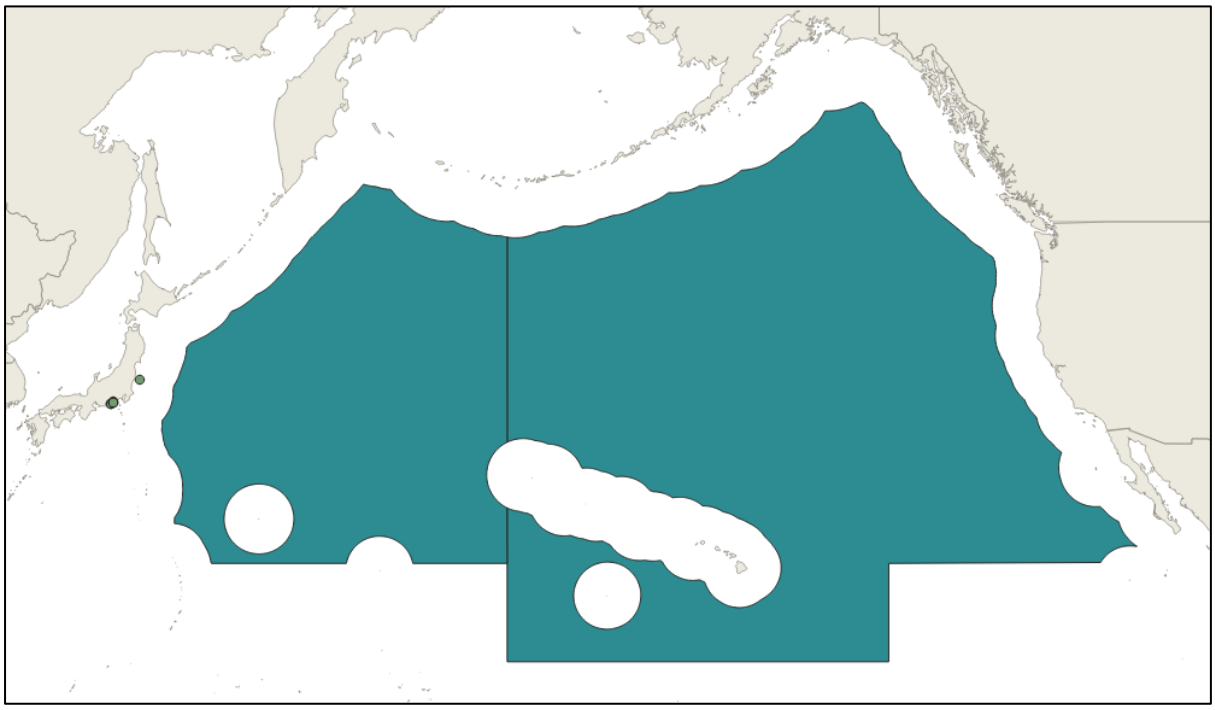
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. tessellatus* in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered possible, as it has been collected on insular slopes off Hawaii.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Deania calcea

The birdbeak dogfish (*Deania calcea*) is a common species on the outer continental and insular shelves and slopes, with records off the coast of Japan, down to 1 500 m, but usually between 500 and 900 m.



Notes on Species Identification by Fishery Observers or Non-Experts

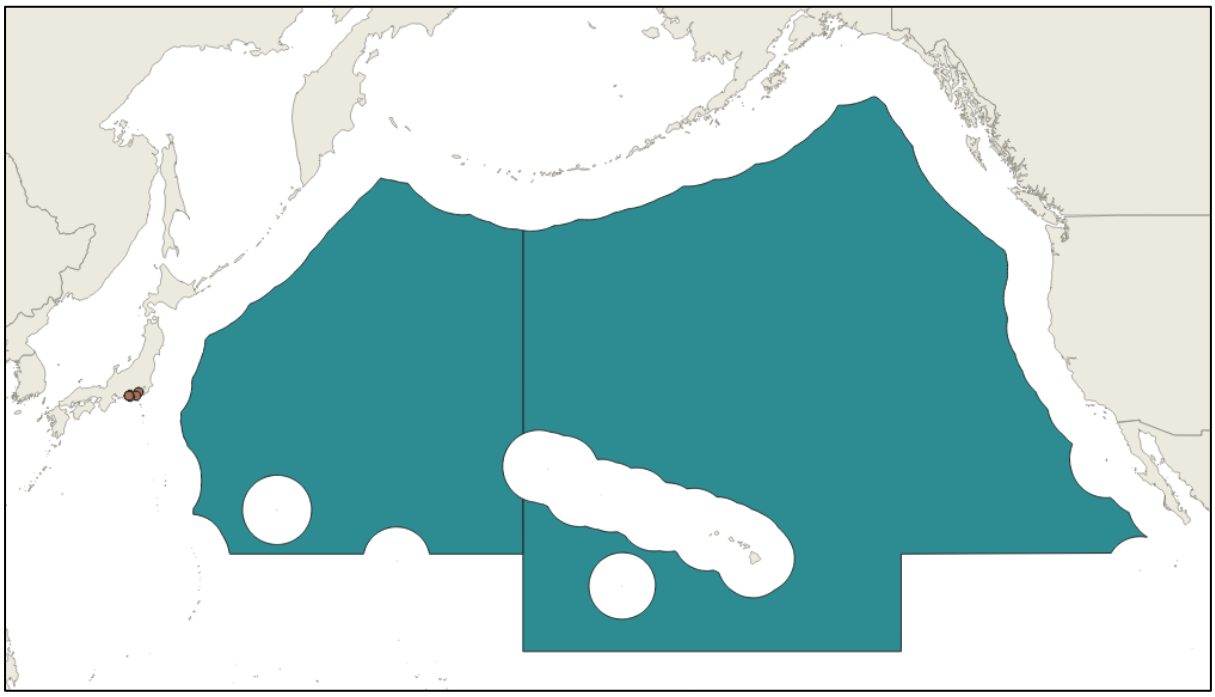
Identification to the genus level is feasible due to the distinct long, flat snout characteristic of *Deania calcea*. However, distinguishing it at the species level is considerably more difficult, despite the fact that only one other *Deania* species appears to be present in the region.

The presence of *D. calcea* in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered possible.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

Deania hystricosa

The Rough longnose dogfish (*Deania hystricosa*) occurs on insular slopes, with records off the coast of Japan, usually below 1 000 m.



Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *D. calcea* in the region is confirmed, but there are no records from the ABNJ. Its occurrence in the deep waters of oceanic seamounts should be considered possible.

Overall, the likelihood of accurate species identification is low, and this species should be included in an ID tool at the genus level.

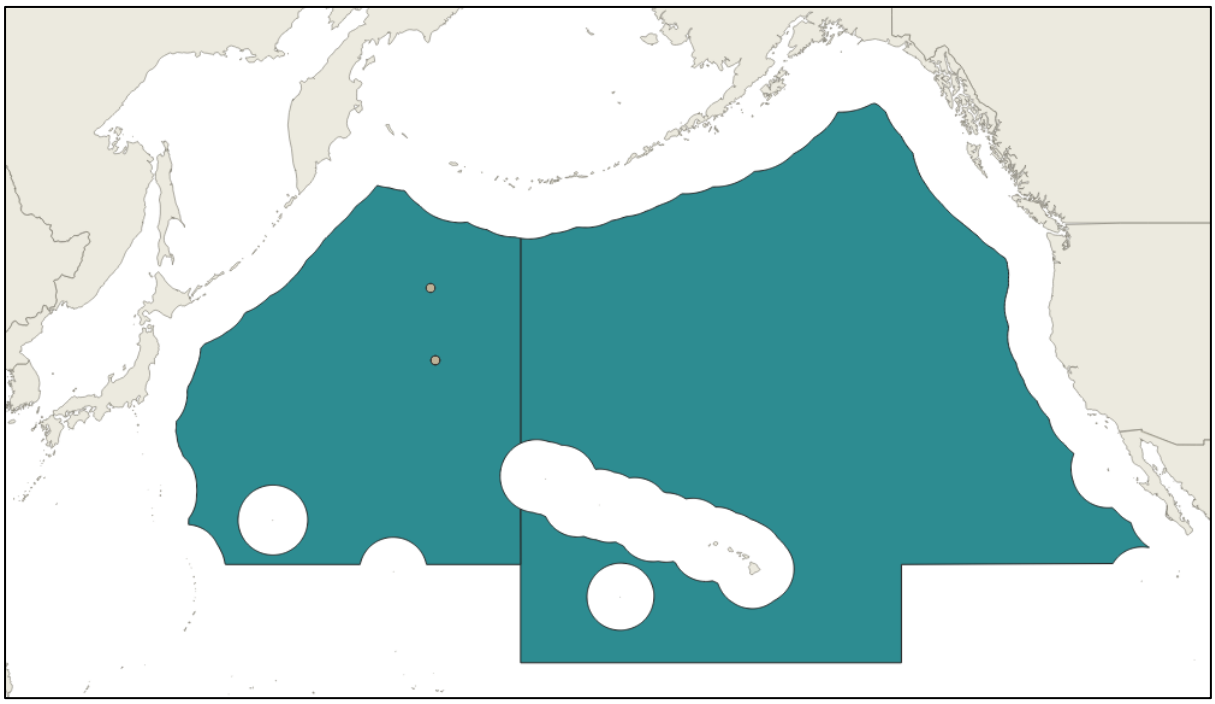
Etmopteridae

The lantern sharks are the largest family of Squaloid sharks, with over 51 species worldwide in four genera, three of which occur in the area. They are known to be abundant in catches as they can form aggregations in deep water between 200 and 1 500 m, down to 4 500 m. Their presence in the deep waters of oceanic seamounts should be considered very likely, although only 9 species have records form the convention area.

Identification to family is feasible as usually they have long dorsal-fin spines and light organs on flanks. These organs appear as darker areas and often they are inconspicuous. Therefore, a key to identify these sharks should consider only mentioning the spines, although this character is typically not considered diagnostic. Identification to genus is also possible, but requires examination of their dentition. Therefore, it is advisable to keep the identification to family.

Centroscyllium excelsum

The Dwarf gulper shark (*Centroscyllium excelsum*) is an upper and outer continental and insular shelf species with records off the coast of Japan, down to 450 m.



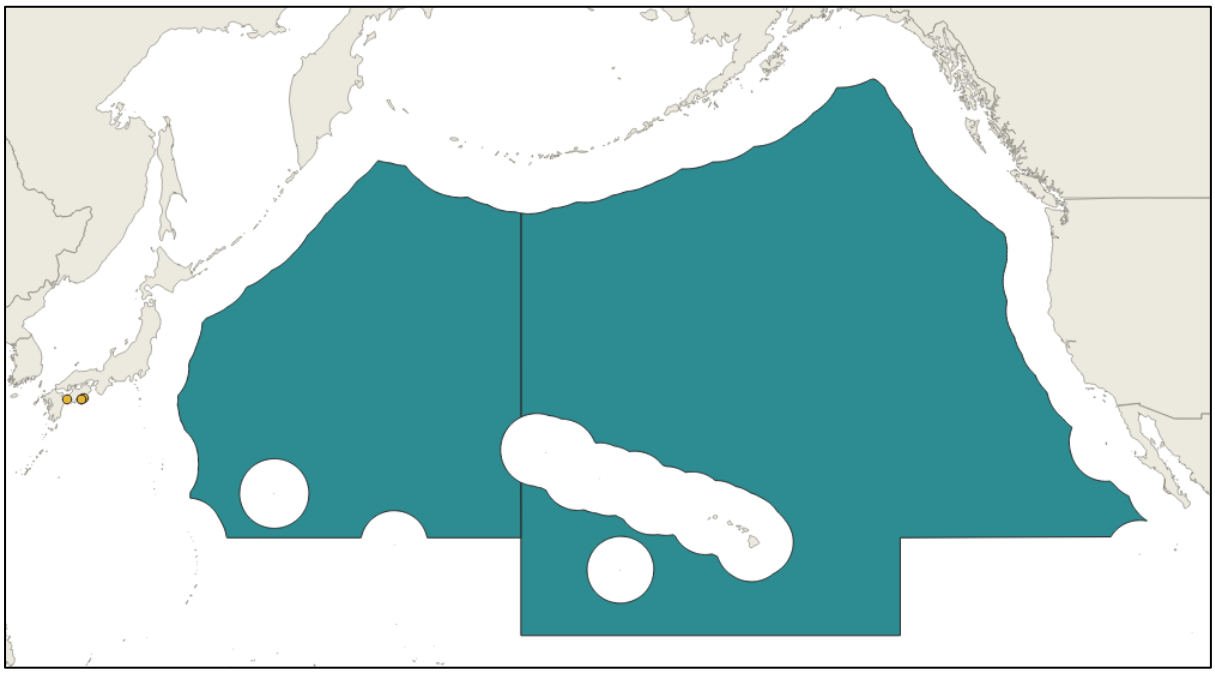
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. excelsum* in the region is confirmed, with records from the Emperor seamount chain. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Centroscyllium kamoharai

The bareskin dogfish (*Centroscyllium kamoharai*) is an outer continental shelf and slope species with records off the coast of Japan, down to 1 225 m.



