Annex 1

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CONVENTION ON INTERNATIONAL TRADE IN ENDANGERED SPECIES
OF WILD FAUNA AND FLORA

Twentieth meeting of the Conference of the Parties
Samarkand (Uzbekistan), 24 November – 5 December 2025

CONSIDERATION OF PROPOSALS FOR AMENDMENT OF APPENDICES I AND II

A. Proposal

Inclusion of the dwarf gulper shark (*Centrophorus atromarginatus*), and the gulper shark (*Centrophorus granulosus*) in Appendix II in accordance with Article II paragraph 2(a) of the Convention and satisfying Criterion A and B in Annex 2a of Resolution Conf. 9.24 (Rev. CoP17).

Inclusion of all other species in the Family Centrophoridae (gulper sharks): *C. harrissoni*, *C. isodon*, *C. lesliei*, *C. longipinnis*, *C. moluccensis*, *C. seychellorum*, *C. squamosus*, *C. tessellatus*, *C. uyato*, *C. westraliensis*, *Deania calceus*, *D. profundorum*, *D. quadrispinosa* and any other putative species within the family Centrophoridae in Appendix II in accordance with Article II paragraph 2(b) of the Convention and satisfying Criterion A in Annex 2b of Resolution Conf. 9.24 (Rev. CoP17).

Dwarf gulper shark (*Centrophorus atromarginatus)*

Gulper shark (*Centrophorus granulosus)*

Qualifying Criteria that are met (Conf. 9.24 Rev. CoP17)

Annex 2a, Criterion A. It is known, or can be inferred or projected, that the regulation of trade in the species is necessary to avoid it becoming eligible for inclusion in Appendix I in the near future.

The deepwater sharks *Centrophorus atromarginatus* and *C. granulosus* have both undergone population declines of >80% in significant parts of their ranges due to overexploitation for the international liver oil trade. This has resulted in assessments for the IUCN Red List of Threatened Species of Critically Endangered for *C. atromarginatus* and Endangered for *C. granulosus* (Finucci et al. 2024a, Rigby et al. 2024). Gulper sharks have the highest value liver oil of all sharks and consequently they are targeted and increasingly retained from bycatch for the liver oil trade (Finucci et al. 2024b). The targeting and bycatch retention is mostly in unregulated and unmanaged fisheries which has driven dramatic and rapid population declines. Both species have extremely low biological productivity and thus, very limited ability to withstand exploitation which is evidenced by rapid population declines when targeted. Population declines are projected to continue due to the ongoing international demand for their high-quality liver oil. The Critically Endangered *C. atromarginatus* fulfils the CITES biological criteria for inclusion in Appendix I. Both these low-productivity marine species fulfil the CITES criteria for inclusion in Appendix II with regulation of their trade critical to ensure their populations do not further decline globally to the point where they require listing on Appendix I.

Annex 2a, Criterion B. It is known, or can be inferred or projected, that regulation of trade in the species is required to ensure that the harvest of specimens from the wild is not reducing the wild population to a level at which its survival might be threatened by continued harvesting or other influences.

Targeted catch and retention from bycatch of both *C. atromarginatus* and *C. granulosus* is due to the species having the highest value shark liver oil on the international market. These species have the highest squalene content, which is the traded product extracted from the oil (Finucci et al. 2024b). Their unregulated catch in largely unmanaged fisheries has caused significant and rapid population declines of these two species. With limited management in place, in the absence of international regulation, the high value of *C. atromarginatus* and *C. granulosus* liver oil combined with their extremely low biological productivity, will drive their continued overfishing, and in turn additional declines globally, thus threatening the survival of wild populations.

Annex 2b, Criterion A: The specimens of the species in the form in which they are traded resemble specimens of a species included in Appendix II under the provisions of Article II, paragraph 2 (a), or in Appendix I, so that enforcement officers who encounter specimens of CITES-listed species are unlikely to be able to distinguish between them.

The gulper shark (Centrophoridae) family is one of the most taxonomically complex shark families. It is very difficult to visually distinguish among species within the genus *Centrophorus* as the overall morphological changes between a juvenile and adult gulper shark are often greater than the differences between species (White et al. 2013, 2017a, 2022; Ebert et al. 2021a; Marrero et al. 2023). This, combined with overlapping ranges, has led to confusion and inaccurate species-specific data collection for all gulper shark species, often leading to this group reported under a generic category (i.e., *Centrophorus* spp.). This is also true for the main product traded, shark liver oil, and for the meat and fins. Although *Deania* can be morphologically separated from *Centrophorus*, these genera co-occur, and their traded products cannot be visually distinguished. In addition, fisheries that generally retain gulper sharks are mainly only retaining products of those species, including the lookalike species, and hence; while ensuring, there is a clear rationale to list all the species in the family to ensure there is no opportunity for laundering products as from non-listed species. The challenge in distinguishing species from this family provides a clearer management process for CITES implementation. A listing of all species in the gulper shark family in Appendix II, under Criteria Annex 2b, Criterion A will avoid the opportunity for illegal trade in *C. atromarginatus* and *C. granulosus* and products to occur, labelled as non-listed *Centrophorus* and/or *Deania* species.

B. Proponent

This proposal is presented by the United Kingdom of Great Britain and Northern Ireland and the European Union.

C. Supporting statement

1. Taxonomy

1.1 Class: Chondrichthyes (Subclass: Elasmobranchii)

1.2 Order: Squaliformes

1.3 Family: Centrophoridae (entire family)

1.4 Table 1: Genus, species, including author and year, common name, and IUCN Red List of Threatened Species status

Scientific Name	**Common Name**	**IUCN Red List Status**
Annex 2a, Criterion A and B		
Centrophorus atromarginatus (Garman, 1913)	EN: Dwarf gulper shark ES: Quelvacho de márgenes negros	Critically Endangered
Centrophorus granulosus (Bloch & Schneider, 1801)	EN: Gulper shark FR: Squale-chagrin commun ES: Quelvacho	Endangered
Annex 2b, Criterion A		
Centrophorus harrissoni (McCulloch, 1915)	EN: Harrisson's dogfish FR: Squale-chagrin bilimélé	Endangered

	ES: Quelvacho galludo	
Centrophorus isodon (Chu, Meng & Liu, 1981)	EN: Blackfin gulper shark	Endangered
Centrophorus lesliei (White, Ebert & Naylor, 2017)	EN: African gulper shark	Endangered
Centrophorus longipinnis (White, Ebert & Naylor, 2017)	EN: Longfin gulper shark	Endangered
Centrophorus moluccensis (Bleeker, 1860)	EN: Endeavour dogfish FR: Squale-chagrin cagaou ES: Quelvacho de aleta corta	Vulnerable
Centrophorus seychellorum (Baranes, 2003)	EN: Seychelles gulper shark	Least Concern
Centrophorus squamosus (Bonnaterre, 1788)	EN: Leafscale gulper shark FR: Squale-chagrin deL'Atlantique ES: Quelvacho negro	Endangered
Centrophorus tessellatus (Garman, 1906)	EN: Mosaic gulper shark FR: Squale-chagrin mosaïque ES: Quelvacho mosaico	Endangered
Centrophorus uyato (Rafinesque, 1810)	EN: Little gulper shark FR: Petit squale-chagrin ES: Quelvacho negro	Endangered
Centrophorus westraliensis (White, Ebert & Compagno, 2008)	EN: Western gulper shark	Data Deficient
Deania calceus (Lowe, 1839)	EN: Birdbeak dogfish FR: Squale savate ES: Tollo pajarito	Near Threatened
Deania profundorum (Smith & Radcliffe, 1912)	EN: Arrowhead dogfish FR: Squale-savate Lutin ES: Tollo flecha	Near Threatened
Deania quadrispinosa (McCulloch, 1915)	EN: Longsnout dogfish FR: Squale-savate à long nez ES: Tollo trompalarga	Vulnerable

Note: *Deania hystricosa* is now considered a junior synonym of *Deania calceus* (Rodríguez-Cabello et al. 2020; Stefanni et al. 2021; Marrero et al. 2023; Simon Weigmann, Chair Integrative Taxonomy Working Group, IUCN Shark Specialist Group pers. comm.)

1.5 Scientific synonyms:

C. atromarginatus**: Centrophorus armatus* ssp. *barbatus* Teng, 1962/ ***C. granulosus: *Centrophorus acus* Garman, 1906, *Centrophorus lusitanicus* Barbosa du Bocage & de Brito Capello, 1864, *Centrophorus niaukang* Teng, 1959/ ***C. harrissoni***: none/ ***C. isodon***: *Pseudocentrophorus isodon* Chu, Meng & Liu, 1981/ ***C. lesliei***: none/ ***C. longipinnis***: none/ ***C. moluccensis***: *Centrophorus scalpratus* McCulloch 1915/ ***C. seychellorum***: none/ ***C. squamosus***: *Centrophorus ferrugineus* Meng, Hu & Li, 1982, *Centrophorus nilsoni* Thompson, 1930, *Centroscymnus fuscus* Gilchrist & von Bonde, 1924/ ***C. tessellatus***: none/ ***C. uyato***: *Squalus uyato* Rafinesque, 1810, *Centrophorus granulosus* Bloch & Schneider, 1801 (part), *Centrophorus zeehaani* White, Ebert & Compagno, 2008/ ***C. westraliensis***: none/ ***Deania calceus***: *Centrophorus crepidalbus*, Barbosa du Bocage & de Brito Capello 1864, *Centrophorus kaikourae*, Whitley 1934, *Deania hystricosa* (Garman 1906) / ***D. profundorum***: *Deania profundora* (Smith & Radcliffe, 1912), *Deania elegans* Springer 1959/ ***D. quadrispinosa***: *Acanthidium quadrispinosum* McCulloch, 1915.

1.6 Common names: See section 1.4

1.7 Code numbers: not applicable.

2. Overview

Centrophorus atromarginatus and *C. granulosus* are deepwater species patchily distributed in the Indo-Pacific and Atlantic Oceans at depths of 100–540 m and 50–1,500 m, respectively. They have undergone dramatic and rapid population declines of >80% in all oceans due to overexploitation in mostly unregulated fisheries for international trade of their high value liver oil (Finucci et al. 2024a, b Rigby et al. 2024). Both species have k-selected life histories; *C. atromarginatus* usually only has one pup per litter, possibly only every 2–3 years. *Centrophorus granulosus* has

4–11 pups per litter (mostly 4–6) every 2 years with maturity estimated to occur at 17 years and a long life of 39 years, resulting in a long generation length of 28 years. Thus, these species have very limited ability to withstand high levels of exploitation and are very slow to recover from overexploitation; it was estimated that *C. granulosus* would take 43 years to recover from overfishing in the absence of fishing pressure (Simpfendorfer and Kyne 2009).

The species are targeted and retained from bycatch in mostly unregulated and unmanaged industrial and artisanal fisheries across their ranges due to them having the highest value shark liver oil of all shark species (Bakes and Nichols 1995, Francis 2022, Kizhakudan et al. 2024). Squalene is the internationally traded product extracted from shark liver oil, and the livers of these species and other gulper sharks have the highest percent content of squalene. Severe and rapid population declines of >80% have been reported for both species in all parts of their ranges, with *C. atromarginatus* targeted in nearly all its restricted range leading to a global Critically Endangered status, that is, global decline >80% (Rigby et al. 2024). *Centrophorus granulosus* also has been heavily targeted in much of its range with dramatic and rapid declines but has some refuge at depth beyond the reach of fishing gear and was assessed as Endangered, i.e., global decline of 50–80% (Finucci et al. 2024a). Due to their extremely low productivity, stocks can rapidly deplete and hence, liver oil fisheries are considered boom and bust, with the fishery moving on sometimes after only four years due to 'commercial extinction' of the stocks (e.g., Flores 2004, Akhilesh and Ganga 2013). These deepwater shark fisheries are mostly unregulated, except for in parts of the Northeast Atlantic and Southwest Pacific where concerns about their status have led to some fisheries management measures.

The gulper sharks are one of the most taxonomically complex shark families (White et al. 2013, 2017a, 2022; Ebert et al. 2021a; Marrero et al. 2023). Taxonomic uncertainty and identification issues have led to this group reported under a generic category (i.e., *Centrophorus* spp). The *Centrophorus* species are difficult to visually distinguish from one another which is also the case for the liver oil, and meat and fins that are traded. The same is true for liver oil, meat, and fins from the other genera within Centrophoridae, such as *Deania* which liver oil, meat and fins cannot be visually distinguished from one another or from those of *Centrophorus* species. Nearly all gulper shark species are traded for their liver oil and the family is the most threatened of all deepwater shark families (Finucci et al., 2024b).

For two decades, significant concerns about gulper shark depletions have been raised at CITES meetings with calls for their improved management and conservation, even as stock depletions worsen (AC20 WG8 Doc 1, CoP 13 Doc 35, CoP 14 Doc 59.1, AC 23 Doc 15.2, AC 25 Inf. 7, AC 26 Doc 16.2, AC28 Doc 17.1.2). No CITES action has been taken despite the repeated flagging of concerns and ongoing declines, and an Appendix II listing is overdue. An Appendix II listing for the Centrophoridae family is necessary to regulate their international trade before their populations further decline to the point where they require listing on Appendix I.

3. Species characteristics

3.1 Distribution

Centrophorus atromarginatus is patchily distributed across the Northwest and Western Central Pacific, and the Eastern and Western Indian Oceans (Figure 1a). It occurs in southern Japan, Taiwan, Province of China, northern Papua New Guinea, Indonesia, India, Sri Lanka, Oman, Somalia (Gulf of Aden), and possibly Pakistan (White et al. 2006, Jabado et al. 2017, White et al. 2017b, Fernando et al. 2019, Ebert et al. 2021a).

Centrophorus granulosus has a widespread, yet patchy, global distribution in the Atlantic and Indo-Pacific Oceans (Ebert et al. 2021a) (Figure 1b). Its range states are detailed in Annex 1. This species may also occur in Areas Beyond National Jurisdiction.

In general, gulper sharks are mostly deepwater species recorded worldwide, except in the Northeast Pacific and at very high latitudes, occurring in cold-temperate to tropical waters at depths of mainly 200–1,500 m (Ebert *et al.* 2021a).

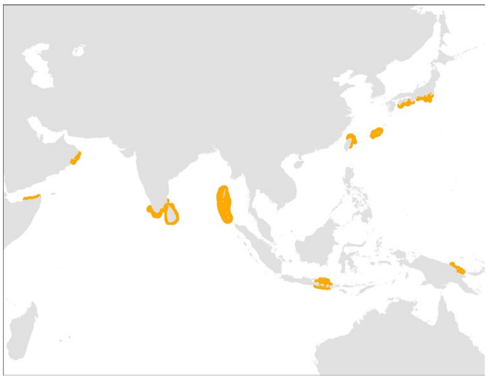

Figure 1a. Distribution of *Centrophorus atromarginatus* (Rigby et al. 2024, Ebert et al. 2021a).

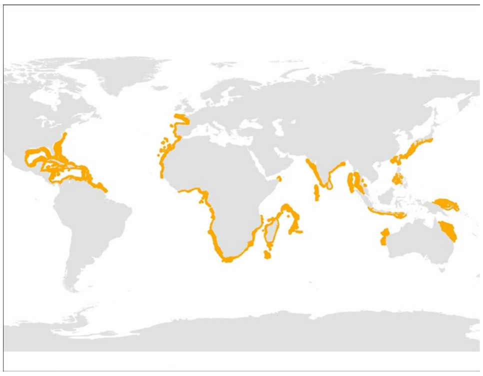

Figure 1b. Distribution of *Centrophorus granulosus* (Ebert et al. 2021a)

3.2 Habitat

Centrophorus atromarginatus occurs in association with the seafloor on the upper continental slope at depths of 100–540 m (White et al. 2017a, Ebert et al. 2021a). Little else is known about its habitat use. *Centrophorus granulosus* occurs on or near the seafloor on continental and insular shelves and slopes at depths of 50–1,500 m (possibly down to 2,307 m), and mostly 300–1,100 m (Weigmann 2016, Ebert et al. 2021a, Finucci et al. 2024a). As individuals increase in size they move into deeper waters (Ebert et al. 2021a).

The two species may undertake vertical diel migrations and horizontal migrations, as reported for some other gulper sharks, though the scale of migrations varies markedly between species e.g., *C. uyato* and *C. squamosus* undertake diel vertical migrations moving up the continental slope at night to feed on micronekton (diverse communities that include small fishes, crustaceans and squid) (Daley et al. 2015, Rodríguez-Cabello et al. 2014). *Centrophorus squamous* has also been shown to be highly migratory in the Northeast Atlantic moving 530 km in 45 days (Rodríguez-Cabello et al. 2016). In contrast, *C. uyato* movements in Australia were limited to a discrete area with an average movement range of only 20 km (Daley et al. 2015).

3.3 Biological characteristics

Deepwater sharks, such as those in the Centrophoridae family, spend most of their lifecycle at depths below 200 m. Their life history traits cause them to be inherently more vulnerable to overexploitation than their counterparts in shelf and pelagic habitats. They have slower growth rates, later age-at-maturity, higher longevity and consequently lower population growth rates than most shark species from shelf and pelagic habitats (Garcia et al. 2008, Rigby and Simpfendorfer 2015, Pardo et al. 2022, Finucci et al. 2024b). Their vulnerability to overexploitation is driven by a conservative (i.e. slow) life history, defined by late maturity, long lives, low fecundity, and long gestation periods. As, in general, K-selection increases with depth, this combination of traits warns that the deeper the fishing, the less capacity deepwater sharks have to recover from exploitation (Rigby and Simpfendorfer 2015).

The two species proposed for inclusion based on Article II paragraph 2(a) of the Convention have extremely conservative life histories. Reproduction for both species is viviparous with low litter sizes. *Centrophorus atromarginatus* has 1–2 pups per litter, though usually one pup, and reproductive periodicity is unknown but could be 2–3 years based on other *Centrophorus* species (Kyne and Simpfendorfer 2007, White et al. 2017b). Males mature at 56 cm total length (TL) and females mature at 75 cm TL with size-at-birth ~28–36 cm TL (Ebert et al. 2021a). Age parameters are unknown but are inferred to be similar to *C. granulosus*, resulting in a long generation length of 28 years.

Centrophorus granulosus has litter sizes of 4–11, but mostly 4–6 pups with a two-year reproductive cycle (Guallart and Vicent 2001, White et al. 2013, Cotton et al. 2015, Ebert et al. 2021a). Pregnant *C. granulosus* females segregate from the rest of the population and inhabit shallower and/or warmer waters (Cotton 2010, Moura et al. 2014). This increases the potential impact of capture on the population if fisheries operate in areas of pregnant females. Mature and post-natal females also spatially segregate from the rest of the population and at least two nursery areas are suspected off the West African coast, i.e., Namibia and Mauritania (Moura et al. 2014).

Centrophorus granulosus males mature at 111 cm TL and females mature at 143 cm TL with size-at-birth 30–47 cm TL (Ebert et al. 2021a). Age-at-maturity is estimated from a congener *C. uyato* in the Mediterranean as 8.5 years for males and 16.5 years for females with maximum age estimates of 25 years and 39 years for males and females, respectively (Guallart 1998). This results in a generation length of 28 years. Growth rates of C*. granulosus* are very slow; estimated as k= 0.107 year^{-1} and k= 0.096 year^{-1} for males and females, respectively (Guallart 1998, Kyne and Simpfendorfer 2007). *Centrophorus granulosus* has a very low intrinsic rebound potential of 0.0161 year^{-1} (4 pups; C. Simpfendorfer pers. comm. 2024) which means it would take 43 years for the population to double in the absence of fishing pressure, and thus, has very limited ability to withstand high levels of exploitation and is very slow to recover from overexploitation (Simpfendorfer and Kyne 2009).

Centrophoridae (gulper sharks) are typical deepwater sharks and are among the least productive of all sharks and rays (Kyne and Simpfendorfer 2007). They all mature late, have small litters, and have long gestation periods which all lead to very limited biological productivity (Forrest and Walters 2009, Dulvy and Forrest 2010, Daley et al. 2019, Ebert et al. 2021a, Finucci et al. 2024b). This makes gulper shark populations highly susceptible to overfishing with recovery from overexploitation extremely slow. For example, it would take 86 years for the previously overfished *C. harrissoni* in Australia to recover to just 25% of its original population size in marine reserves that prohibit fishing (AFMA 2022, CITES 2024). Some species, e.g., *Deania calceus* and *D. profundorum,* form schools or large aggregations, a behaviour that increases susceptibility to large numbers of individuals being captured in a short time-frame (Finucci et al. 2018, Ebert et al. 2021a).