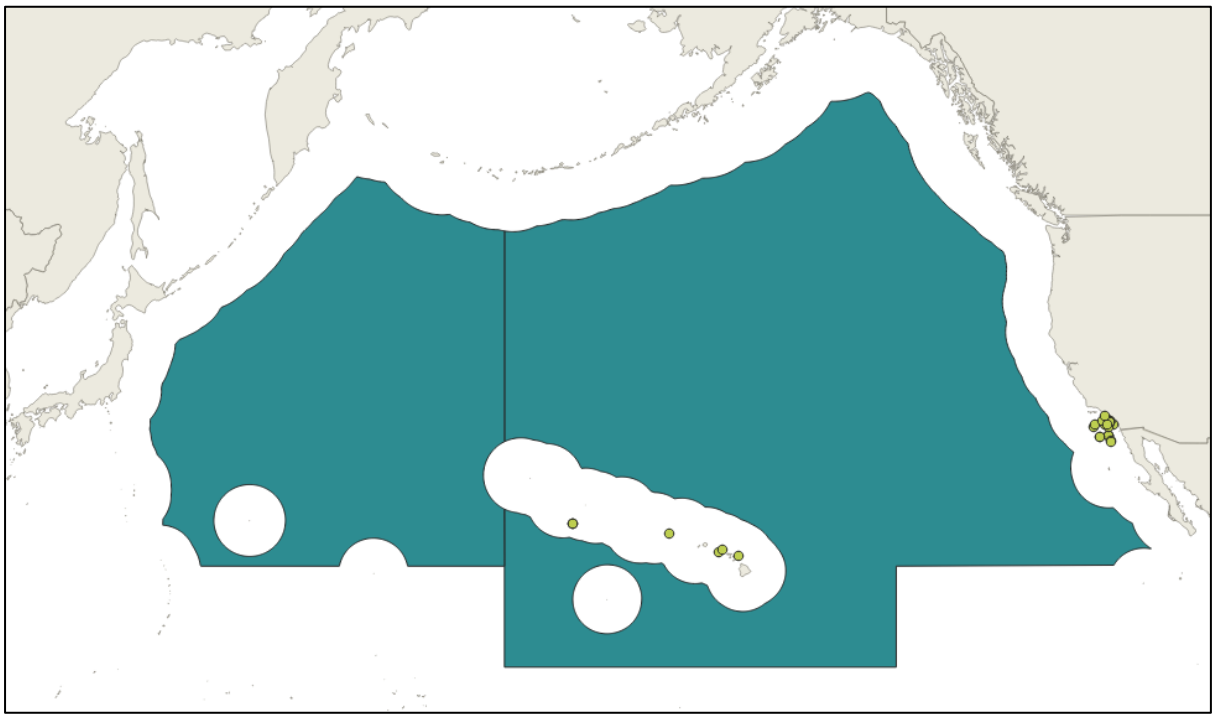
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. kamoharai* in the region is confirmed, but there are no records from the ABNJ. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level.

Centroscyllium nigrum

The combtooth dogfish (*Centroscyllium nigrum*) is an outer continental and insular slope species with records off the coast of Hawaii and continental USA, down to 1 200 m.



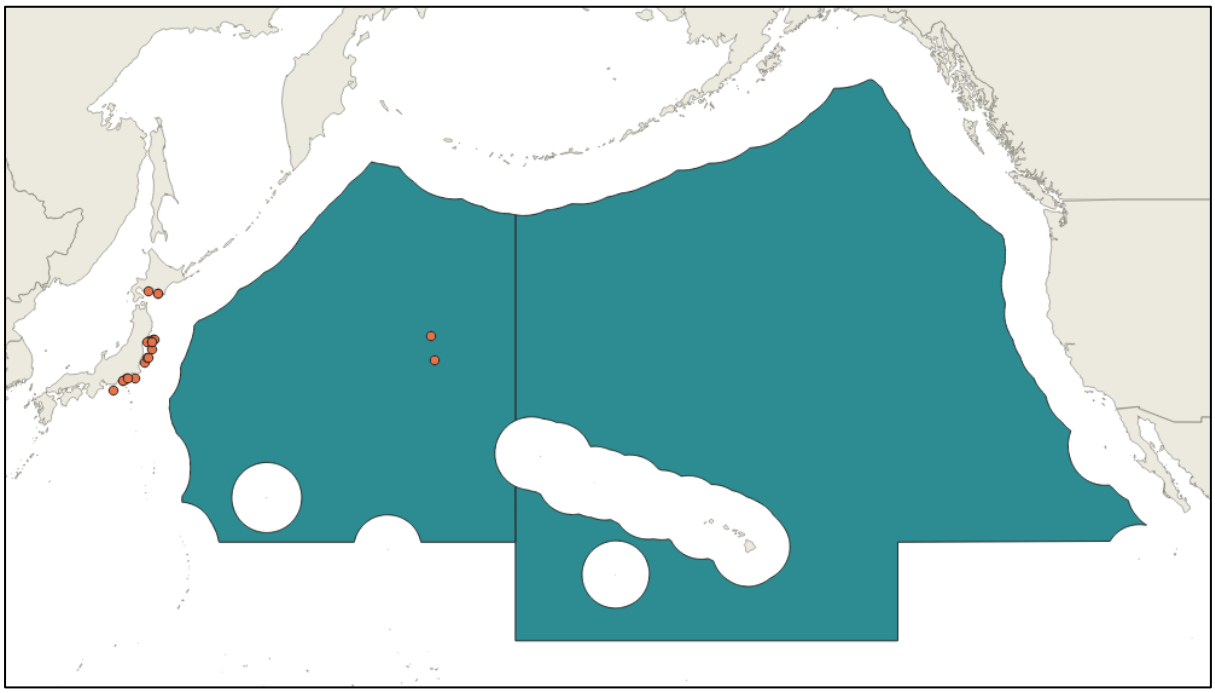
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. nigrum* in the region is confirmed, but there are no records from the ABNJ, although its presence is likely. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level.

Centroscyllium ritteri

The whitefin dogfish (*Centroscyllium ritteri*) is an outer continental and insular slope species with records off the coast of Hawaii and continental USA, down to 1 200 m.



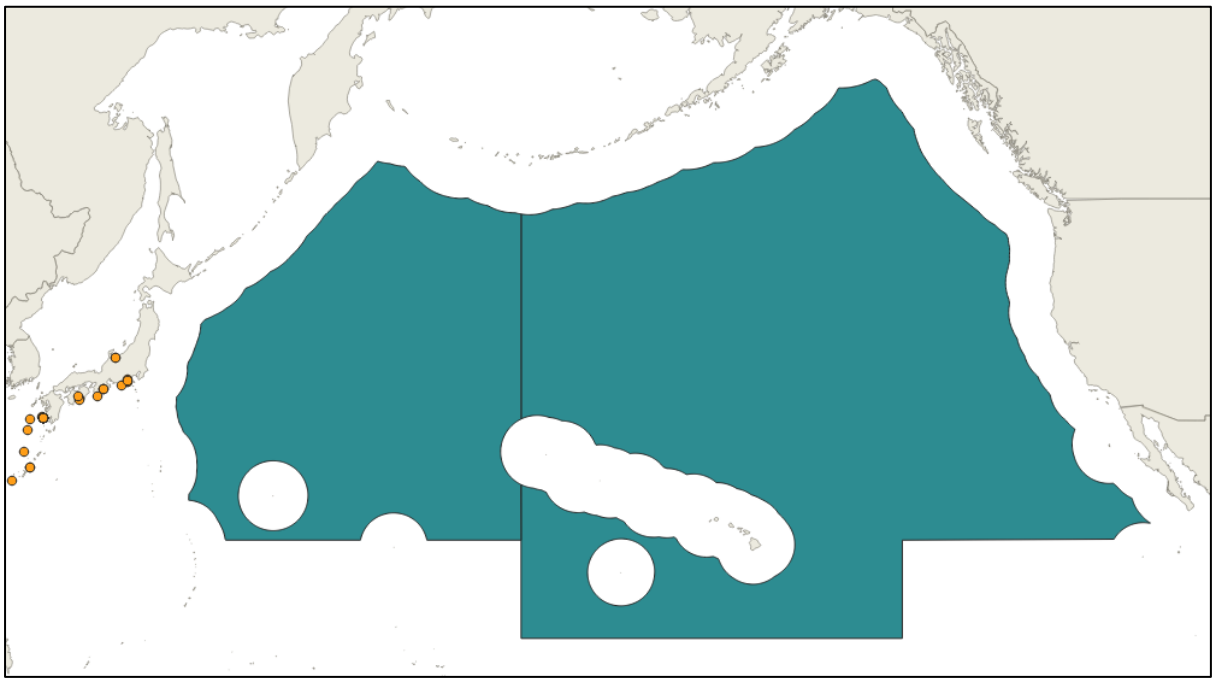
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. ritteri* in the region is confirmed, and there are records from the ABNJ. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus brachyurus

The Shorttail lanternshark (*Etmopterus brachyurus*) is an outer continental shelf species with records off the coast of Japan, down to 700 m.



Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. brachyurus* in the region is confirmed, and there are records from the ABNJ. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

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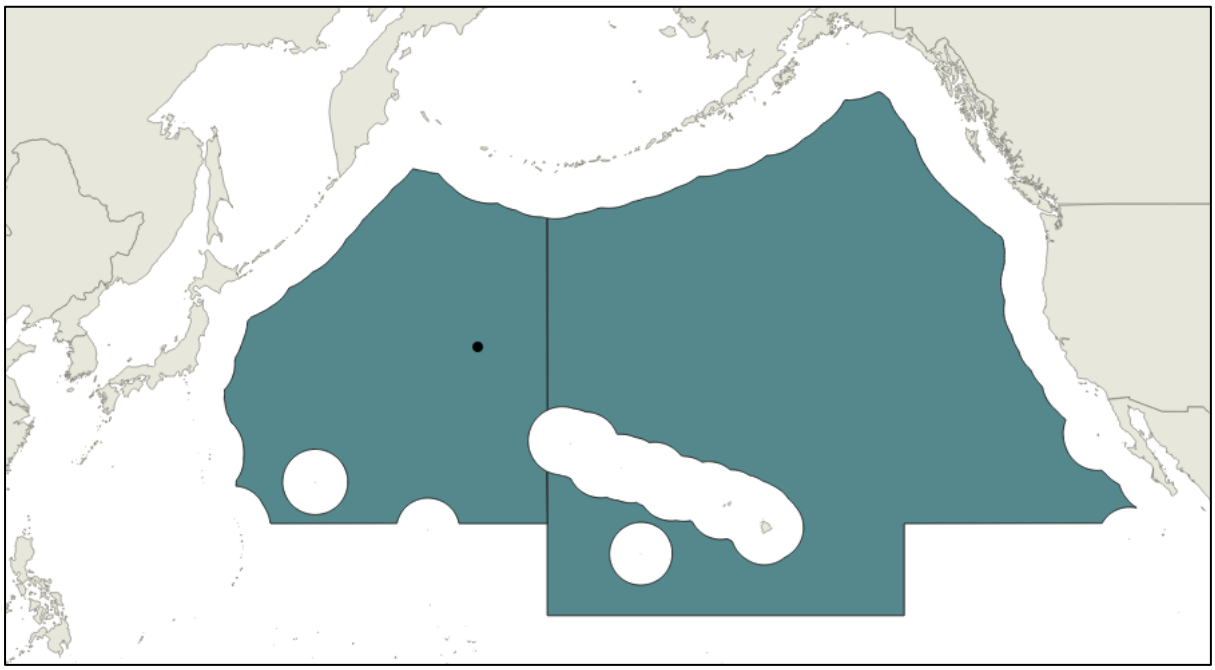
Etmopterus lailae

The Laila's lanternshark *(Etmopterus laliae)* is a recently discovered species from the seamount of the northwestern Hawaiian Islands at depths of about 300-380 m.



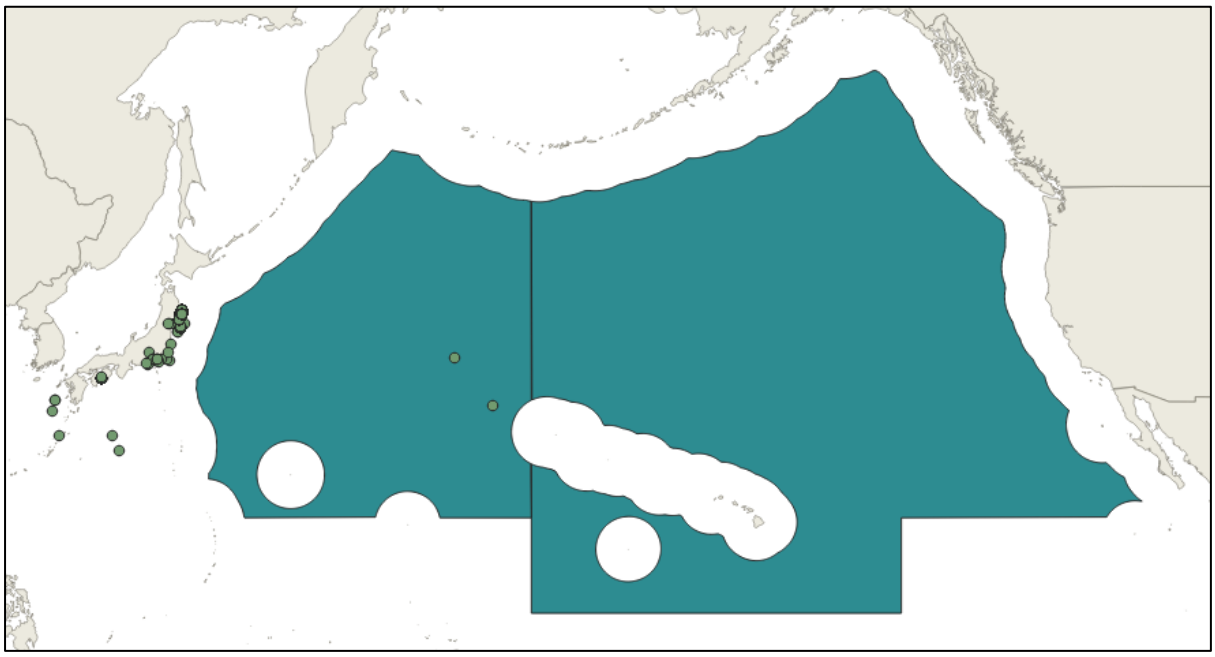
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. laliae* in the region is confirmed, and there are records from the ABNJ. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus lucifer

The Blackbelly lanternshark *(Etmopterus lucifer)* is a small-sized species common on the outer continental shelves and slopes of the Western Pacific, at depths between 160 and 1 600 m.