3.4 Morphological characteristics

Many deepwater sharks, including gulper sharks, are distinguished from other sharks by the lack of an anal fin. Gulper sharks are differentiated from other deepwater sharks by their teeth (upper teeth relatively broad and blade-like and lower teeth low, wide and blade-like) (Ebert et al. 2021a). All gulper sharks have large green or yellowish eyes and two dorsal fins with grooved fin spines. They are small to moderately large with cylindrical or slightly compressed bodies. They lack ridges, precaudal pits and caudal keels. They have five gill slits before the pectoral fins, large spiracles behind the eyes, and no nictitating eyelids. Their snout is broad, flattened, and lacks barbels. They have a strongly asymmetrical caudal fin with a subterminal notch. Their dermal denticles are close-set, and their body colour ranges from greyish to blackish brown without distinct markings or luminescent organs (Carpenter, 2002). *Centrophorus* species have a moderate-sized snout, angular or greatly lengthened pectoral fin free rear tips, and tough and relatively smooth skin compared to *Deania* species that have a very long snout and rougher skin (White et al. 2013, Ebert et al. 2021a).

It is very difficult to visually distinguish species within *Centrophorus* as the overall morphological changes between a juvenile and adult gulper shark species are often greater than the differences between species (White et al. 2013, 2017a, 2022; Ebert et al. 2021a; Marrero et al. 2023). The gulper sharks are one of the most taxonomically confusing and complex shark families with major identification problems. A recent taxonomic revision reduced the number of species; some species were previously distinguished based on their dermal denticles that have now been found to change with size rather than being indicative of separate species (White et al. 2013, Ebert et al. 2021a, Marrero et al. 2023). Genetic tools are available to identify the separate gulper shark species (See Section 9).

Centrophorus atromarginatus is a relatively small shark, reaching a maximum size of 99 cm TL (Weigmann 2016). It has smooth grey or grey-brown skin with dusky fins, dark fin tips (juveniles only), a fairly long thick snout, pectoral fin rear tips elongate, second dorsal fin only slightly smaller than first, and dorsal fin spines moderately long and slender (White et al. 2017b, Ebert et al. 2021a).

Centrophorus granulosus is a small-medium sized shark, reaching a maximum size of 176 cm TL (Weigmann 2016). Its skin and body colour is similar to that of *C. atromarginatus* but can be more brownish and it has similar fin colours. Compared to *C. atromarginatus*, its snout is a bit shorter, the dorsal fins more similar in height, and the dorsal fin spines are shorter and more robust (White et al. 2013, 2017a; Ebert et al. 2021a).

3.5 Role of the species in its ecosystem

The diet of *C. atromarginatus* includes small bony fishes and shrimps while that of *C. granulosus* is mainly small sharks, bony fishes, cephalopods, and crustaceans (Megalofonou and Chatzispyrou 2006, White et al. 2017b, Ebert et al. 2021a, Martin and Mallefet 2023). Deepwater sharks' role in the deepwater ecosystem has not been clearly defined, although they are suspected to play an important role based on a number of factors. Their high trophic level (predators), a relatively large body size for the deepwater habitat, and the wide-ranging nature of some species means their role may include: vertical transfer of nutrients from the surface to deepwater through feeding on mesophotic fishes and crustaceans, horizontal nutrient transfer through foraging, can be important prey items for other deepwater species, and fear and dominance on demersal fish assemblages (Heupel et al. 2014, Jackson et al. 2021, Finucci et al. 2024b). As top predators, sharks adaptive foraging may also assist with ecosystem stability in environments impacted by fishing (Dunn et al. 2013). That is, as these species have broad diets and the ability to switch between diverse prey, when an area is fished, they are able to switch prey if other normal prey are not available. This means that the system retains a level of predation that helps keep it stable, but the sharks are also able to survive because they do not have a narrow selective diet. Improved management, if this proposal is adopted, would occur through ensuring all traded individuals were from sustainable and legal sources, and would ensure that these gulper sharks are able to continue to contribute to the integrity of deepwater ecosystems.

4. Status and trends

4.1 Habitat trends

Fisheries are increasingly moving into deeper waters as coastal fisheries decline in response to greater fishing pressure (Norse et al. 2012, Watson and Morato 2013, Victorero et al. 2018). This is a direct threat to populations of the two species and other gulper sharks, as overfishing is the primary threat to these species. It also is a threat to deepwater habitats, particularly from demersal trawl gear that can detrimentally impact seafloor habitats and that may also reduce areas of habitat refuge from fishing pressure for some gulper sharks. For example, within *C. granulosus* range, in the Seychelles, there has been a general expansion of fisheries into deeper waters and in Taiwan, Province of China, where C*. atromarginatus* also occurs, over the past 30 years, the deepwater trawl fishery has moved to deeper waters (Finucci et al. 2024a, Rigby et al. 2024a).

Resource extraction in deepwater habitats, for example mining for polymetallic nodules, poses considerable potential risk to the two species and other gulper sharks through the disturbance to their habitat (Heffernan 2023). In addition, marine debris, such as plastics and ghost nets, pose threats to the two species and other gulper sharks due to the risk of entanglement, ingestion, bioaccumulation, and degradation of habitat (Woodall et al. 2014, Amon et al. 2020). Climate change impacts in the deepwater habitat are beginning to be understood and have been shown to influence the distributions of deepwater sharks and skates in European waters with their suitable habitat shifting spatially and to deeper waters (Sguotti et al. 2016, Coulon et al. 2024). All of these habitat pressures will likely lead to further population declines in these two species and other gulper sharks, without improved management. While these threats need to be addressed and managed, a global analysis of threats to deepwater sharks found these habitat threats to be secondary compared to overfishing (Finucci et al. 2024b).

4.2 Population size

There is no information on population size for the two species or any of the gulper sharks. Population abundance trends are detailed in Section 4.4.

4.3 Population structure

Population structure for the two species is unknown. Genetic population structure has been studied for only one gulper shark species, *C. squamosus* which occurs in the Atlantic, Indian, and Southwest Pacific Oceans (Veríssimo et al. 2012). This study found the species to be a single global population, however, there was evidence of limited female dispersal, and it may engage in site philopatry (Veríssimo et al. 2012).

4.4 Population trends

Population declines of >80% for *C. atromarginatus* and *C. granulosus* are reported in all parts of their ranges and in all oceans. *Centrophorus atromarginatus* is targeted in nearly all of its restricted range leading to a global Critically Endangered status, that is, global decline >80% (Rigby et al. 2024). *Centrophorus granulosus* also has been heavily targeted and retained from bycatch in much of its range with dramatic and rapid declines but has some refuge at depths beyond the reach of fishing gear and was assessed as globally Endangered, i.e., global decline of 50–80% (Finucci et al. 2024a). Extremely rapid population declines have occurred when these species and other gulper sharks are targeted in mostly intensive and unmanaged deepwater fisheries. This has caused ‘commercial extinction' and fishers move onto new fishing grounds, repeating the dramatic depletions (e.g., Flores 2004, Ali 2015).

Taxonomic uncertainty and identification issues have led to some confusion over the species-specific distribution of gulper sharks, often leading to this group reported under a generic category in catch and landings data (i.e., *Centrophorus* spp.). In some population trend studies, scientists have identified the species whereas other studies only report *Centrophorus* spp. Population trend studies that specifically identify *Centrophorus atromarginatus* and *C. granulosus* are summarised in Table 2 with more detailed information in the text following the table. If other species were identified they are also included along with additional ‘possible' Centrophoridae species that occur within the range of the fisheries and could also have been caught. Population trend studies are also included where only *Centrophorus* spp. was reported but possibly include *C. atromarginatus* and *C. granulosus* based on range. Additional 'possible' species that occur within the range of the fisheries were added.

Table 2: Population declines for *Centrophorus atromarginatus* and *Centrophorus granulosus.* The decline includes historic rate of decline (3 generation lengths (3GL)) where the recent rate of decline is <70%. Multiple species are included in the species column because not all studies report species. The lead species are in bold and if specifically identified are at the beginning of the list, with other 'possible' species added that occur within the fisheries range. Where only *Centrophorus* spp. is reported but in the lead species range, the 'possible' lead species is noted, along with other 'possible' species within the fisheries range. Source references for the declines are cited in the text following the table.

Decline	Region	Time Period	Species
	Indo-Pacific Ocean		
47% (4 years), >99% (83 years)	East Nusa Tenggara, Indonesia	4 years (2011–2014) and 83 years (3GL*)	***C. granulosus****, C. squamosus.* Possible *C. atromarginatus, C. isodon, C. longipinnis, C. moluccensis.*
88%	Lombok, Indonesia	3 years (2016–2018)	*Centrophorus* spp. Possible ***C. atromarginatus*, *C. granulosus*,** *C. isodon, C. longipinnis, C. moluccensis, C. squamosus.*
	Pacific Ocean		
>80%	Taiwan, Province of China	22 years (1988–2009)	***C. atromarginatus***
88%	Taiwan, Province of China	41 years (1975–2015)	*Centrophorus* spp. Possible ***C. granulosus****, C. isodon, C. longipinnis, C. moluccensis, C. squamosus, C. uyato, D. calceus.*
87%	Philippines	14 years (1980–1993)	*Centrophorus* spp. Possible ***C. granulosus****, C. isodon, C. longipinnis, C. moluccensis, C. squamosus.*
99%	Japan	64 years (1950–2014)	*Centrophorus* spp. includes ***C. atromarginatus.*** Possible ***C. granulosus****, C. moluccensis, C. squamosus, C. tessellatus, C. uyato*, and *D. calceus*.
	Indian Ocean		
97%	Maldives	21 years (1982–2002)	*Centrophorus* spp. includes ***C. granulosus*,** *C. squamosus*. Possible *C. tessellatus*.
66% (4 years), >99% (83 years)	Cochin, Indian	4 years (2008–2011) and 83 years (3GL)	*Centrophorus* spp. includes ***C. atromarginatus***. Possible ***C. granulosus****, C. moluccensis, C. squamosus, C. uyato.*
56% (4 years), >99% (83 years)	South Andaman Islands	4 years (1998–1992) and 83 years (3GL)	***C. granulosus****.* Possible ***C. atromarginatus,*** *C. moluccensis.*
93%	Sri Lanka	40 years (1980–2019)	*Centrophorus* spp. Possible ***C. atromarginatus*, *C. granulosus*,**

			C. isodon, *C. moluccensis*, *C. squamosus*, *C. uyato.*
	Atlantic Ocean		
10% (annual rate of decline 9 years), >80% (83 years)	Gulf of Mexico	9 years (2011–2018) and 83 years (3 GL)	***C. granulosus***
86% (10 years), > 99% (83 years)	Mauritania	10 years (1992–2001) and 83 years (3 GL)	***C. granulosus****, C. squamosus, D. calceus, D. profundorum.* Possible *C. lesliei, C. uyato.*
96%	Portugal	13 years (1996–2009)	***C. granulosus***
	High Seas		
93%	SIOFA (Southern Indian Ocean Fisheries Agreement)	7 years (2015–2022)	***C. granulosus****.* Possible *C. squamosus*, *D. calceus*, *D. profundorum*.

* Generation length in all instances was calculated from female median age at maturity (Amat) and maximum age (Amax) as GL = ((Amax − Amat)z) + Amat where z=0.5 as defined in Red List Guidelines (IUCN Standards and Petitions Committee 2022)

Indo-Pacific Ocean

Across Indonesia, gulper sharks are targeted in demersal deepwater longline fisheries (White and Dharmadi 2010). Data from one of these targeted demersal longline fisheries for gulper sharks landed in Tenau, East Nusa Tenggara, documented a decline in catch-per-unit-effort (CPUE) from 146 kg/trip to 77 kg/trip between 2011–2014. This is a rapid 47% decline and equates to an estimated >99% population decline over three generation lengths (83 years) of *C. granulosus* which was found to account for 15–20% of *Centrophorus* spp. catch (Samusamu and Dharmadi 2017). *Centrophorus squamosus* was also identified and accounted for 10–13% of *Centrophorus* catch (Samusamu and Dharmadi 2017). Based on the range of other gulper sharks in the area, the fisheries catch could possibly include *C. atromarginatus, C. isodon, C. longipinnis,* and *C. moluccensis.*

In addition, the total catch of dogfishes, a mixed category for more than 10 species (Centrophoridae, including *C. atromarginatus* and *C. granulosus*, and Squalidae), reported to the Indonesian National Shark Data Collection program decreased from 14,472 t to 4,820 t between 2006–2016 (DGCF 2017). This equates to a >80% population decline over three generation lengths (~83 years) of *C. granulosus*.

In Lombok, Indonesia the estimated CPUE for *Centrophorus* spp. declined dramatically by 88% between 2016–2018 and then remained at the 2018 level in 2019 (Rigby et al. 2020). The exact fishing location for the landings in Lombok is unclear but based on the range of other Centrophoridae in the region, the catch could possibly include *C. atromarginatus*, *C. granulosus*, *C. isodon*, *C. longipinnis*, *C. moluccensis*, and *C. squamosus*.

Pacific Ocean

A population decline of >80% in *C. atromarginatus* is inferred in Taiwan, Province of China where the species was relatively common in landings in the late 1980s but was rare by the 2000s and has not been seen since 2009 (Rigby et al. 2024). Although landings data are not a direct measure of abundance, these can be used to infer population reduction where landings have decreased while fishing effort has remained stable or increased. Fishing effort has increased in Taiwan, Province of China, since 2000, and thus, infers the >80% population reduction.

In Taiwan, Province of China, besides *C. atromarginatus*, there is no species-specific data though landings data are available on all combined shark species (shelf and deepwater species) from fisheries within the Taiwan, Province of China Exclusive Economic Zone (EEZ). These show declines of 88% from 1975–2015, that is, from 32,400 t to 4,023 t (Liao et al. 2019, Rigby et al. 2024). Both industrial and artisanal fishing efforts have increased substantially since 1975. This infers an 88% decline over that period in *C. granulosus*, and although not species-specific, is informative for suspecting the possible levels of decline of this species in Taiwan, Province of China Based on the range of other Centrophoridae in Taiwan, Province of China, the fisheries landings could possibly include *C. isodon*, *C. longipinnis*, *C. moluccensis*, *C. squamosus*, *C. uyato*, and *D. calceus*.

In the Philippines, *Centrophorus* spp. were first targeted in the 1960s for their liver oil with the fishery expanding nationwide from Iloilo (Flores 2004). The liver oil was exported to Japan, HongKong SAR and Mainland China, and the United States of America. In many areas of the Philippines, the target fishery was highly profitable upon commencement but without any effective management, usually collapsed after 10 years (Flores 2004). Annual exports of shark liver oil from the Philippines peaked at 336 t in 1980 and declined to 45 t in 1993 which is an 87% decline (BFAR 2017). These export quantities and periods are different to those reported to FAO (2024) but they also follow a similar fishery trend of dramatic declines with exports for 3–7 years in a row each decade (see Section 6.2). In addition, dogshark landings declined from 418 t to 190 t from 1980–2002 which is a 48% decline (BFAR 2009). Based on the range of *Centrophorus* spp. in the Philippines, the catches of species used for liver oil could possibly include *C. granulosus, C. isodon*, *C. longipinnis*, *C. moluccensis*, and *C. squamosus*.

In Japan, *C. atromarginatus* was targeted for its liver oil in Suruga Bay, Honshu with deepwater gillnets; however, there is no species-specific catch data available (McCormack and White 2009), and while it is uncertain if it is still targeted it is still retained when caught as bycatch (Nakajima et al. 2022). Reconstructed catches of sharks, rays, and skates based on landings data are available between 1950–2014 for the Exclusive Economic Zone (EEZ) and show declines of 99% from 1,300 t to 14 t annually (Zeller and Pauly 2016). Some of the catch decline may be due to reduced fishing effort but the level of decline is much greater than the decline in fishing effort which infers there has been an actual decline in the abundance of sharks, rays, and skates in the Japan EEZ. This represents a 99% decline when scaled to three generation lengths (83 years) of *C. atromarginatus and C. granulosus*, and although not species-specific, is informative for estimating the possible levels of reduction of these species in Japan. Based on the range of other Centrophoridae in the region that may have also been caught, such declines could possibly have also occurred for *C. moluccensis*, *C. squamosus*, *C. tessellatus*, *C. uyato*, and *D. calceus*.

Indian Ocean

In the Maldives, the *Centrophorus* spp. stocks collapsed in the early 2000s due to targeted fishing for their liver oil after only about 20 years of exploitation (Anderson and Ahmed 1993, Ali 2015). A 97% population reduction in *Centrophorus* spp. was estimated in the fishery targeting gulper sharks for their liver oil that was exported to Japan (Kyne and Simpfendorfer 2007). The fishery commenced in 1980 and was closed entirely by 2006 due to stock collapse from overfishing that likely occurred soon after 1992 (Anderson and Ahmed 1993, Ali 2015, MRC 2008). The species composition remains unresolved, but three species were identified in 1998 as *C. granulosus, C. squamosus*, and *C. tessellatus*, with *C. granulosus* the most common species taken in the fishery (Adam et al. 1998, MRC 2008). There were no catch time series but export data for shark liver oil was recorded, and exports peaked in 1982 at 87,400 litres and were ~2,000 litres by 2003 towards the end of the fishery (Figure 3). These data can be used to track the rapid growth and steep decline in the fishery and infer the 97% *Centrophorus* spp. population decline from 1982–2003 (Kyne and Simpfendorfer 2007, Finucci et al. 2024b). Since 2010, there has been no shark fishing in the Maldives. No other *Centrophoridae* species are reported from the Maldives.

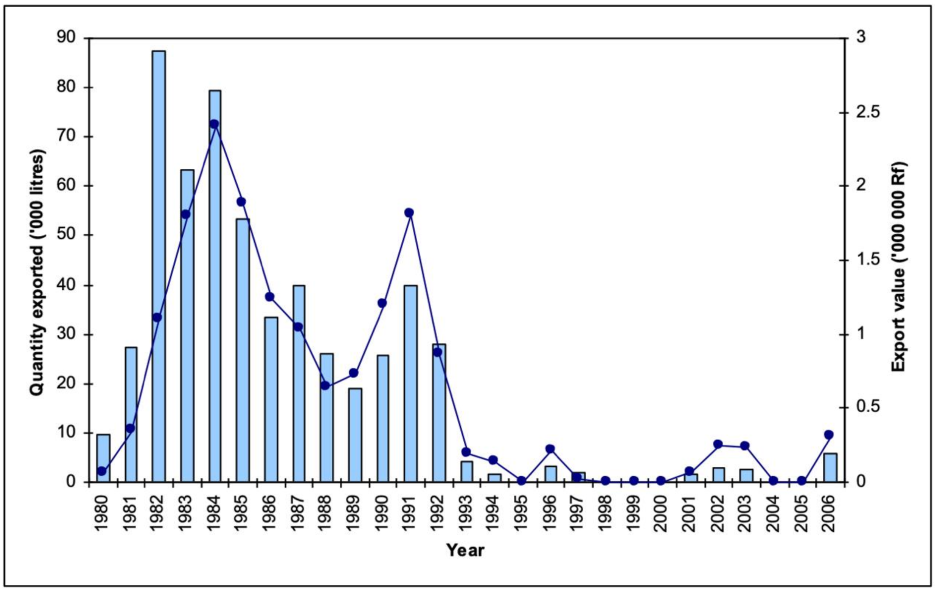

Figure 3. Gulper shark (*Centrophorus* spp.) liver oil exports quantity and value from the Maldives from 1980 to 2006. Source: MRC 2008.

At Cochin, southwestern India, *Centrophorus* spp. stocks are also suspected to have collapsed due to the rapid development of targeted fishing for their liver oil. A >99% population decline in *Centrophorus* spp. over three generation lengths (83 years) is estimated based on dramatic declines in landings of *Centrophorus* spp. for their liver oil. The fishery commenced in 2002 due to demand from pharmaceutical companies and other countries for the shark liver oil, peaked in 2007 then declined until 2011 after which the fishery virtually ceased due to very few catches and small sizes of the sharks caught, though landings still continued. *Centrophorus* spp. landings declined from 114 t to 39 t between 2008–2011 with 66% landings decline in just four years equating to >99% decline over three generation lengths (83 years) of *C. atromarginatus* (Akhilesh et al. 2011, Akhilesh and Ganga 2013, Finucci et al. 2024c, Rigby et al. 2024). The species composition was mostly unknown, although *C. atromarginatus* was reported (Akhilesh and Ganga 2013). Based on the range of other Centrophoridae off southwestern India that may have also been targeted, such levels of declines could possibly also have occurred for *C. granulosus, C. moluccensis*, *C. squamosus*, and *C. uyato*.

Off the South Andaman Islands, India, a 56% reduction in mean CPUE of *C. granulosus* over just 4 years from 1988–1992 was estimated in a small-scale fishery targeting the species for its liver oil ; the CPUE peaked at 112 kg/trip in mid-1988 and was 49 kg/trip by early 1992 (Soundararajan and Roy 2004). This CPUE was reported for *C. granulosus* combined with the other main species caught, that is, Shortnose Spurdog (*Squalus megalops*). This infers a >99% population decline over three generation lengths (83 years) of *C. granulosus*. Based on the range of other *Centrophoridae* off the Andaman Islands, such levels of declines could possibly also have occurred for *C. atromarginatus* and *C. moluccensis* that may have also been targeted.