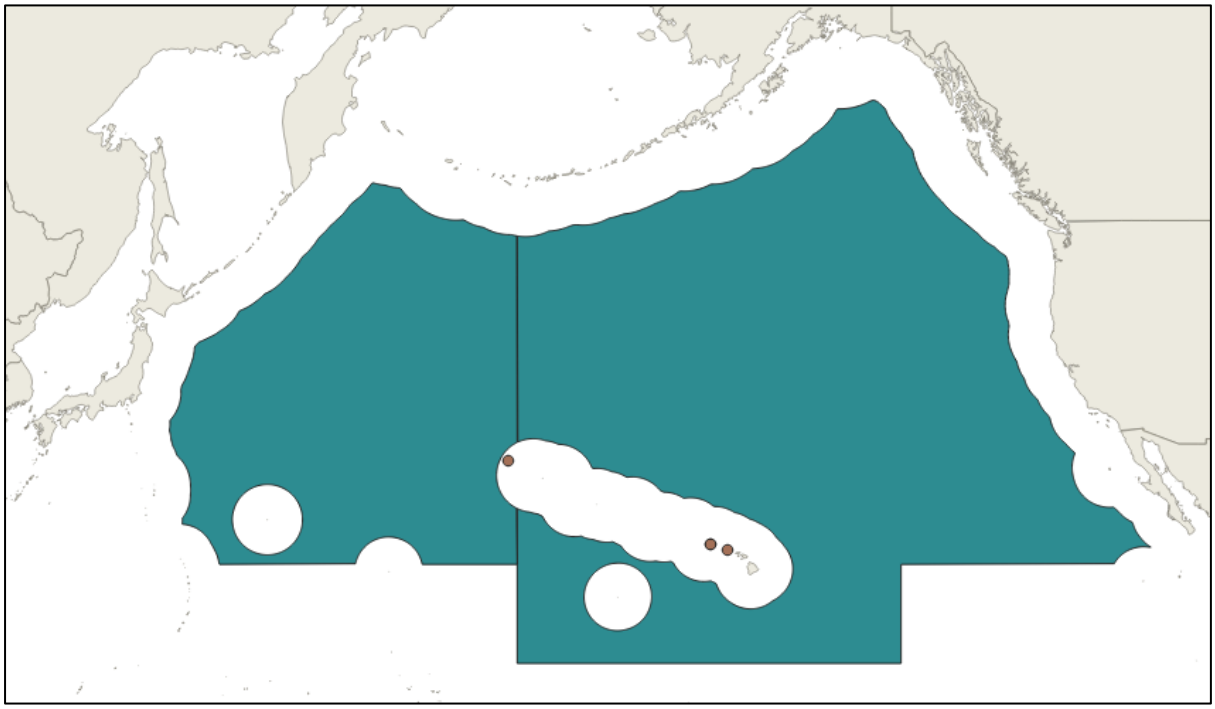
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. lucifer* in the region is confirmed, although the records from the Hawaiian ridge in the CA could be misidentifications with *E. laliae*. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus bigelowi

The Blurred Smooth lanternshark *(Etmopterus bigelowi)* is a fairly large species quite common on the outer continental shelves and slopes, and seamounts of the Western Pacific, at depths down to 1 000 m.



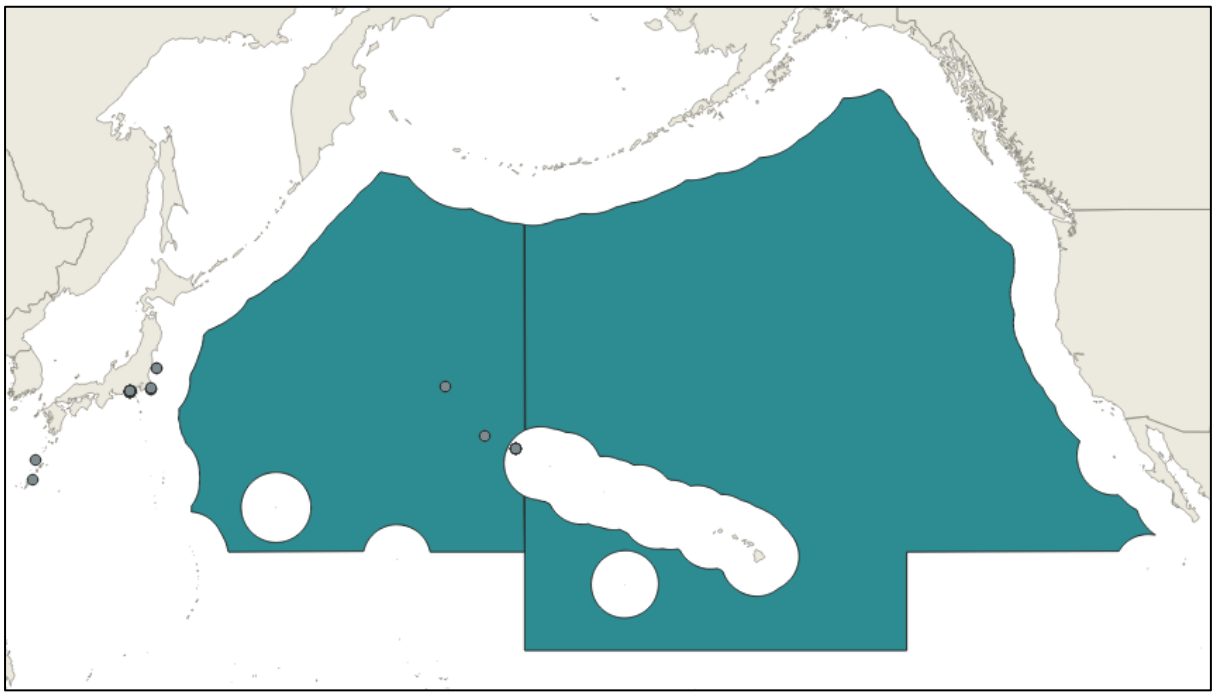
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. bigelowi* in the region is confirmed, and there are records from the ABNJ (not shown in the map). Identification to genus and species is really challenging, although this species together with *E. pusillus*, is the only Etmopterid with a smooth skin. It is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus pusillus

The Smooth lanternshark *(Etmopterus bigelowi)* is a fairly common species on the outer continental shelves, slopes, and seamounts of the Western Pacific, at depths down to 1 200 m.



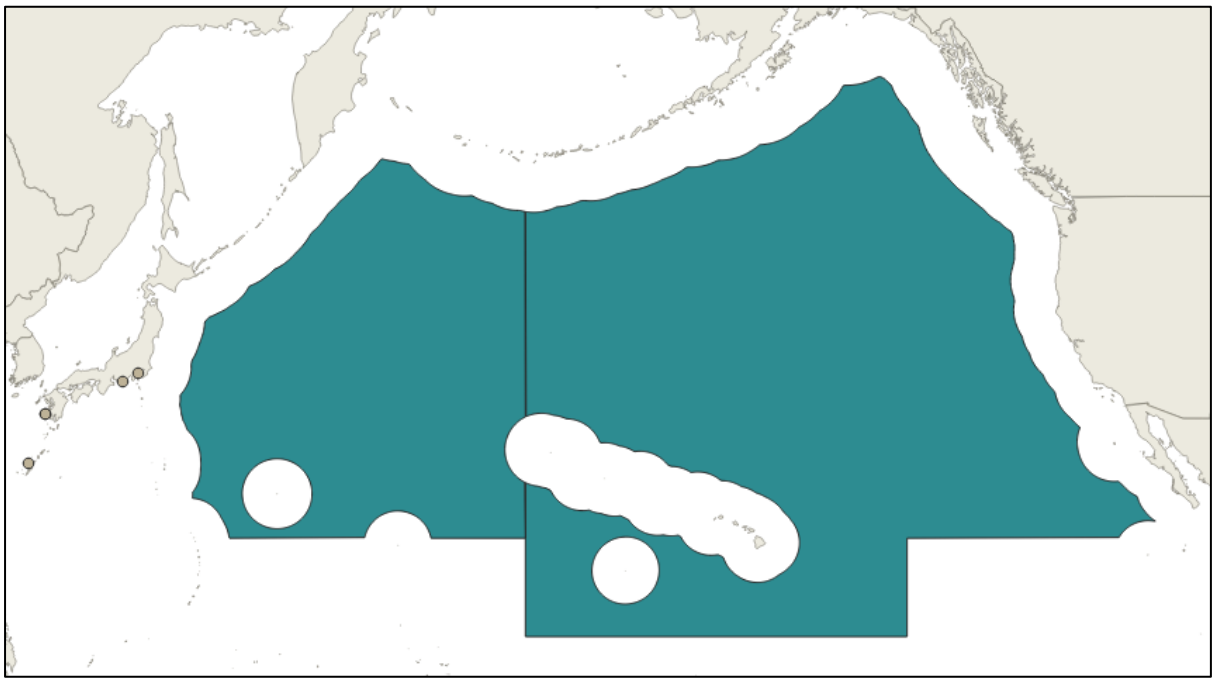
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. pusillus* in the region is confirmed, and there are several records from the ABNJ. Identification to genus and species is really challenging, although this species together with *E. bigelowi*, is the only Etmopterid with a smooth skin. It is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus splendidus

The Splendid lanternshark *(Etmopterus splendidus)* is a species apparently with a restricted depth and geographic distribution from south of Japan, at depths down to 300 m.



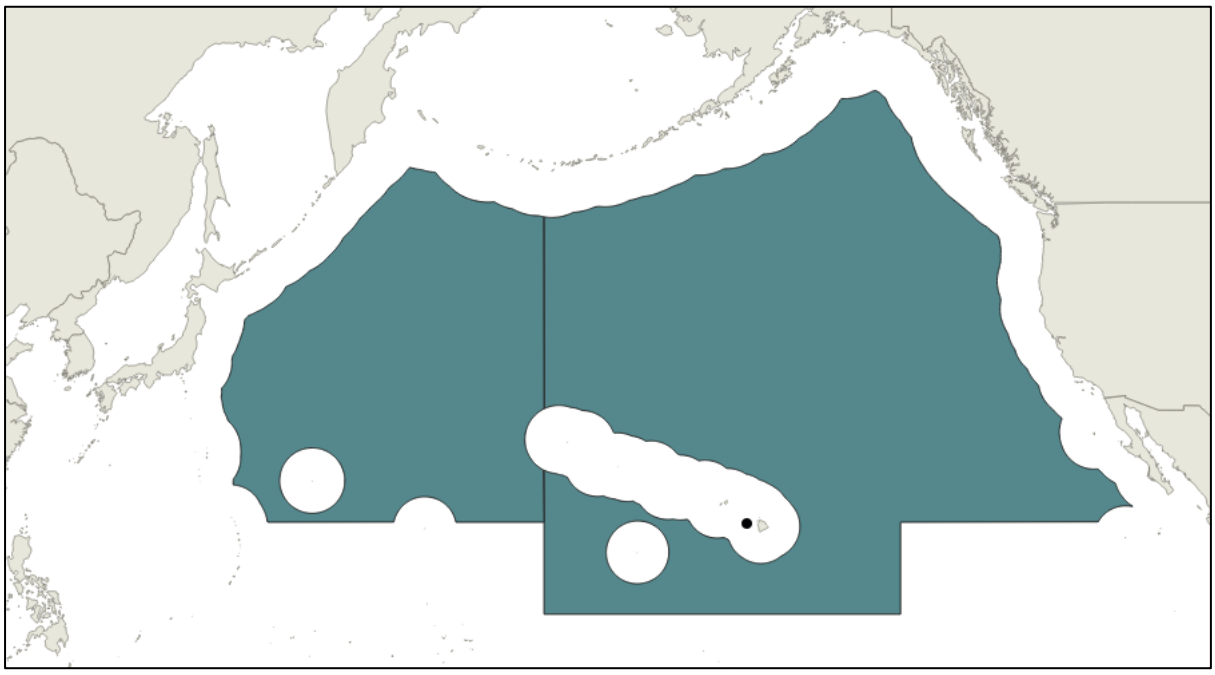
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. splendidus* in the region is confirmed, but there are no records from the ABNJ. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus villosus

The Hawaiian lanternshark *(Etmopterus villosus)* is a very rare species known from a single specimen off Hawaii, at depths down to 900 m.



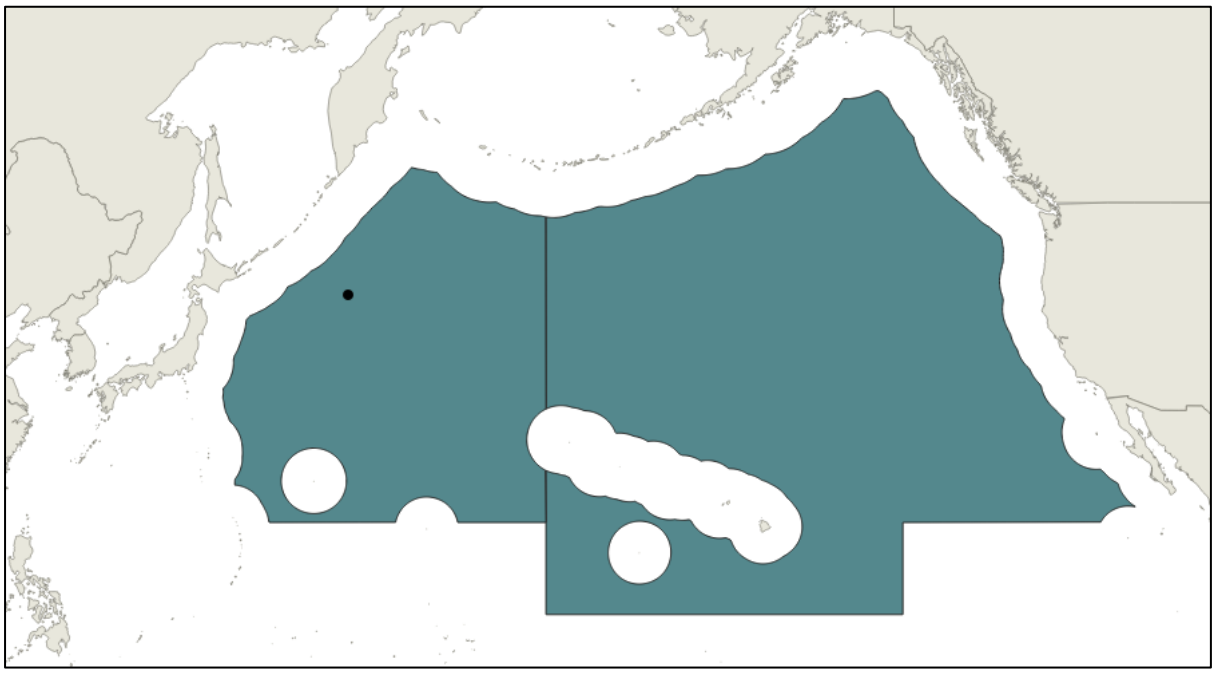
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. villosus* in the region is confirmed, but there are no records from the ABNJ. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus parini

The Parin's lanternshark *(Etmopterus parini)* is a rare species known from two specimens caught in the northwest Pacific at 40-140 m over very deep waters.