In Sri Lanka, a 93% reduction in effort has been observed in a targeted gulper shark fishery at Valaichchenai from 1980–2019. Over that period, the number of vessels reduced from 30 to two (Finucci et al. 2024a). The rationale for this reduction in fleet is claimed to be self-regulation of the fishery, although lack of long-term economic and biological viability of the fishery is also suspected (Finucci et al. 2024a). This level of effort reduction is used as a proxy to suspect a similar 93% population decline in *Centrophorus* spp. The species composition of the target fishery is unknown but based on range, could possibly include *C. atromarginatus*, *C. granulosus*, *C. isodon*, *C. moluccensis*, *C. squamosus*, and *C. uyato*.

Atlantic Ocean

In the Gulf of Mexico, a >80% estimated population decline in *C. granulosus* occurred over three generation lengths (83 years). This decline was extrapolated from CPUE data between 2011–2018 that had an annual rate of decline of 10% (Finucci et al. 2024a).

Off Mauritania, landings of the most reported squalid sharks in the Spanish deepwater hake fishery, including the identified *C. granulosus*, *C. squamosus*, *D. calceus*, and *D. profundorum*, are estimated to have declined from 158 t to 22 t from 1992–2001 (Fernández et al. 2005). These sharks are bycatch but retained for their liver oil. This is an 86% decline over 10 years and equates to a >99% population reduction over three generation lengths (83 years) of *C. granulosus.* The landings of these gulper sharks may be underestimated across this period as only the livers are retained and recorded in the landings. Causes of these declines have been attributed to changes in the fishing fleet, economics, and likely over-exploitation of both the target species and bycatch by this fleet and other fishing fleets that operate in the same area (Fernández et al. 2005). Based on the range of other Centrophoridae off Mauritania, such levels of declines could possibly also have occurred for *C. lesliei* and *C. uyato*.

In Portugal, *C. granulosus* landings, from the Portuguese longline fishery declined from a peak of 400 t in 1996 to 17 t in 2009 (Alves et al. 2020, ICES 2022). This is a 96% decline of *C. granulosus* in 13 years. Higher landings of *C. granulosus* prior to 1993 were apparently due to Portuguese trawlers fishing off North Africa that then ceased operations when agreements to fish in those waters ended (Alves et al. 2020). In 2010, restrictive management measures of zero total allowable catch of deepwater sharks were introduced in European Union waters (Alves 2020, ICES 2022). Some subsequent misreporting of gulper sharks was noted; half of the sharks landed as Tope (*Galeorhinus galeus*) were found to be *C. squamosus* or Portuguese dogfish (*Centroscymnus coelolepis*) (ICES 2020). Based on the range of other *Centrophorus* spp. in the Northeast Atlantic that may have also been caught, such declines may also have occurred for *C. squamosus* and *C. uyato*.

Overall, gulper shark declines are not only due to unmanaged large-scale industrial fishing; rapid declines in catches have also occurred in unregulated small-scale fisheries. Records of new species of deepwater sharks are emerging in artisanal fisheries across the Indo-Pacific, providing a warning alert that these fisheries may be fishing in previously unfished areas, are reaching greater depths, or are retaining previously discarded catch (e.g., White et al. 2017b). However, quantitative data from these small-scale Indo-Pacific fisheries is lacking.

High Seas

Of the two lead species, only *C. granulosus* is publicly reported from High Seas catches in the Southern Indian Ocean Fisheries Agreement area. In the North-east Atlantic Fisheries Commission (NEAFC), landings of one individual *C. granulosus* was reported in each of 2019 and 2020, during the period when there was a restrictive deepwater shark bycatch allowance (Thompson 2023). The range of the two *Centrophorus* species also encompasses a number of other deepwater Regional Fisheries Management Organisations although no catch data seems to be publicly available (Thompson 2023).

Southern Indian Ocean Fisheries Agreement (SIOFA)

Some catch data from the European Union fleet operating in the SIOFA region is publicly available (SIOFA 2024a). *Centrophorus granulosus* and *Deania calceus* were reported as two of the top eight most fished species (of all teleosts and sharks, rays, chimaeras) from 2001–2023. Reported *C. granulosus* annual retained catch was 106.1 tonnes (t) in 2008, peaked at 133.7 t in 2015, and rapidly declined to 2.3 t by 2020. A further 9.2 t was reported in 2022, and no catch was reported in 2021 or 2023 (SIOFA 2024a). This is a 93% decline in 7 years; the standardized catch-per-unit-effort data is not publicly available. There was no reported discarded catch (SIOFA 2024a). Gillnet fisheries ceased in the SIOFA Convention area in 2015, however prior to that, catches of *C. granulosus* by targeted gillnet fishing during 2013–2015 declined by 77% from 128 t to 30 t (Georgeson et al. 2020). An ecological risk assessment framework for deepwater sharks in the SIOFA area found *C. granulosus* to have extreme vulnerability across all SIOFA fisheries (Georgeson et al. 2020). Based on the range of other gulper sharks in the area, the fisheries catch could possibly include *C. squamosus*, *D. calceus, D. profundorum*.

4.5 Geographic trends

See section 4.4

5. Threats

The main threat to *C. atromarginatus* and *C. granulosus* is unregulated and unmonitored deepwater industrial and artisanal target and bycatch fisheries where international demand for their high value liver oil drives targeting and bycatch retention. *Centrophorus* species have the highest value shark liver oil of all sharks, yet their conservative life histories make them particularly susceptible to overexploitation from even low levels of unmanaged fishing pressure. Fisheries have collapsed over relatively short periods of time due to the depletion of stocks (<20 years). *Centrophorus atromarginatus* faces an extremely high risk of extinction (Critically Endangered) and *C. granulosus* (Endangered) a very high risk of extinction due to overexploitation. The gulper shark family is one of the top ten most threatened families of sharks and rays, ranked 8th, and is the most threatened of all deepwater shark families with 73% of all gulper shark species assessed at high to extremely high risk of extinction as a result of overfishing (Table S4 Dulvy et al. 2021, Finucci et al. 2024b).

The two species, *C. atromarginatus* and *C. granulosus* are caught in mainly trawl, longline, gillnet, and demersal hook-and-line fisheries and targeted liver oil fisheries for them have occurred in at least Japan, Indonesia, Maldives, India, and Sri Lanka (see Section 4.4). Some of these fisheries are ongoing, such as in Indonesia and the Andaman Islands, India with others emerging (Fahmi and Sentosa 2017, Tyajbi et al. 2020, 2022; Francis 2022, Kizhakudan et al. 2024). There is also a fishery targeting deepwater sharks for their liver oil in Morocco where the longline vessels target them and the trawlers retain them when caught as bycatch (Nafia et al. 2023); this likely includes *C. granulosus*. Target fisheries for the other gulper shark species have taken place in the Northeast and Central Atlantic, Mozambique, Australia and the Southwest Pacific (see Section 9) (Finucci et al. 2024b). The two species and the other gulper sharks are taken incidentally across numerous fisheries that occur within their spatial and depth ranges and are often retained, unless regulations prohibit retention. They are also targeted and retained from bycatch in deepwater high seas fisheries, e.g., in the Southern Indian Ocean (SIOFA) and South Pacific Ocean (in the South Pacific Regional Fisheries Management Organisation Convention area) (Georgeson et al. 2020). Distant water fishing nations and/or flagged vessels, such as the European Union, operate in these Convention areas and catch and retain these species.

Additional threats to these species include deep-sea mining, marine pollution, and climate change which are discussed in Section 4.1. A global analysis of threats to deepwater sharks found these threats were currently relatively minor compared to overfishing (Finucci et al. 2024b).

6. Utilisation and trade

Overview

The liver oil from gulper sharks, including *C. atromarginatus* and *C. granulosus*, is the primary product used from the species and due to its high international value is the main driver of their harvest and retention when caught as bycatch in fisheries (Akhilesh et al. 2011, Kizhakudan et al. 2024, Finucci et al. 2024b). Livers from all species of shark contain squalene, a natural organic compound, that helps maintain buoyancy. While both coastal and deepwater sharks are used for their liver oil, deepwater sharks have very large livers that can account for up to 30% of their body weight (Peyronel et al. 1984, Anderson and Ahmed 1993). Their squalene content is also higher making them preferred for shark liver oil over coastal species (Anderson and Ahmed 1993, Daley et al. 2002). The liver oil of gulper sharks contains the highest percentage of squalene of any shark family, for example, the percentages are: *C. moluccensis* 82%*, C. uyato* 89%, *C. squamosus* 70–94%, and *D. calceus* 70%. Liver oil of gulper sharks is considered the most valuable of shark liver oils (Peyronel et al. 1984, Bakes and Nichols 1995, Wetherbee et al. 2000, Priede et al. 2020, Francis 2022). The family of gulper sharks represents just over one-quarter (26%) of all deepwater shark species known to be used for the liver oil although they are the most threatened deepwater shark family (Finucci et al. 2024b); other species traded are mentioned in Section 9. All species of gulper sharks, except one (*C. seychellorum*), have been identified in the shark liver oil trade or inferred to be traded based on their range and interactions with fisheries that have reported traded species generically, e.g., *Centrophorus* species (Finucci et al. 2024b).

Shark liver oil is the most widely used shark product after shark fins and meat. For example, in India, shark liver oil exports are twice as valuable as exports of shark meat (Dent and Clarke 2015). Shark liver oil, alongside shark fins, is the most valuable international shark product (Chabrol 2012). The global demand for shark liver oil was estimated at 2,000–2,200 tonnes in 2012 and by 2016, the global production of squalene (from all sources) was >5,900 tonnes, according to the Global Market Insight statistics with 50-55% of that production sourced from animal squalene (Chabrol 2012, Lozano-Grande et al. 2018, Markets and Markets 2020). For many local communities, gulper shark liver oil is an important marine resource (Flores 2004, White and Dharmadi 2010, Akhilesh et al. 2011). The liver oil may be processed locally or exported overseas for processing (e.g., France, Dubai) prior to being widely traded internationally (Finucci et al. 2024a, c; Rigby et al. 2024, Tyabji et al. 2022, Muttaqin et al. 2024). The uses of shark liver oil are wide, varied and increasing in diversity; it is used in cosmetics (e.g., sunscreens, facial oil, lipsticks), pharmaceuticals (e.g., vaccine adjuvants, anti-ageing and omega-3 supplements), and industrial applications (e.g., biofuels, machine oil, boat maintenance, tanning and textile industries) (Bakes and Nichols 1995, Cardeñosa et al. 2017, Vasconcellos et al. 2018, Ebert et al. 2021a, Mendes et al. 2022, Fisher et al. 2023a). It is estimated that most of the global squalene production is used for the cosmetics industry (65%), followed by the pharmaceuticals industry (20%), food (10%) and other applications (5%) (Nicholson 2022). Although shark liver oil has been internationally traded for decades, little is known of the shark liver oil trade (Dent and Clarke 2015).