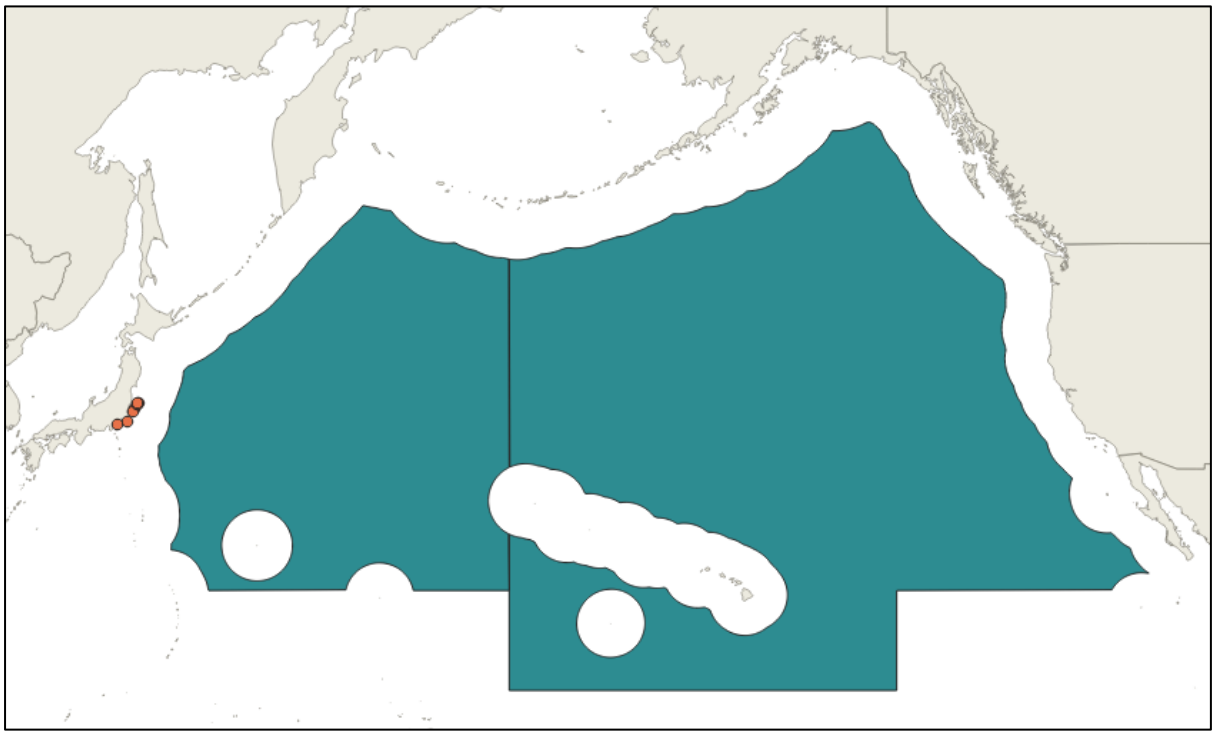
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. parini* in the region is confirmed, and the only known records are from the ABNJ. As for the other Etmopterids, identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus unicolor

The Brown lanternshark *(Etmopterus unicolor)* is a large, stocky lanternshark known from off Japan, on the continental slope and seamounts down to 1 500 m, with catches also in the epipelagic zone.



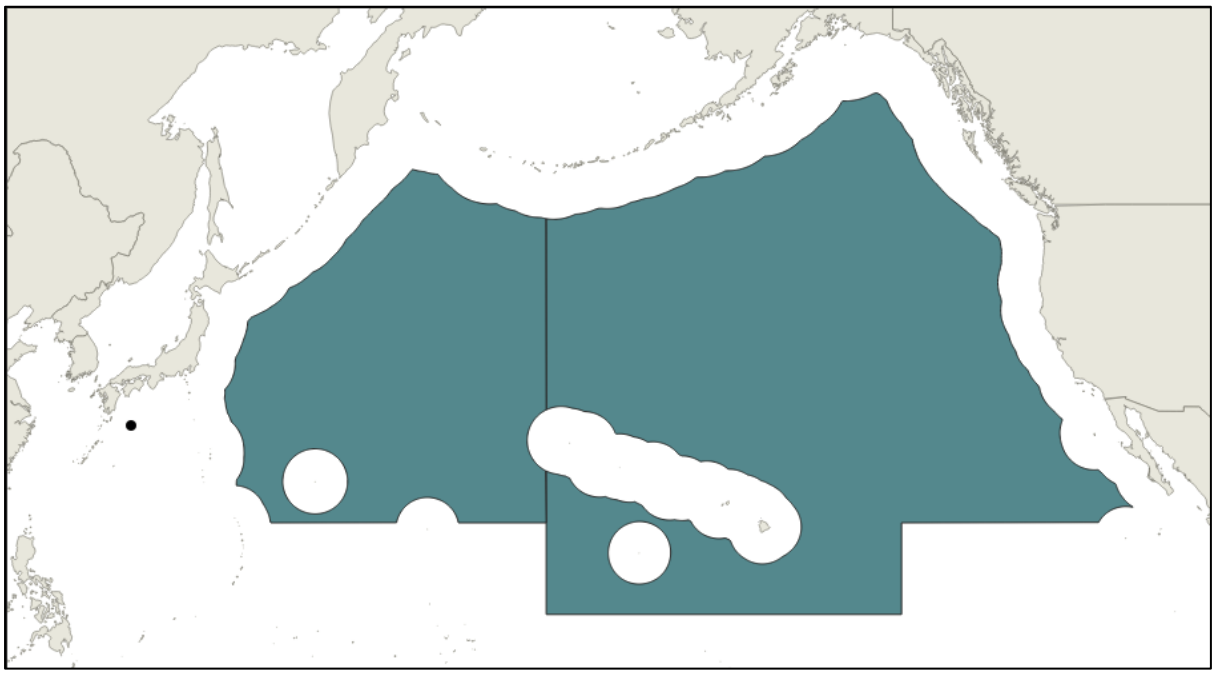
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. unicolor* in the region is confirmed, but there are no records from the ABNJ. Identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Etmopterus sheikoi

The Rasptooth lanternshark *(Etmopterus sheikoi)* is a rare species known from the Northwest Pacific on the Kyushu-Palau Ridges, at depths around 350 m, but probably also deeper.



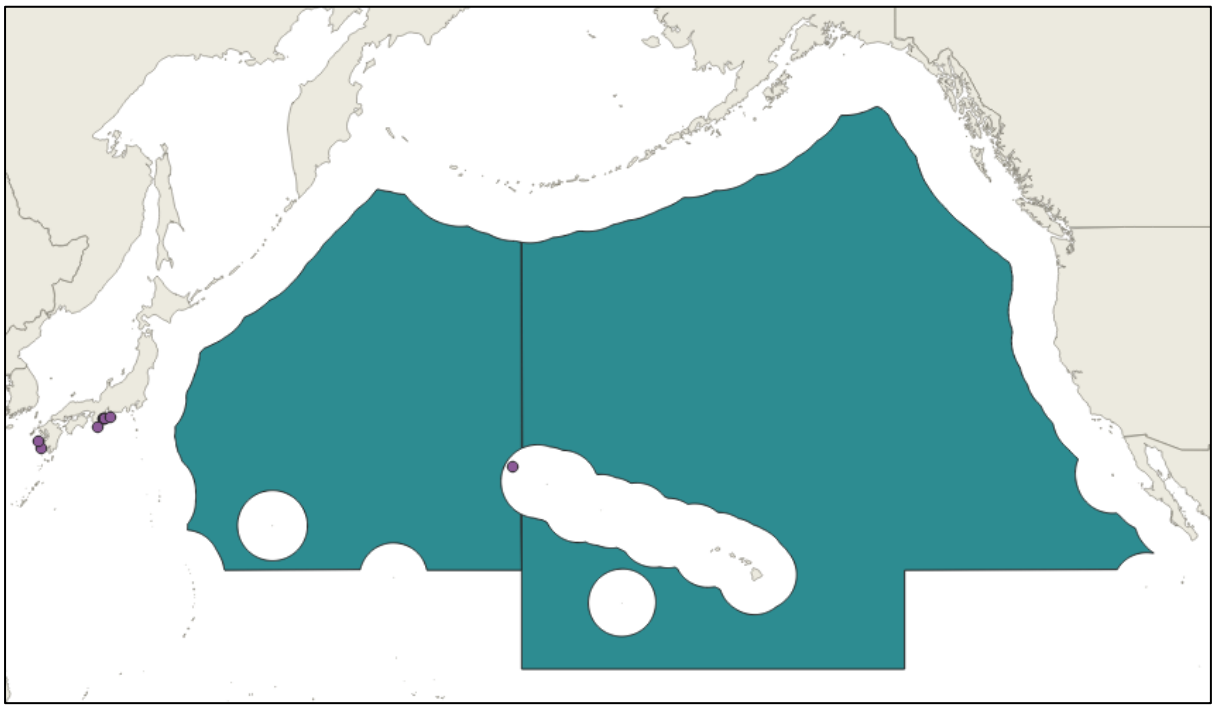
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. sheikoi* in the region is confirmed, but there are no records from the ABNJ. Identification to genus and species is really challenging, and it is unlikely that a non-expert can reach such level.

Overall, the likelihood of accurate genus and species identification is low, and this species should be included in an ID tool at the family level, with notes on its occurrence in the area.

Trigonognathus kabeyai

The Viper dogfish *(Trigonognathus kabeyai)* is a very characteristic species known from Japan and the Hawaiian Islands, at depths between 250 and 1 000 m.



Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *Trigonognathus kabeyai* in the region is confirmed, and there are records close to the ABNJ. Identification to genus and species is feasible as the dentition of this lanternshark is very characteristic.

Overall, the likelihood of accurate genus and species identification is high, and this species should be included in an ID tool at the species level, with notes on its occurrence in the area.

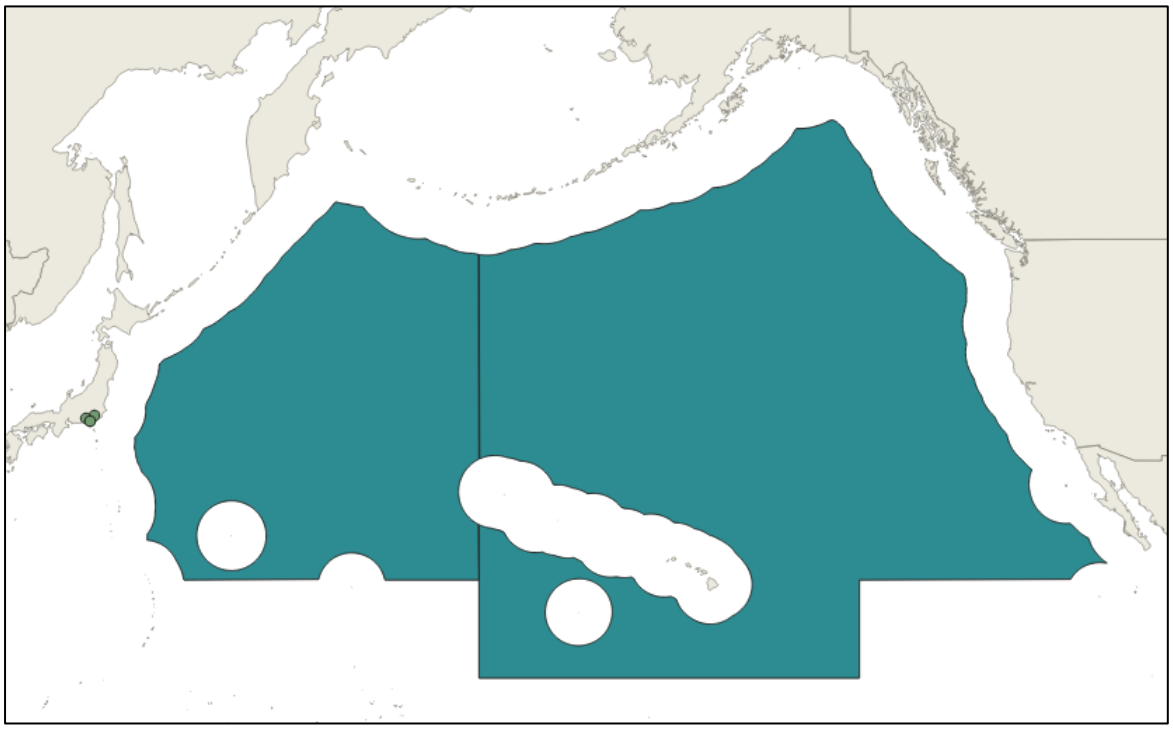
Somniosidae

The Sleeper sharks are a moderately common family of deep-water sharks, with 16 species worldwide, six of which occur in the area. They are known to be an important component of targeted and bycatch deep-sea sharks fisheries. Their presence in the deep waters of oceanic seamounts should be considered very likely, although only 3 species have records form the convention area.

Identification to family is not easy as they can be confused with members of the Dalatiidae, and small specimens with other brown or dark deep-water sharks. The characters used to separate these species from other Squaliforms are the shape of the snout (which can be difficult to assess), and the presence/absence and length of the dorsal-fin spines. Identification to family and genus is possible, but requires familiarity with shark identification. A couple of species are distinctive. Therefore, it is advisable to keep the identification to family, with a couple of characteristic species mentioned separately.