Synthetic and plant-based squalene

Despite the availability of synthetic and plant-based squalene products for a wide range of uses, including vaccine adjuvants (which use relatively small volumes) (Chabrol 2012, Lozano-Grande et al. 2018, Fisher et al. 2023a,b), squalene from shark livers is still in high demand. This may be due to a number of reasons including: plant-based alternatives have lower concentrations of squalene and as such are more expensive, a preference for the 'natural product', and synthetic yields are insufficient to meet global demand (Chabrol 2012, Ducos et al. 2015, Lozano-Grande et al. 2018, Nicholson 2022, Yeomans 2024). A number of laboratories have developed patents for synthetic squalene production including Amyris Biotechnologies, Arista Industries Inc., and Nucelis LLC. (Lozano-Grande et al. 2018). Oceana led a campaign in 2008 to encourage the cosmetics industry to stop using shark liver oil as it is mainly sourced from threatened deepwater sharks. Some brands (Unilever- Ponds and Dove and L'Oreal) have removed shark squalene from their cosmetics brands and by 2010, much of the European Union had moved to using only plant-based squalene and some United States cosmetics brands are also moving to plant-based squalene (Chabrol 2012, Yeoman 2024). Other companies that have announced the end to using shark squalene or already had a policy against using it, include: Beiersdorf, Biossance, Boots, Clarins, Henkel, La Mer (an Estée Lauder brand), LVMH, Sisley and Topicrem (Oceana 2013, Chabrol 2012, Nicholson 2022).

There is clear evidence that trade in C*. atromarginatus* and *C. granulosus* and all gulper shark's liver oil is the major driver for the retention of these species by fishers, and hence the rapid population declines reported. As such, it is appropriate that these species be regulated by a CITES Appendix II listing.

6.1 National utilization

In addition to the main use of the species for their liver oil, *Centrophorus atromarginatus* and *C. granulosus* are also used for their meat and fins. The meat is sold fresh, dried, and salted and generally sold in local domestic markets (Finucci et al. 2024a, c; Rigby et al. 2024). It is popular in some countries, such as Australia, for the boneless flakes, and is commonly used domestically for fish and chips (AFMA 2024). In some regions, for e.g., Europe, the meat is highly valued (Ebert et al. 2021a) and may be traded internationally. Individuals too small for human consumption are likely used locally in fish meal production (Rigby et al. 2024). Byproducts from gulper shark liver oil production may also be used in fish meal and in poultry feed (Finucci et al. 2024a, Muttaqin et al. 2024). Gulper shark fins are of low value but have been reported in the international fin trade in low quantities, i.e., accounting for up to 0.4% of fin samples in HongKong SAR, China (Jaiteh et al. 2016, Fields et al. 2018, Cardeñosa et al. 2020).

6.2 Legal trade

The global volumes of shark liver oil processed production reported to FAO for 1976–2020 were from five countries. In order of decreasing total production for the period these were: Senegal, Taiwan, Province of China, Japan, Republic of Korea, Maldives, and Uruguay (FAO 2024). The periods of production markedly varied among these countries, for example, most of Senegalese production has been in the last decade, whereas most of Taiwan Province of China and Japan's production was in the first decade, while the Maldives production mirrored that of the fishery; commencing in 1980 and declining rapidly after 1991 until production ceased after 2006 (MRC 2008, FAO 2024). These countries' production of liver oil is very likely from deepwater species and based on the information in Section 4.4, likely to be from gulper sharks. The processed production trends and quantities are quite different from the global shark liver import and export trade volumes reported to FAO for the same period and thus, they are likely under-reported, and the export quantities and values are instead detailed. Based on internet searches, other current shark liver oil providers include Australia, China, France, India, Indonesia, Morocco, New Zealand, Somalia, and Yemen. Although the shark liver oil trade includes other deepwater and some coastal species, many of the target fisheries focussed on gulper sharks that have the highest value liver oil and as shown below, the exported quantities and values follow similar trends over the 45 years of data, and consequently, it can be inferred that these species are a significant part of these traded quantities.

The export and import quantities are not synchronised but follow the same general trend and volumes. For simplicity, only export quantities are presented (Figure 3a). These rose rapidly from 1980 to a peak of 992 t in 1985, fluctuated considerably till the early 1990s after which they remained between ~50–200 t until 2017 when there was no reported export for two years, and by 2020 the export was 10 t (FAO 2024). Seven countries reported exports during that period and in order of decreasing total exports were: Portugal, Norway, Philippines, Maldives, Republic of Korea, Madagascar, and Uruguay. Similar to the processed production, export periods varied markedly among these countries, for e.g., Portugal had no exports after 1988, while Norway and the Philippines have exported since ~1990s with Norway exporting most years and Philippines exporting for 3–7 years in a row each decade (Figure 4). This also illustrates the relatively short periods of exports, particularly when exports were large. There were four countries that reported imports to FAO which were in order of decreasing total imports for that period: Republic of Korea, Norway, Philippines, and Portugal with the former two accounting for nearly all the imports (FAO 2024). Re-exports of shark liver oil were reported to FAO for 1976–2020 (FAO 2024). Other countries that have reported either local use, import or export of shark liver oil are: Argentina, Australia, Belize, Canada, Chile, France, Germany, India, Indonesia, Italy, Japan, Kenya, New Zealand, Réunion, Russian Federation, South Africa, Spain, and United States of America (Dent and Clarke 2015, Kizhakudan et al. 2024). Japan is one of the leading markets for squalene, accounting for 40% of global demand (in 2010) and Spain was noted as having a central role in the shark liver oil trade (Chabrol 2012, Nicholson 2022). In 2012, according to fishers, and liver oil and squalene producers, the main countries producing shark liver oil were the Philippines, Indonesia, India, Australia, New Zealand and (indirectly) Spain (Chabrol 2012).

The global trade value of exports of shark liver oil from 1976–2020 follows a similar trend to export volumes (Figure 3b). They also peaked in 1985 when they were valued at USD 5 million, fluctuated considerably until the mid-1990s, after which they remained between ~USD 0.3-0.7 million till 2012 when they rose and peaked in 2015 at USD 2.8 million before declining to USD 0.3 million in 2020 (FAO 2024). The global squalene market is predicted to reach USD 356 million by 2032 based on significant increase in demand by the pharmaceutical industry whose research and development activities have diversified squalene uses (Polaris 2024).

These production and export and import quantities and values indicate the shark liver oil trade peaked in the mid-1980s till the early 1990s, with production and international trade ongoing since and even peaking again (albeit smaller) in 2015. This highlights the need to regulate the international ongoing trade to bring an end to the unsustainable fisheries of *C. atromarginatus*, *C. granulosus*, and the other gulper shark species.

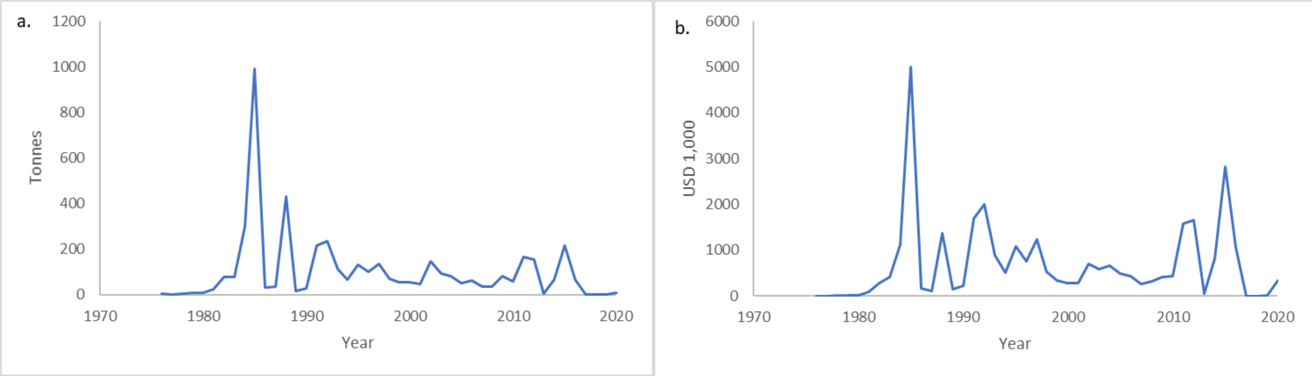

Figure 3. Global trade shark liver oil, a. export quantities and b. export value (FAO 2024).

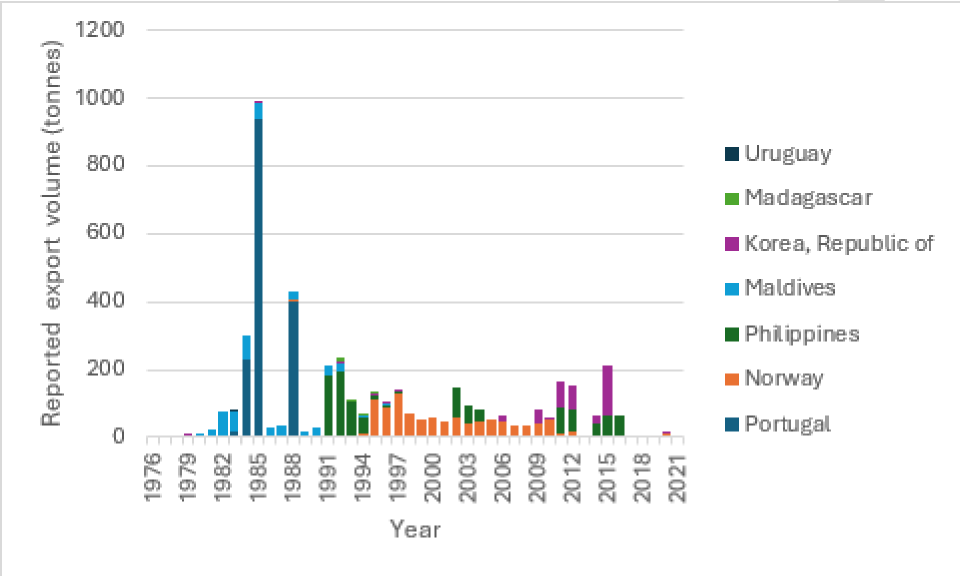

Figure 4: Global trade shark liver oil export quantities by country (FAO 2024).