Centroscymnus coelolepis

The Portuguese dogfish (*Centroscymnus coelolepis*) is a stocky shark on the continental slopes off Japan, but likely with a wider distribution. Usually found deeper than 400 m, down to 3 500 m.



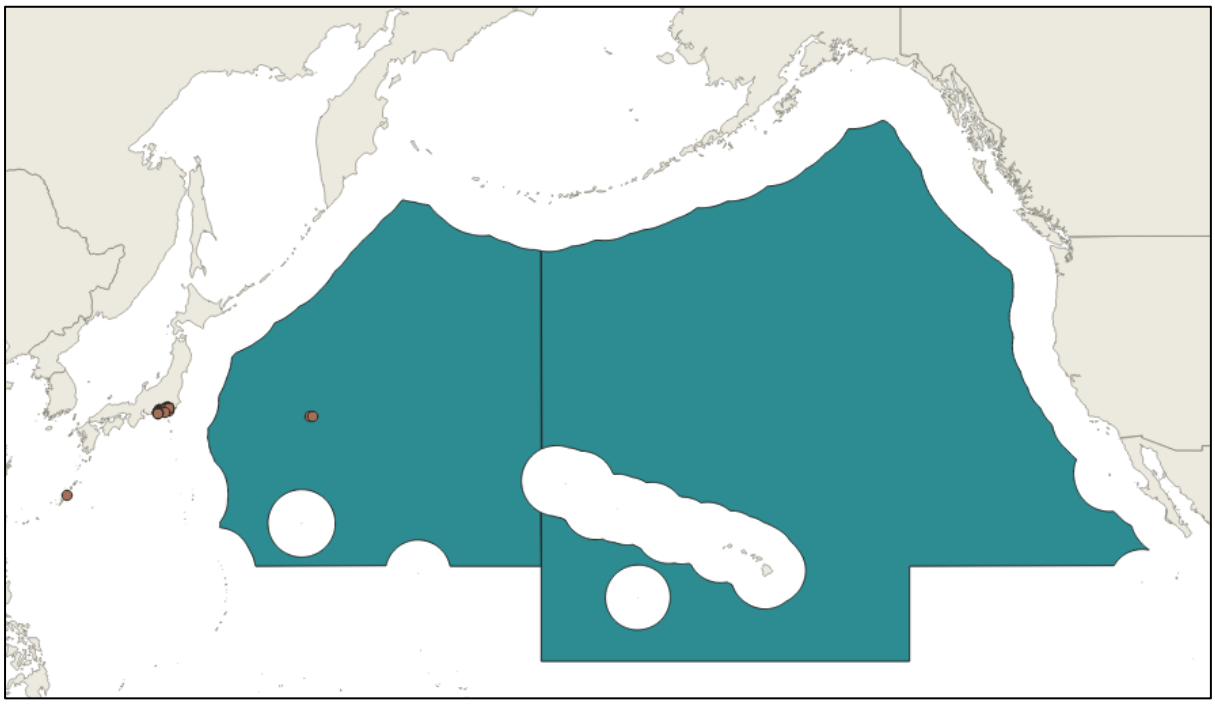
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. coelolepis* in the region is confirmed, with no records from the ABNJ. Identification to genus is possible, upon closer examination, but difficult. To species really challenging, given the presence in the area of the similar-looking *C. owstonii*. The main difference between the two species is the length of the snout. It is unlikely that a non-expert can reach the species level.

Overall, the likelihood of accurate genus identification is moderate, to species low. This species should be included in an ID tool as a group of unidentified Somniosidae which includes all species, except for *Somniosus* sp.

Centroscymnus owstonii

The Roughskin dogfish (*Centroscymnus owstonii*) is a shark on the continental slopes off Japan, but likely with a wider distribution. Usually found deeper than 600 m, down to 1 500 m.



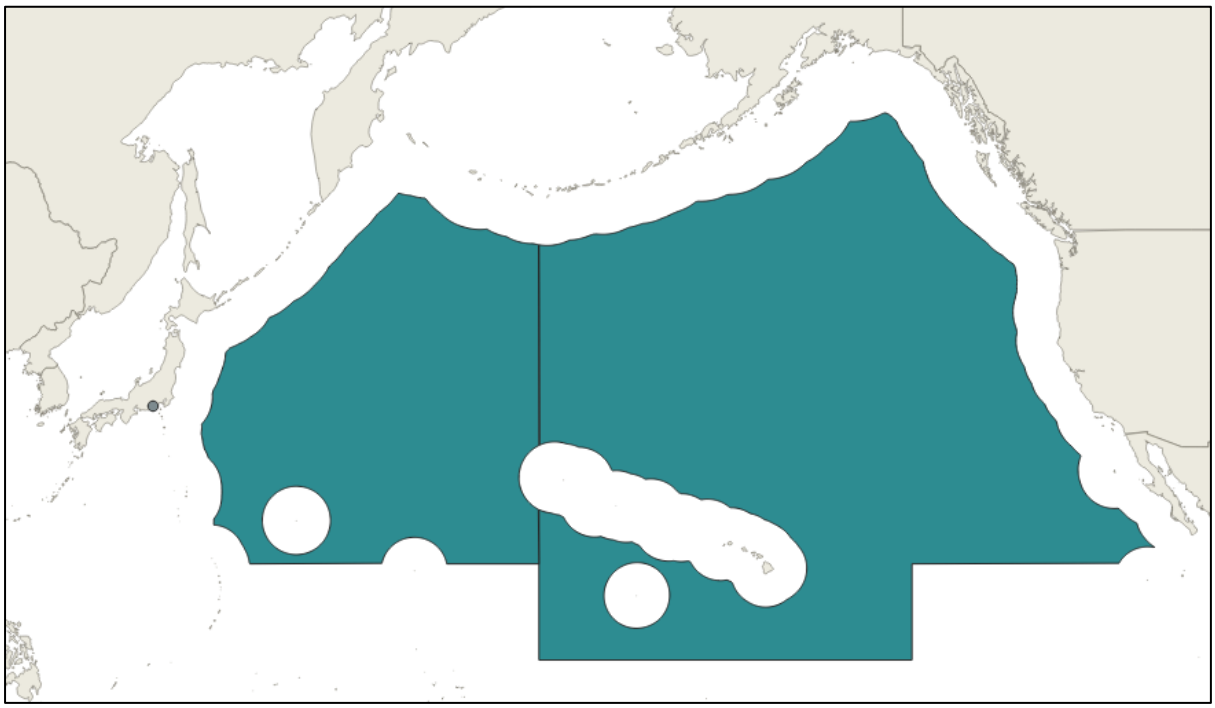
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *C. owstonii* in the region is confirmed, with records from the ABNJ that require verification. Identification to genus is possible, upon closer examination, but difficult. To species really challenging, given the presence in the area of the similar-looking *C. coelolepis*. The main difference between the two species is the length of the snout. It is unlikely that a non-expert can reach the species level.

Overall, the likelihood of accurate genus identification is moderate, to species low. This species should be included in an ID tool as a group of unidentified Somniosidae which includes all species, except for *Somniosus* sp.

Scymnodon ichiharai

The Japanese velvet dogfish (*Scymnodon ichiharai*) is a deep-water shark on the slopes off Japan, usually found deeper than 450 m.



Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *Scymnodon ichiharai* in the region is confirmed, with no records from the ABNJ. Identification to genus and species is difficult, based on dentition. It is unlikely that a non-expert can reach the species level.

Overall, the likelihood of accurate genus identification is moderate, to species low. This species should be included in an ID tool as a group of unidentified Somniosidae which includes all species, except for *Somniosus* sp.

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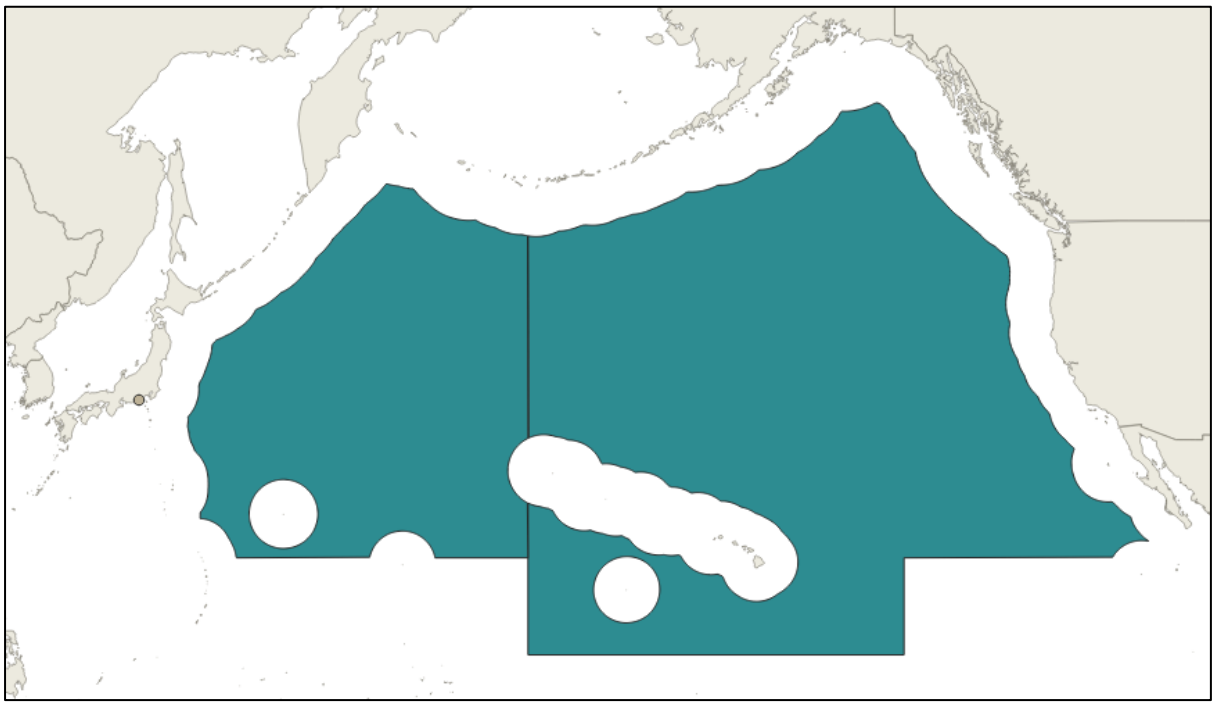
Somniosus longus

The Frog shark (*Somniosus longus*) is a rare deep-water shark on the slopes off Japan, usually found deeper than 250 m.



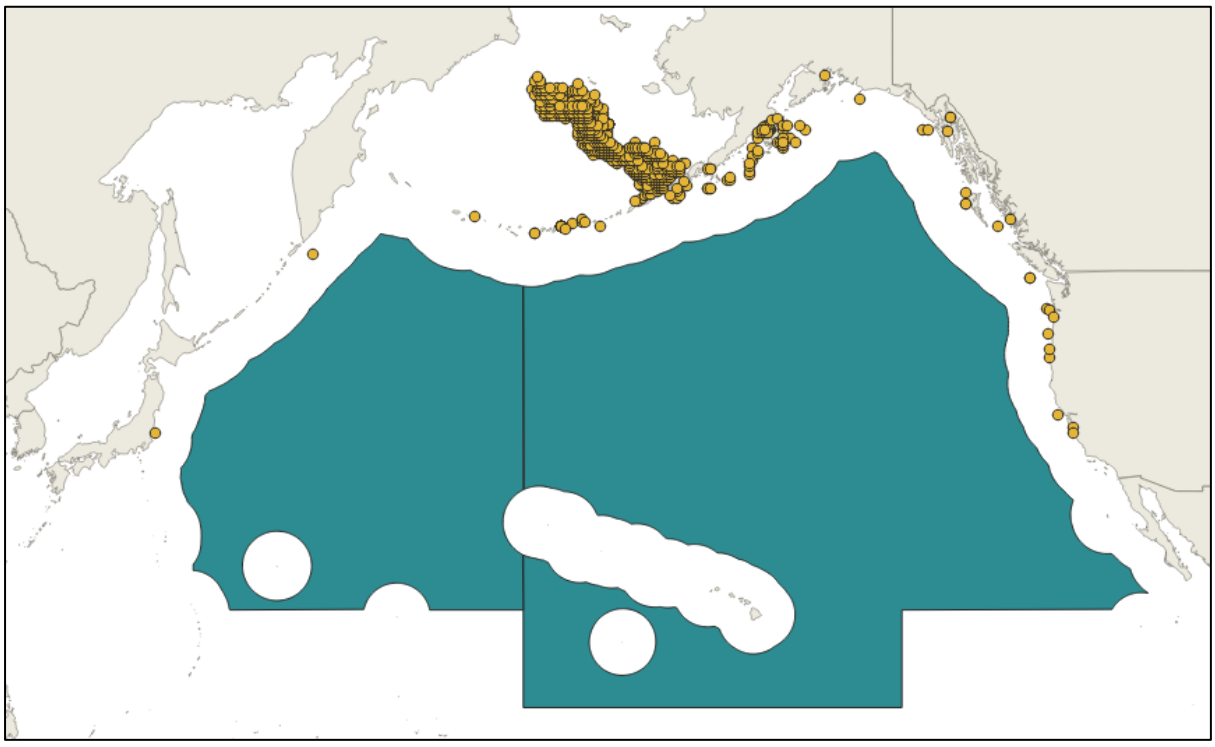
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *S. longus* in the region is confirmed, with records from the ABNJ. Identification to genus is possible as they are the only Somniosids without fin spines, but this requires some close examination. To species more challenging. It is unlikely that a non-expert can reach the species level.

Overall, the likelihood of accurate genus identification is high/moderate, to species low. This species should be included in an ID tool at the genus level.

Somniosus pacificus

The Pacific Sleeper shark (*Somniosus pacificus*) is a relatively common gigantic deep-water shark that occurs throughout the Nort Pacific, usually found deeper than 200 m.