6.3 Parts and derivatives in trade

The products traded (shark liver oil extracted from their livers, and meat and fins) and the main internationally trading countries are described above. There are no specific commodity codes for species-specific shark liver oil, though the FAO uses general commodity codes and the International Standard Statistical Classification of Fisheries Commodities for 'shark liver oil', 'shark oil', 'sharks, rays, chimaeras, liver oil', and 'sharks, rays, chimaeras, oil' (FAO 2024). The internationally traded gulper shark meat has no specific commodity code, rather there are various generic 'sharks, rays, chimaeras etc.' meat categories (e.g., minced, dried, salted). Similarly, internationally traded gulper shark fins have no specific commodity code but are likely included under generic 'shark fin' codes.

6.4 Illegal trade

The scarcity of species-specific legislation and management measures in place for *C. atromarginatus and C. granulosus* throughout their range means nearly all trade in the species is legal in nature. There are some range States that have gulper shark management measures, e.g., Australia (Section 7 and 8), where there is the potential for illegal trade, though as far as can be ascertained, it has not been reported. The extent of illegal, unreported, and unregulated fishing capturing gulper sharks in Areas Beyond National Jurisdiction (ABNJ) areas is unknown.

6.5 Actual or potential trade impacts

International demand for high quality and high value shark liver oil drives much of the unsustainable targeting and bycatch retention of *C. atromarginatus* and C. *granulosus* across their ranges, and consequential depletion of stocks. Despite synthetic and plant-based alternative squalene sources, shark derived squalene is still the preferred source (e.g., Fisher et al. 2023a).

Regulation of international trade through an Appendix II listing for these species is necessary to ensure that their populations do not decline globally to the point where they require listing on Appendix I. By ensuring that the trade in their liver oil is sustainable and legally sourced, these species will receive the management they need across their range to ensure they are not driven further towards extinction.

In addition, the listing of all gulper sharks in Appendix II as lookalikes alongside these two species will reduce the opportunity for illegal trade in these two species to occur, labelled as non-listed gulper sharks.

7. Legal instruments

7.1 National

As far as can be ascertained, there is no national legislation specific to *C. atromarginatus* or *C. granulosus*.

In Australia, *C. harrissoni* and *C. uyato* are listed as Conservation Dependent under the Environment Protection and Biodiversity Conservation Act 1999 (AFMA 2022). To halt their decline and support recovery, the species are strictly managed and monitored, including through a network of spatial closures, zero retention, move-on provisions, and handling practices (AFMA 2022, CITES 2024).

7.2 International

Deepwater shark fisheries and trade in ABNJ are mostly unregulated, except for in the Northeast Atlantic and to a lesser extent in the southern Indian and Pacific Oceans where concerns about deepwater shark status have led to some fisheries measures.

There are no species-specific international measures for *C. atromarginatus.*

Centrophorus granulosus was included in 2008 on the OSPAR (Northeast Atlantic) List of threatened and/or declining species and habitats (OSPAR Agreement 2008-06). Inclusion on this list was to guide the OSPAR Commission in priority setting for further work on its conservation.

In northeast Atlantic waters, *C. granulosus* was specifically included in 2013 in the ‘deep-sea shark’ category that includes ~17 deepwater shark species. A North-east Atlantic Fisheries Commission (NEAFC) Recommendation in 2013 banned directed fishing for these ‘deep-sea shark’ species in European Community and international waters with no allowances for bycatch (ICES 2022). In 2017 and 2018, a restrictive bycatch allowance (10 t) was trialled, permitting limited landings of unavoidable catches of deepwater sharks in directed artisanal demersal longline fisheries for Black Scabbardfish (*Aphanopus* spp.). This was discontinued after 2020 with a return to a ban on directed fishing and bycatch retention for ‘deep-sea shark’ species in those fisheries, in European Union and international waters, and in Northwest African waters of the Fishery Committee for the Eastern Central Atlantic (CEFAC) (ICES 2022). This legislation is also applicable in the United Kingdom waters and to UK vessels and is addressed as ‘Retained European Union Law’ (https://www.sharktrust.org/pages/category/fisheries-advisories).

Other general Eastern Atlantic measures relevant to *C. granulosus* include: since 2005, gillnets are banned at depths >200 m in Azores, Madeira, and Canary Islands; since 2007, use of gillnets by European Community vessels are banned at depths >600 m depth, albeit with a provision for maximum bycatch limits of 5% deepwater shark for those fisheries targeting European Hake (*Merluccius merluccius*) and monkfish (*Lophius* spp.) at depths of 200–600 m (ICES 2022). In European waters, since 2016, demersal trawl fishing is prohibited at depths >800 m (ICES 2022).

In the Southern Ocean, the SIOFA banned gillnets in 2017 (CMM 2016/05) and in 2019, adopted a conservation and management measure for sharks that banned directed fishing for all deepwater shark species previously targeted and listed as ‘high risk and of concern’, which includes *C. granulosus* (Georgeson et al. 2020). However, *C. granulosus*, identified as at extremely high risk in the SIOFA area, is still frequently retained from bycatch which reduces the effectiveness of the target ban to reduce fishing mortality (Georgeson et al. 2020, SIOFA 2023a). In 2023, the CMM was updated and included a catch limit for Portuguese dogfish (*Centroscymnus coelolepis*) (CMM 12(2023)). There was no bycatch limits set for other species although a deepwater workshop report recommended *C. granulosus* (and other high species of concern frequently retained) be managed as a precautionary measure until further work can determine the sustainable catch (SIOFA 2023a, b). In 2024, the deepwater ecological risk assessment was updated and progress towards deepwater species stock assessments noted but species-specific outcomes were not publicly available. The SIOFA Scientific Committee noted that a prohibition on wire trace could effectively reduce the bycatch of deepwater sharks and recommended further research on trace types in SIOFA be conducted in 2024 (SIOFA 2024b).

The South East Atlantic Fisheries Organisation (SEAFO) has recommended a ban on targeting of deepwater sharks (Recommendation 1/2008), but it has not yet been adopted (SEAFO 2024). The South Pacific Regional Fisheries Management Organisation (SPRFMO) banned gillnets in 2010 (CMM 08-2023) and has a 10-nautical mile move-on rule if >250 kg of deepwater sharks is caught (CMM 14 a, d-2022); neither lead *Centrophorus* species is present in SPRFMO area but other gulper sharks occur there. There are no gulper sharks in the area of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR). Three other Regional Fisheries Management Organizations (RFMOs) include the range of one or both lead *Centrophorus* species, yet have no measures implemented specific to deepwater sharks, that is for *C. granulosus* only: Northwest Atlantic Fisheries Organization (NAFO and Western Central Atlantic Fishery Commission (WECAFC) and for both species: North Pacific Fisheries Commission (NPFC) (Thompson 2023). In the Mediterranean, *C. granulosus* is listed on Annex III (list of species whose exploitation is regulated) of the SPA/BD Protocol to the Barcelona Convention. However, this Annex has not been updated since 2012, and this refers to *C. uyato* which in the Mediterranean was previously referred to as *C. granulosus* (White et al. 2022). The tuna Regional Fisheries Management Organisations longline fisheries may interact with the two *Centrophorus* in their upper depth ranges, though the level of interactions is unknown; they have no measures implemented specific to deepwater sharks.

8. Species management

8.1 Management measures

As far as can be ascertained, there are no national species-specific management measures for *C. atromarginatus* or *C. granulosus* across their range. This has led to significant population declines, as detailed in Section 4.

In Northeast Atlantic waters, *C. granulosus* range states are required to comply with the NEAFC and CEFAC regulations (Section 7.2). In addition to these requirements, the region has additional management measures that are likely to offer some refuge for gulper sharks, including area restrictions by vessel size and gear, gear restrictions (hook size, maximum number of hooks on longline gear.

In Australia, three species of gulper sharks are strictly managed to halt decline and promote recovery: *C. harrissoni*, *C moluccensis*, and *C. uyato* (AFMA 2022). *Centrophorus granulosus* occurs outside the range of the historical intense fisheries that caused the dramatic declines in the three species. Almost 15 years after strict management of the three species was implemented, the populations are showing early stages of recovery with increases in abundance, area occupied, and proportion and range of juveniles (Scoulding et al. 2024). In addition, other gulper sharks that occur in Australia's southern waters, i.e., *Deania calceus* and *D. quadrispinosa*, are managed and assessed as part of multi-species deepwater shark stocks and subject to total allowable catches (Patterson et al. 2022).

Despite the known vulnerability of gulper sharks to overexploitation, across most of their range, there is little to no management in place to encourage sustainable practice or conserve depleted gulper shark populations. This is the case in all areas, other than the Northeast Atlantic and Australia, where they have been targeted to the point of significant depletion and 'economic extinction'. The implementation of a CITES Appendix II listing will incentivise management measures, encourage sustainable fisheries, and facilitate protections where needed.

8.2 Population monitoring

There appears to be no monitoring of *C. atromarginatus* populations and some monitoring for *C. granulosus* in the Northeast Atlantic as part of the ongoing requirements of deepwater shark regulations. The International Council for the Exploration of the Sea (ICES) Working Group on Elasmobranch Fishes (WGEF) provides ongoing assessments and advice on stock status of deepwater sharks in the ICES area (ICES 2022).

In Australia, *C. granulosus* catches may be reported as part of general fisheries monitoring and independent fisheries observer work. The populations of gulper shark species in its southern waters, particularly the three species mentioned in Section 8.1, are closely monitored.

In New Zealand, *C. squamosus* and *Deania* spp. catches are reported as part of general fisheries monitoring and independent research trawl surveys.

The lack of species-specific catch and effort data and the difficulties in species identification and clear nomenclature have resulted in difficulties in monitoring the population status to species level. The management priority that a CITES Appendix II listing will provide will help prioritise data collection for these species.

8.3 Control measures

8.3.1 International

There are no controls, monitoring or marking schemes to regulate, trace, or assess the international trade in any gulper shark species or their products.

8.3.2 Domestic

Across the range of the *C. atromarginatus* and *C. granulosus* there are only compliance measures in the Northeast Atlantic as described in Section 7.2. In Australia, there are significant control measures for three other strictly managed gulper shark species that are implemented through the Upper-Slope Dogfish Management Strategy (Section 8.1).

8.4 Captive breeding and artificial propagation

Not applicable

8.5 Habitat conservation

There are very few deepwater marine protected areas (MPAs) across the range of *C. atromarginatus* and *C. granulosus*, and other gulper sharks. Where they do occur, e.g., Japan and Hawaii, their effectiveness for gulper shark protection is unknown (Sackett et al. 2014, Uehara et al. 2019). There are also at least 10 MPAs in the Northeast Atlantic ABNJ, however their efficacy is also unknown (Smith and Jabour 2017). In Northeast Atlantic waters, refuge at depth for *C. granulosus* and other gulper sharks would be provided by depth prohibitions for trawl (>800 m) and gillnet (>600 m) gears.