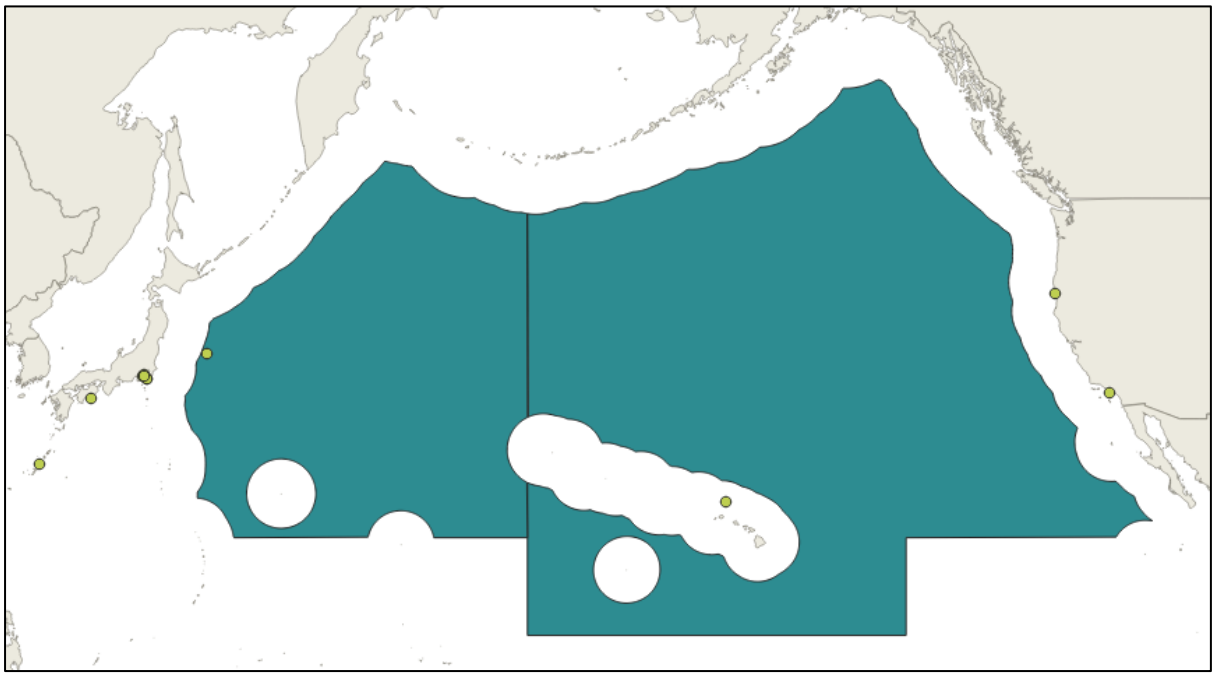
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *S. pacificus* in the region is confirmed. It is a common species at high latitudes, although there are no records from the ABNJ. Identification to genus is possible as they are the only Somniosids without fin spines, but this requires some close examination. To species also possible due to its size.

Overall, the likelihood of accurate genus and species identification is high for large individuals. This species should be included in an ID tool at the genus level, with a species account.

Zameus squamulosus

The Velvet dogfish (*Zameus squamulosus*) is an oceani deep-water shark on the continental and insular slopes of the North Pacific, usually found deeper than 550 m. It can also be found in the epipelagic zone.



Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *Z. squamulosus* in the region is confirmed, with records from the ABNJ. Identification to genus and species is difficult.

Overall, the likelihood of accurate genus and species identification is low. This species should be included in an ID tool as a group of unidentified Somniosidae which includes all species, except for *Somniosus* sp.

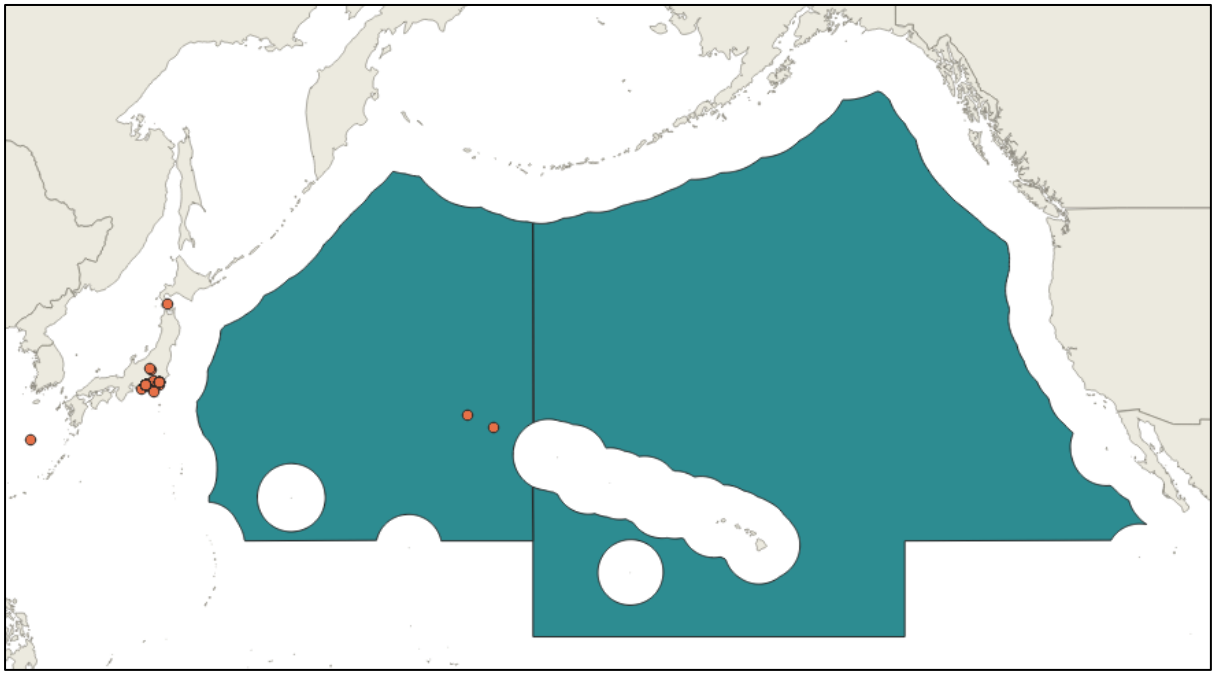
Dalatiidae

The kitefin sharks, with 10 species in seven genera are a group of small to medium-sized deep-water and deep midwater species. Their presence in the deep waters of oceanic seamounts should be considered very likely, although only 3 species have records form the convention area.

Identification to family is feasible, but not taken for granted. The main character used to separate these sharks from the Somniosids is the shape of the head and snout, which can be very subjective. Identification to genus means identification to species as most species are monospecific.

Dalatias licha

The Kitefin shark (*Dalatias licha*) is a medium-sized deep-water shark, relatively common where it occurs, usually found deeper than 200 m.



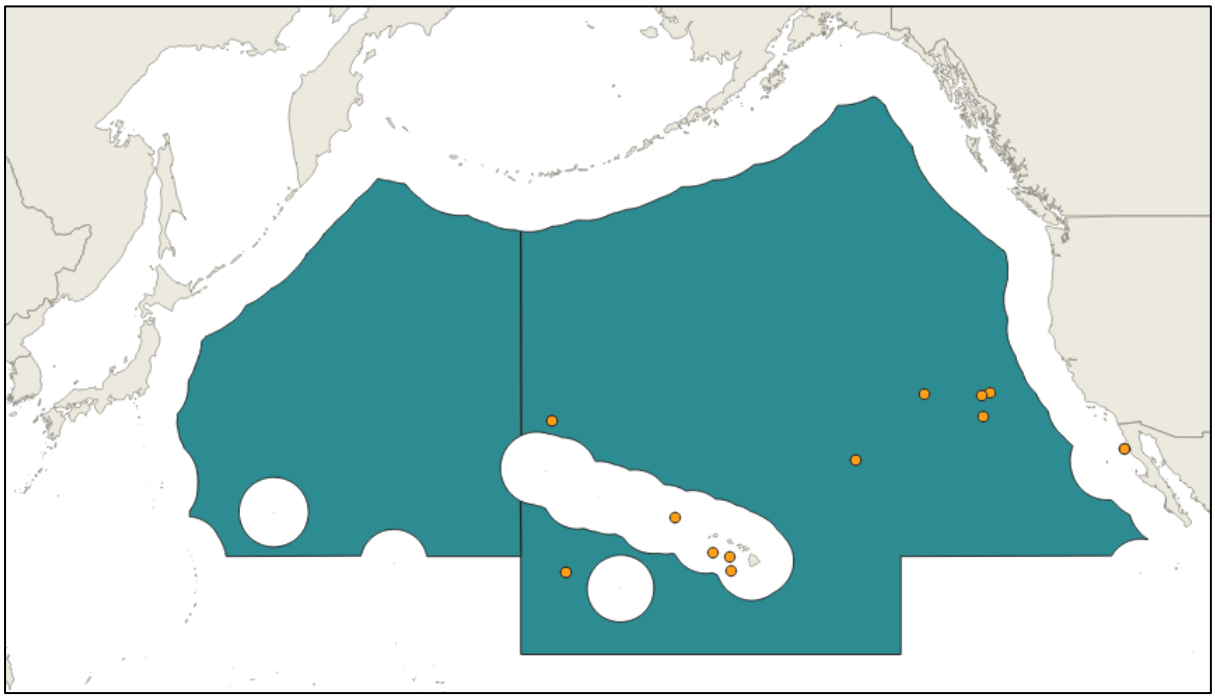
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *D. licha* in the region is confirmed, with records from the ABNJ. Identification to genus and species is possible, upon closer examination. It is possible that a non-expert can reach the species level.

Overall, the likelihood of accurate species identification is high/moderate. This species should be included in an ID tool at the species level.

Euprotomicrus bispinatus

The Pigmy shark (*Euprotomicrus bispinatus*) is a tiny cylindrical black deep-water shark, which be epi-meso and bathypelagic. It was recorded throughout the North Pacific from the surface to deeper than 1 500 m.



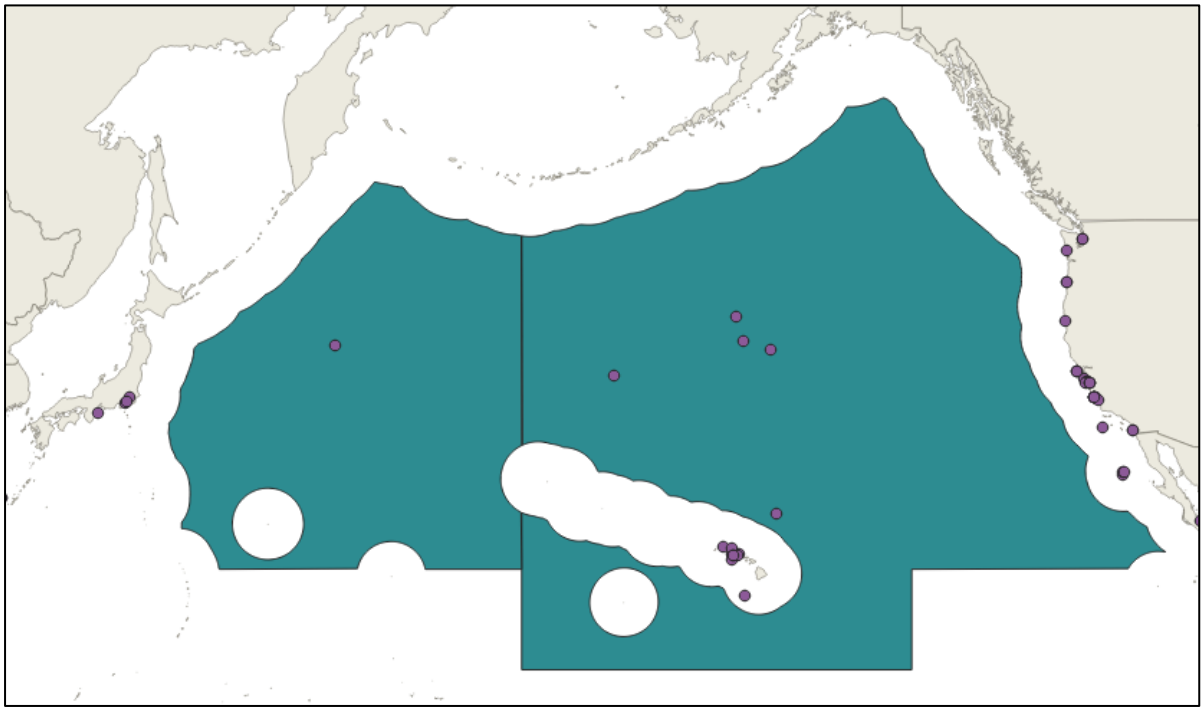
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *E. bispinatus* in the region is confirmed, with records from the ABNJ. Identification to genus and species is possible, upon closer examination. It is possible that a non-expert can reach the species level.

Overall, the likelihood of accurate species identification is high/moderate. This species should be included in an ID tool at the species level.

Isistius brasiliensis

The Cookiecutter shark (*Isistius brasiliensis*) is a small deep-water shark, which be epi-meso and bathypelagic. It was recorded throughout the North Pacific from the surface to deeper than 3 000 m.



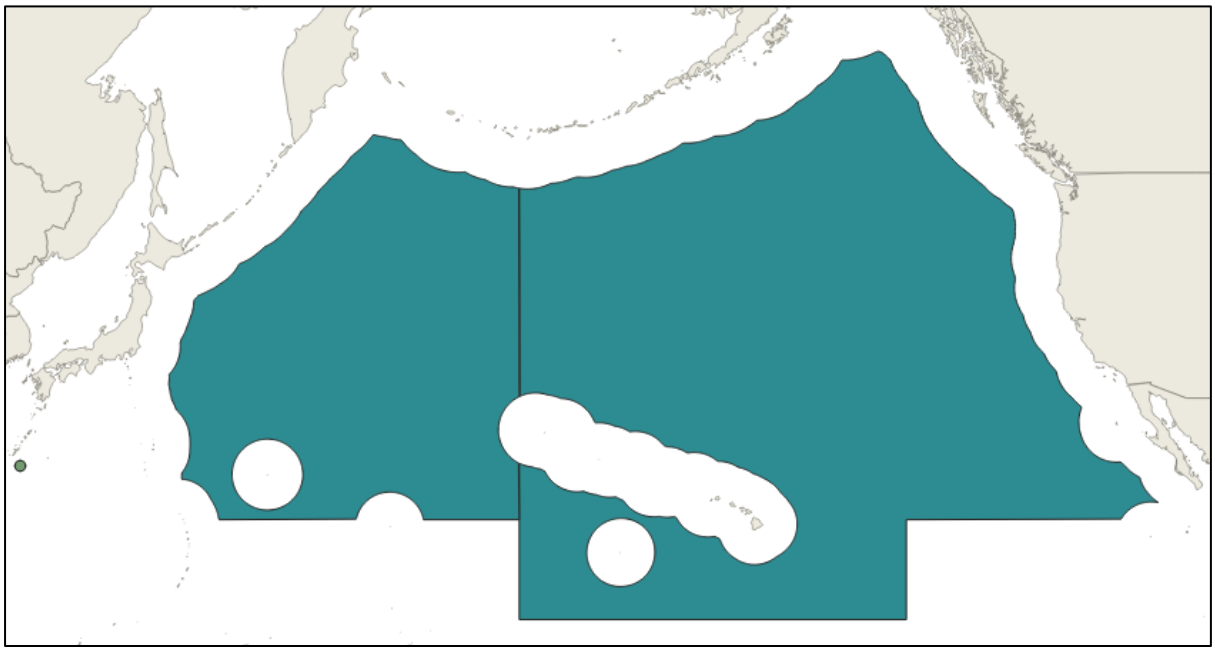
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *I. brasiliensis* in the region is confirmed, with several records from the ABNJ. Identification to genus and species is possible, upon closer examination. It is possible that a non-expert can reach the species level.

Overall, the likelihood of accurate species identification is high/moderate. While this species could be included in an ID tool at the species level, genus-level identification would be more reliable.

Isistius plutodus

The Largetooth cookiecutter shark (*Isistius plutodus*) is a small deep-water shark, which be epi-meso and bathypelagic. It was recorded in the West Pacific, but it seems to be rarer than *I. brasiliensis*.



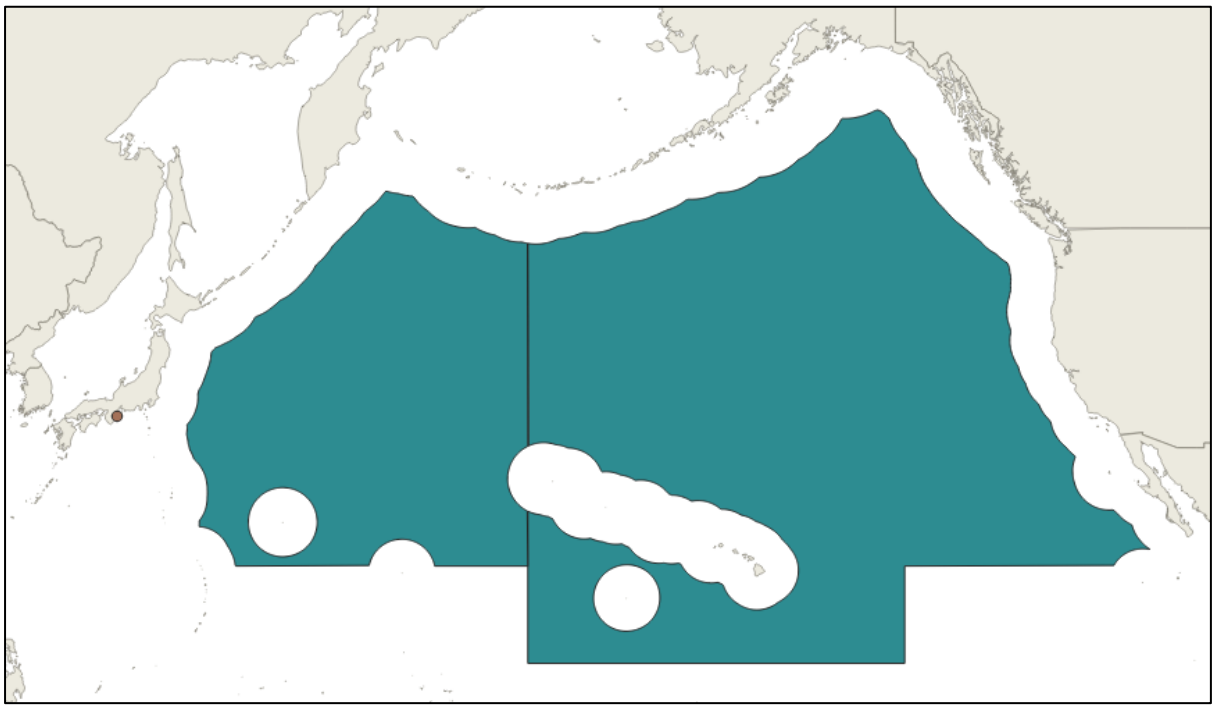
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *I. plutodus* in the region is confirmed, with no records from the ABNJ. Identification to genus and species is possible, upon closer examination. It is possible that a non-expert can reach the species level.

Overall, the likelihood of accurate genus identification is high, to species moderate. While this species could be included in an ID tool at the species level, genus-level identification would be more reliable.

Squaliolus aliae

The Smalleye pigmy shark (*Squaliolus aliae*) is a small deep-water shark, which be epi- or mesopelagic. It was recorded in the West Pacific, but it seems to occur close to the land.



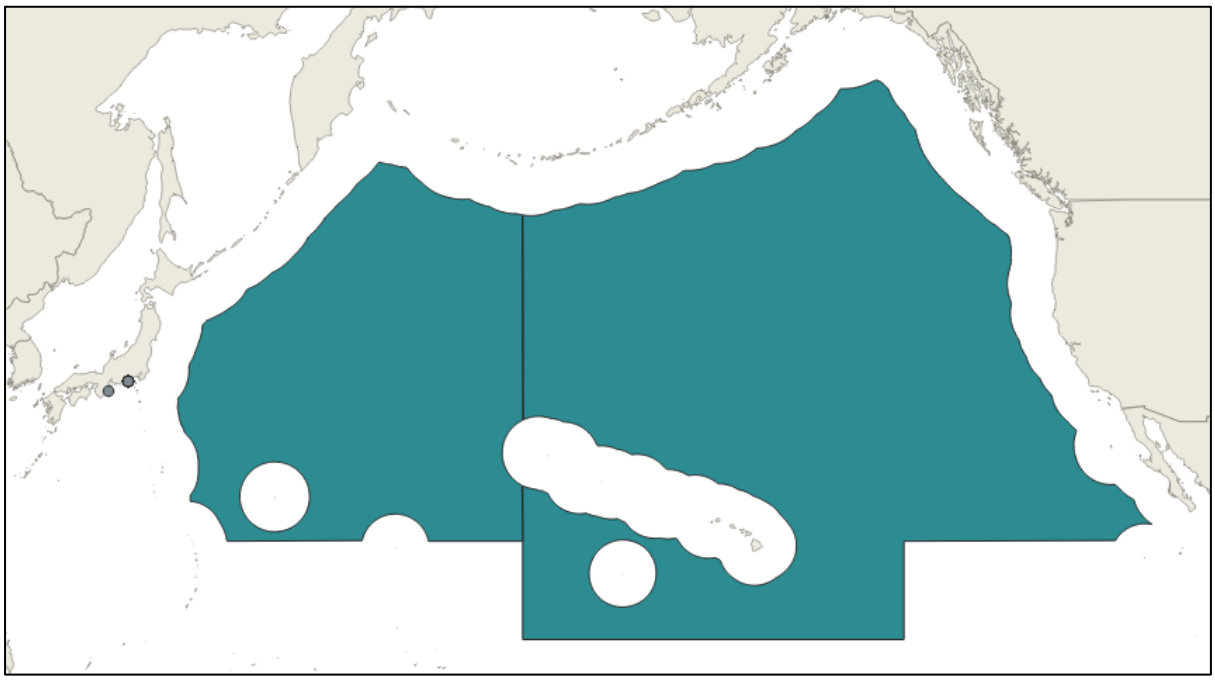
Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *S. aliae* in the region is confirmed, with no records from the ABNJ. Identification to genus and species is possible, upon closer examination. It is possible that a non-expert can reach the species level, but its presence in the convention area seems to be unlikely.

Overall, the likelihood of accurate genus identification is high, to species moderate. While this species could be included in an ID tool at the species level, genus-level identification would be more reliable.

Squaliolus laticaudus

The Spined pigmy shark (*Squaliolus laticaudus*) is a tropical epipelagic species, usually found in the water column between 200 and 500 m, but close to the bottom at 750 m.



Notes on Species Identification by Fishery Observers or Non-Experts

The presence of *S. laticaudus* in the region is confirmed, with no records from the ABNJ. Identification to genus and species is possible, upon closer examination. It is possible that a non-expert can reach the species level, but its presence in the convention area seems to be unlikely.

Overall, the likelihood of accurate genus identification is high, to species moderate. While this species could be included in an ID tool at the species level, genus-level identification would be more reliable.

TAXONOMIC LIST

	West Pacific	East Pacific	Convention Area
HEXANCHIFORMES			
Hexanchidae			
Hexanchus griseus	x	x	x
Hexanchus nakamurai	x		
Heptranchias perlo	x		
Chlamydoselachidae			
Chlamydoselachus anguineus	x		x
LAMNIFORMES			
Mitsukurinidae			
Mitsukurina owstonii	x	x	
Odontaspididae			
Odontaspis ferox	x	x	
Odontaspis noronhai	x	x	
Pseudocarchariidae			
Pseudocarcharias kamoharai	x	x	x
Alopiidae			
Alopias superciliosus	x	x	x
CARCHARHINIFORMES			
Pentanchidae			
Apristurus brunneus		x	x
Apristurus japonicus	x		
Apristurus macrorhynchus	x		
Apristurus macrostomus	x		
Apristurus platyrhynchus	x		
Apristurus herklotsi	x		
Apristurus longicephalus	x		
Apristurus fedorovi	x		x
Apristurus kampae		x	
Apristurus pinguis	x		
Apristurus spongiceps	x	x	x
Cephalurus cephalus		x	
Galeus eastmani	x		
Galeus longirostris	x		
Galeus nipponensis	x		
Galeus piperatus		x	
Halaelurus buergeri	x		
Parmaturus pilosus	x		
Parmaturus melanobranchus	x		
Parmaturus xaniurus		x	x
Pseudotriakidae			
Pseudotriakis microdon	x		x
ECHINORHINIFORMES			
Echinorhinidae			
Echinorhinus brucus	x		
Echinorhinus cookei	x	x	x
SQUALIFORMES			

Squalidae			
Cirrhigaleus asper		x	
Cirrhigaleus barbifer	x		
Squalus suckleyi	x	x	
Squalus brevirostris	x		
Squalus boretzi			x
Squalus formosus	x		
Squalus hawaiiensis		x	
Squalus japonicus	x		
Squalus mitsukurii	x	x	
Centrophoridae			
Centrophorus atromarginatus	x		
Centrophorus granulosus	x		
Centrophorus moluccensis	x		
Centrophorus squamosus	x		
Centrophorus tessellatus	x	x	
Deania calcea	x		
Deania hystricosa	x		
Etmopteridae			
Centroscyllium excelsum			x
Centroscyllium kamoharai	x		
Centroscyllium nigrum		x	
Centroscyllium ritteri	x		x
Etmopterus brachyurus	x		
Etmopterus laliae			x
Etmopterus lucifer	x		x
Etmopterus bigelowi		x	x
Etmopterus pusillus	x		x
Etmopterus splendidus	x		
Etmopterus villosus		x	
Etmopterus parini			x
Etmopterus unicolor	x		
Etmopterus sheikoi	x		
Trigonognathus kabeyai	x		x
Somniosidae			
Centroscymnus coelolepis	x		
Centroscymnus owstonii	x		x
Scymnodon ichiharai	x		
Somniosus longus	x		
Somniosus pacificus	x	x	x
Zameus squamulosus	x	x	x
Dalatiidae			
Dalatias licha	x		x
Euprotomicrus bispinatus		x	x
Isistius brasiliensis	x	x	x
Isistius plutodus	x		
Squaliolus aliae	x		
Squaliolus laticaudus	x		

Taxa selected for inclusion in the identification keys

HEXANCHIFORMES

Hexanchidae

Hexanchus griseus

Hexanchus nakamurai

Heptranchias perlo

Chlamydoselachidae

Chlamydoselachus anguineus

LAMNIFORMES

Mitsukurinidae

Mitsukurina owstonii

Odontaspididae

Odontaspis sp.

Pseudocarchariidae

Pseudocarcharias kamoharai

Alopiidae

Alopias superciliosus

CARCHARHINIFORMES

Pentanchidae

Apristurus sp.

Cephalurus cephalus

Galeus sp.

Halaelurus buergeri

Parmaturus sp.

Pseudotriakidae

Pseudotriakis microdon

ECHINORHINIFORMES

Echinorhinidae

Echinorhinus sp.

SQUALIFORMES

Squalidae

Squalidae unid.

Centrophoridae

Centrophorus sp.

Deania sp.

Etmopteridae

Etmopteridae unid.

Trigonognathus kabeyai

Somniosidae

Somniosus sp.

Somniosidae unid.

Dalatiidae

Dalatias licha

Euprotomicrus bispinatus

Isistius sp.

Squaliolus sp.

IDENTIFICATION KEYS

Key to Orders (classical key for taxonomists or trained scientists/observers)

1a. No anal fin.....2

1b. Anal fin present.....3

2a. First dorsal-fin origin behind pelvic-fin origins.....**Echinorhiniformes**

2b. First dorsal-fin origin in front of pelvic-fin origins.....**Squaliformes**

3a. Gill openings 6 or 7 pairs; 1 dorsal fin.....**Hexanchiformes**

3b. Gill openings 5 pairs; 2 dorsal fins.....4

4a. No nictitating eyelids.....**Lamniformes**

4b. Nictitating eyelids present.....**Carcharhiniformes**

Comments: The distinguishing characteristics for identifying the main orders of deep-water sharks are generally easy to determine provided that the observer has basic knowledge of shark morphology and sufficient time to examine specimens closely. However, differentiating between Lamniformes and Carcharhiniformes can be challenging. Therefore, for the deep-water shark orders expected in the convention area, it is proposed to modify the characters as follows:

Key to Orders (adjusted for users with limited training)

1a. No anal fin.....2

1b. Anal fin present.....3

2a. First dorsal-fin origin behind pelvic-fin origins.....**Echinorhiniformes**

2b. First dorsal-fin origin in front of pelvic-fin origins.....**Squaliformes**

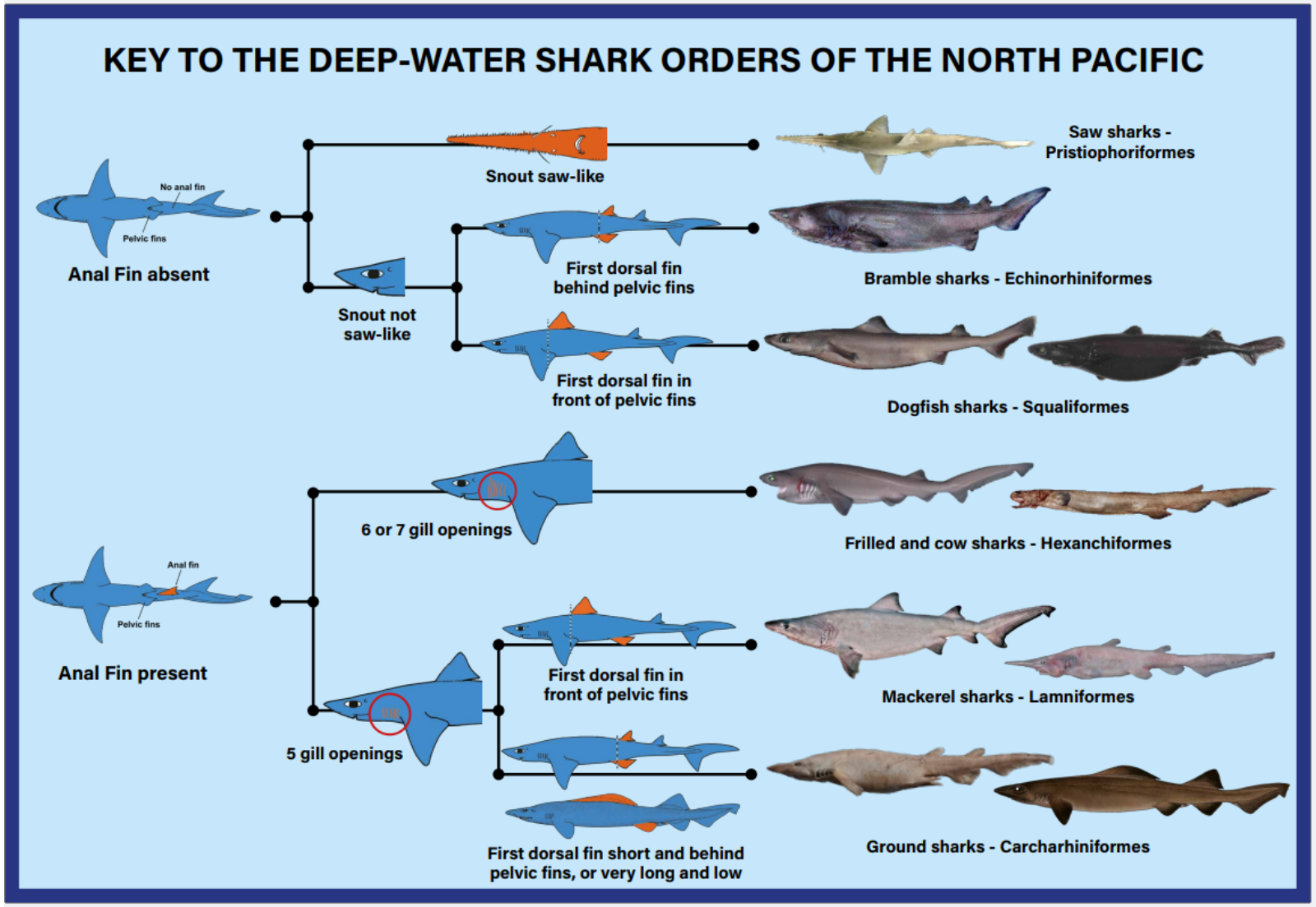
3a. Gill openings 6 or 7 pairs; 1 dorsal fin.....**Hexanchiformes**

3b. Gill openings 5 pairs; 2 dorsal fins.....4

4a. First dorsal fin short and behind pelvic fins, or in front but very long and low.....**Lamniformes**

4b. First dorsal fin short and in front of pelvic fins.....**Carcharhiniformes**

Please note that one Sawshark species occurs off Japan. It belongs to another order, the Pristiophoriformes. It was not included in the key as the species is considered unlikely to occur in the ABNJ, but it will be mentioned in the tool.



Example of a key to shark orders.

Key to Hexanchiformes families (classical key for taxonomists or trained scientists/observers)

1a. Body eel-like; mouth terminal; teeth tricuspidate, similar on both jaws; 6 paired gill openings, with first extending across throat..... **Chlamydoselachidae**

1b. Body fusiform; mouth subterminal; teeth not tricuspidate, dissimilar on upper and lower jaws; 6 or 7 paired gill openings, with first not extending across throat..... **Hexanchidae**

Comments: Separating these two families should be easy for anyone with basic knowledge of shark morphology. The above mentioned key provides a combination of characters that are usually used to identify members of the two families. A few characters can be omitted to make the key more user friendly.

Key to Hexanchiformes families (adjusted for users with limited training)

1a. Body eel-like; 6 paired gill openings, with first extending across throat..... .....**Chlamydoselachidae**

1b. Body fusiform; 6 or 7 paired gill openings, with first not extending across throat..... **Hexanchidae**

Key to Hexanchiformes genera and species that occur or are likely to occur in the CA of NPFC (classical key for taxonomists or trained scientists/observers, but can be used by users with limited training)

1a. Body eel-like; 6 paired gill openings, with first extending across throat..... .....***Chlamydoselachus anguineus***

1b. Body fusiform; 6 or 7 paired gill openings, with first not extending across throat..... **2**

2a. 7 paired gill openings..... ***Heptranchias perlo***

2b. 6 paired gill openings **3**

2a. Distance between dorsal-fin insertion and upper caudal origin about equal to or slightly greater than length of dorsal-fin base; very large-sized, maximum ~5 m TL.....***Hexanchus griseus***

2b. Distance between dorsal-fin insertion and upper caudal origin much greater than length of dorsal-fin base; medium-sized, maximum ~1.8 m TL..... ***Hexanchus nakamurai***

Key to Lamniformes families, genera and species that occur or are likely to occur in the CA of NPFC (classical key for taxonomists or trained scientists/observers)

1a. Snout extremely elongated, flat and blade-like; no precaudal pits and no caudal-fin lower lobe..... **Mitsukurinidae** (*Mitsukurina owstonii*)

1b. Snout short to moderately elongated (not greatly elongated or blade-like), and broadly rounded; precaudal pits and caudal-fin lower lobe present **2**

2a. Caudal fin about as long as trunk of body.... **Alopiidae** (*Alopias superciliosus*)

2b. Caudal fin much shorter than trunk of body..... **3**

3a. Body stout; eyes relatively small; anal fin broad-based, not pivoting; peduncle with upper precaudal pit, but without lower pit and lateral keels..... **Odontaspididae** (*Odontaspis* sp.)

3b. Body slender; eyes relatively large; anal fin narrow-based, pivoting; peduncle with upper and lower precaudal pits, and with weak lateral keels..... **Pseudocarchariidae** (*Pseudocarcharias kamoharai*)

Comments: Separating these four families should be easy for anyone with basic knowledge of shark morphology. The above mentioned key provides a combination of characters that are usually used to identify members of the two families. A few characters can be omitted to make the key more user friendly.

Key to Lamniformes families, genera and species that occur or are likely to occur in the CA of NPFC (adjusted for users with limited training)

1a. Snout extremely elongated, flat and blade-like ..... **Mitsukurinidae** (*Mitsukurina owstonii*)

1b. Snout short to moderately elongated (not greatly elongated or blade-like) **2**

2a. Caudal fin about as long as trunk of body..... **Alopiidae** (*Alopias superciliosus*)

2b. Caudal fin much shorter than trunk of body..... **3**

3a. Body stout; eyes relatively small; anal fin broad-based..... **Odontaspididae** (*Odontaspis* sp.)

3b. Body slender; eyes relatively large; anal fin narrow-based..... **Pseudocarchariidae** (*Pseudocarcharias kamoharai*)

Key to Carcharhiniformes families (classical key for taxonomists or trained scientists/observers)

1a. First dorsal-fin base in front of pelvic-fin bases..... **Pseudotriakidae**

1b. First dorsal-fin base opposite or behind pelvic-fin bases..... **2**

2a. Narrow shelf-like cartilage extending from the chondrocranium to just above the eyes, forming a supraorbital crest (usually detected by touching the area)..... **Scyliorhinidae**

2b. No supraorbital crest present.....**Pentanchidae**

Comments: The presence of Scyliorhinids in the convention area of NPFC is possible. However, the 3 species that occur off Japan and off the west coast of the USA are not typically deep-water species, and were excluded from this report. The family could still be included in the key, and notes on the species added to the Carcharhiniformes section. The above mentioned key provides a combination of characters that are usually used to identify members of the two families. A few characters can be omitted or their wording simplified to make the key more user friendly.

Key to Carcharhiniformes families, genera and species that occur or are likely to occur in the CA of NPFC (adjusted for users with limited training)

1a. First dorsal-fin base in front of pelvic-fin bases..... **Pseudotriakidae** (*Pseudotriakis microdon*)

1b. First dorsal-fin base opposite or behind pelvic-fin bases..... **2**

2a. An internal crest present on dorsal margin of eye, which can be felt by running the fingers over the dorsal margin of the orbit..... **Scyliorhinidae**

2b. No crest on dorsal margin of eye.....**3**

3a. Head broadly flattened and spatulate, snout elongated and usually greater than mouth width..... *Apristurus* sp.

3b. Head moderately or little–flattened, not spatulate, snout equal or usually less than mouth width.....**4**

4a. Dorsal caudal–fin margin, and sometimes preventral margin, with a crest of enlarged denticles..... **5**

4b. No caudal crests of denticles..... **6**

5a. Pectoral fins relatively large; body firm. Colour pattern of blotches and spots often present..... *Galeus* sp.

5b. Pectoral fins relatively small; body soft; colour plain..... *Parmaturus* sp.

6a. Origin of first dorsal fin posterior to pelvic-fin origins ..... *Halaelurus buergeri*

6b. Origin of first dorsal fin slightly anterior to pelvic-fin origins....*Cephalurus cephalus*

Key to Squaliformes families (classical key for taxonomists or trained scientists/observers)

1a. Teeth similar in both jaws, oblique, blade-like, with single smooth-edged cusp, without cusplets; caudal fin without subterminal notch..... **Squalidae**

1b. Teeth dissimilar in both jaws, with prominent single cusp, possibly flanked by lateral cusplets; caudal fin with subterminal notch..... **2**

2a. Flanks, underside of body and caudal fin with conspicuous black markings with photophores (light organs)..... **Etmopteridae**

2b. Flanks, underside of body and caudal fin without conspicuous black markings or photophores.....**3**

3a. Upper teeth broad-based, with cusps narrow and blade-like, lower teeth low, with cusps oblique to semi-erect; dorsal-fin spines prominent...**Centrophoridae**

3b. Upper teeth with relatively narrow bases, not blade-like, lower teeth high and wide; dorsal-fin spines short and inconspicuous or absent.....**4**

4a. Head moderately broad and somewhat flattened or conical; dorsal-fin spines variably present or absent (depending on species) .....**Somniosidae**

4b. Head narrow and rounded conically; dorsal-fin spines absent from most genera (except *Squaliolus*).....**Dalatiidae**

Comments: the above mentioned key provides a combination of characters that are usually used to identify members of the five families. Many characters require close examination and cannot be omitted.

Key to Squaliformes families, genera and species that occur or are likely to occur in the CA of NPFC (adjusted for users with limited training)

1a. Caudal fin without a subterminal notch..... **Squalidae** (Squalidae unid.)

1b. Caudal fin with a subterminal notch..... **2**

2a. Flanks, underside of body and caudal fin with conspicuous black markings with photophores (light organs)..... **3**

2b. Flanks, underside of body and caudal fin without conspicuous black markings or photophores.....**4**

3a. Teeth comb-like, knife-like, with a cusp and usually cusplets.....Etmopteridae unid. (*Etmopterus* or *Centroscyllium*)

3b. Teeth fang-like, curved ..... *Trigonognathus kabeyai*

4a. Dorsal-fin spines prominent.....**5**

4b. Dorsal-fin spines short and inconspicuous or absent.....**6**

5a. Snout flat and long.....*Deania* sp.

5b. Snout short..... *Centrophorus* sp.

6a. Head broad and snout flat.....**7**

6b. Head narrow and rounded conically, snout short.....**8**

7a. Dorsal–fin spines absent.....*Somniosus* sp.

7b. Dorsal–fin spines present, though sometimes short and partly covered by skin ..... Somniosidae unid. (*Centroscymnus, Zameus squamulosus, Scymnodon ichiharai*)

8a. **7**

8b. Head narrow and rounded conically; dorsal-fin spines absent from most genera (except *Squaliolus*).....**Dalatiidae**