In Australia, a network of MPAs that include zoning and gear restrictions include part of the range of *C. granulosus* and would provide some refuge (Parks Australia 2024). Other southern Australian gulper sharks would receive significant refuge at depth as fishing is prohibited >700 m depth (Patterson et al. 2022).

8.6 Safeguards

Not applicable

9. Information on similar species

The use of the look-alike provisions (listing in accordance with Article II, paragraph 2(b) of the Convention) is appropriate because of the morphological similarity between *Centrophorus* species in the family that makes them very difficult to visually distinguish (White et al. 2013, 2017, 2022; Ebert et al. 2021a; see Section 3.4). This is also true for the main product traded, shark liver oil, and for the meat and fins, that can only be delineated with confidence for all gulper sharks using genetic techniques. Some traders use hand-held refractometers to check squalene content (e.g., Maldives, Anderson and Ahmed 1993; Batista and Nunes 1992, Nichols et al. 1997). Squalene content can also be accurately and rapidly determined using Raman Spectroscopy (Hall et al. 2016). Gulper sharks could be identified from the liver oil due to their high level of squalene. These methods will identify that the liver oil is from gulper sharks based on the high squalene content, but the refractometers may not be precise enough to separate species of gulper shark in the liver oil. These identification methods are outlined below and summarised in Annex 2.

Genetic identification of *Centrophorus* species is possible for *C. atromarginatus* and *C. granulosus*, and for *C. moluccensis*, *C. squamosus*, *C. longipinnis*, *C. tessellatus*, and *C. uyato* (Naylor et al. 2012, Ng et al. 2023). In Australia, genetic methods were used to separate *Centrophorus* species caught in Australian and Indonesian commercial fisheries, and to enable catch verification and implementation of an Australian Conservation Dependent listing under the Environment Protection and Biodiversity Conservation Act 1999 (Daley et al. 2012, AFMA 2022). Genetic species identification was also undertaken in North Atlantic waters to implement and monitor commercial fisheries with zero total allowable catch for *C. granulosus* and *C. squamosus* (Veríssimo et al. 2014). Genetic studies using short DNA fragments (COI and 16S) have produced inconsistent species delineation trees as *Centrophorus* spp. genomes are relatively conserved. However, with longer DNA fragments and trusted reference genomes currently available on NCBI GenBank, species delineation of the *Centrophorus* family using genetic methods is possible.

Genetic identification of species in shark liver oil products is possible. Shark species were able to be identified in facial oil, mask, and foam containing squalene and in shark liver oil pills (Cardeñosa et al. 2017, 2019). Work is in progress to improve the genetic techniques to enable the identification of species, including multiple species if present, within the raw and processed shark liver oil and the products.

Gulper sharks have the highest value shark liver oil of all sharks and hence, the traded gulper shark liver oil is often separated from that of other shark species which would enable implementation and enforcement of a gulper shark family Appendix II listing. As noted above, some traders use hand-held refractometers to check squalene content, and it can also be determined using Raman Spectroscopy (Anderson and Ahmed 1993, Hall et al. 2016). However, at times the gulper shark liver oil may be mixed with that of other deepwater sharks also used for their liver oil, which is currently known to include an additional 39 deepwater species and includes dogfish sharks (Squalidae), sleeper sharks (Somniosidae), cow sharks (Hexanchidae), lanternsharks (Etmopteridae), catsharks (Scyliorhinidae and Pentanchidae), kitefin shark (*Dalatias licha*), and bramble sharks (Echinorhinidae) (Finucci et al. 2024b).

Coastal and pelagic species are also used for their liver oils; however, the species involved have not been investigated since the 1990s (Vannuccini 1999, Fowler et al. 2002) and need to be verified. As stated earlier, their squalene content and hence value is lower than that of gulper sharks and other deepwater sharks. The deepwater fisheries often operate in separate locations to coastal and pelagic fisheries and as such, the liver oil from deepwater fisheries often may not include coastal and pelagic species (although there are exceptions). Thus, for implementation of a gulper shark listing, although genetic techniques, hand-held refractometers and/or Raman spectroscopy would need to be used to separate gulper sharks' liver oil from the other species, the potential number of species may be relatively limited.

Carbon stable isotope analysis was recently found to be able to identify the likely provenance of squalene in commonly available off the shelf pharmaceutical products sold in Australia. This was investigated as a compliance monitoring method to ensure products sold in Australia were, as stated, sourced from strictly managed and monitored Australian fisheries and not from unregulated fisheries elsewhere (Revill et al. 2022). Squalene derived and produced from Southeast Australia and New Zealand was able to be distinguished from squalene derived from India, the Arabian Seas, and Northeast Africa (Revill et al. 2022). This provides a tool to support traceability and regulation of gulper shark products if listed. Carbon isotope analyses can also be used to test whether the source of squalene in a product, such as beauty cream and makeup, is from shark or plant-based squalene (Ducos et al. 2015, Nicholson 2022).

The meat and fins of all gulper sharks are also not possible to visually separate into species. Although whole *Deania* can be morphologically separated from whole *Centrophorus* spp., their meat and fins cannot be easily visually distinguished. *Deania* and *Centrophorus* co-occur and can be caught together in a fishery and not separated in logbooks (e.g., Sporcic 2018) or products.

For implementation of a proposed CITES Appendix, the simplest process for identification would be landing the sharks whole which would enable identification of gulper sharks to genera (i.e., *Centrophorus* or *Deania*) prior to processing, based on their morphological differences from other shark genera. As it is difficult to visually distinguish between gulper shark species, a listing of all gulper sharks in Appendix II as look-alikes is necessary to avoid the opportunity for illegal trade in *C. atromarginatus* and *C. granulosus* animals and products to occur, labelled as non-listed *Centrophorus* and/or *Deania* species.

As detailed throughout the proposal and below, other species of gulper sharks are also highly threatened by their retention for the shark liver oil trade and a family level listing will provide trade regulation for these exceptionally vulnerable gulper shark species. The remainder of the family Centrophoridae included in this proposal under Annex 2b, Criterion A are detailed below with information mainly sourced from the Red List assessments and Ebert et al. 2021a, b. Many species have overlapping ranges with *C. atromarginatus* and *C. granulosus* (Annex 1).

***Centrophorus harrissoni,* Harrisson's dogfish** – occurs in southwest Pacific; eastern Australia and New Zealand at depths of 220–1,500 m. Reaches 114 cm total length (TL) and has 1–2 pups per litter every 1–2 years. Smooth skin, long flat narrow snout, and dorsal fins with dark oblique bar. In southeast Australia, declines of >96% in the CPUE of this species and *C. moluccensis*, *C. uyato*, and *D. quadrispinosa* documented over two decades, i.e., from 1976–77 to 1996–97 due to target commercial fisheries (Graham et al. 2001). In 2012, the proportion of *C. harrissoni and C. uyato* populations remaining was estimated to be 21% for *C. harrissoni* and 13% for *C. uyato* which indicates both stocks remain substantially depleted (AFMA 2022). IUCN Red List – Endangered.

***Centrophorus isodon,* blackfin gulper shark** – found in western Pacific (China, Taiwan, Province of China, Philippines, Indonesia) and possibly Indian Ocean at depths of 435–770 m. Reaches 108 cm TL and has 2 pups per litter. Smooth skin, long flat snout, and blackish fin edges. Is considered a rare species in some areas, e.g., China, Taiwan, Province of China, Philippines and population declines of 50–80% inferred based on high levels of exploitation in its range and limited biological productivity. IUCN Red List – Endangered.

***Centrophorus lesliei,* African gulper shark** – occurs in the eastern Atlantic and western Indian Oceans, mainly in west Africa, at depths of 340–610 m. Reaches 100 cm TL and has 1–2 pups per litter. Slender body, long head, and no distinct fin markings. Population declines of 50–80% suspected based on severe overexploitation in fisheries across its range and limited biological productivity. IUCN Red List – Endangered.

***Centrophorus longipinnis,* longfin gulper shark** – found in western Pacific; Taiwan, Province of China, Philippines, Indonesia, Papua New Guinea at depths of 330–460 m. Reaches 91 cm TL and has 1–2 pups per litter. Slender body, long head, and no distinct fin markings. Population declines of 50–80% suspected due to dramatic *Centrophorus* spp. declines in Indonesia and Philippines. IUCN Red List – Endangered.

***Centrophorus moluccensis,* Endeavour dogfish** – occurs in Indian and western Pacific Oceans at depths of 125–820 m. Reaches 102 cm TL and has 2 pups per litter every 2 years. Smooth skin, short snout, caudal fin with narrow pale margin. Population declines vary across its range and overall estimated as 30–50%; dramatic declines in southeast Australia, Indonesia, Philippines, suspected to be stable in Japan and also in Western Australia where it has refuge from fisheries. IUCN Red List – Vulnerable.

***Centrophorus seychellorum,* Seychelles gulper shark** – endemic to Seychelles, western Indian Ocean at depths of 490–1,000 m. Reaches 80 cm TL; biology unknown. Relatively long snout and blackish margins on dorsal fin tips. Population suspected to be stable as there are currently no deepwater fisheries in the Seychelles. IUCN Red List – Least Concern.

***Centrophorus squamosus,* leafscale gulper shark** – found in Atlantic, Indian, western and southeast Pacific Oceans at depths of 0–3,366 m. Reaches 166 cm TL and has 5–8 pups per litter. Rough skin, short slightly flattened snout, and dusky fins. In the Northeast Atlantic, 99% declines in just 7 years of commercial 'siki' landings which are mainly this species and Portuguese dogfish (*Centroscymnus coelolepis*) (Finucci et al. 2024b). Also, dramatic declines in Ireland (CITES 2024), Mauritania, Maldives, Indonesia, and Philippines, and population increases in New Zealand; overall estimated population decline of 50–80%. IUCN Red List – Endangered.

***Centrophorus tessellatus,* mosaic gulper shark** – occurs in the western and central Pacific; Japan and the Hawaiian Islands (USA), and possibly in the western Indian Ocean (Maldives) at depths of 260–730 m. Reaches 90 cm TL; biology unknown. Smooth skin, fairly long snout, and light margins on fins. Population declines of 99% and 97% inferred in Japan and the Maldives, respectively, with refuge in Hawaii; overall suspected population decline of 50–80%. IUCN Red List – Endangered.

***Centrophorus uyato,* little gulper shark** – found in Atlantic, Mediterranean, Indian Ocean, and northwest and southwest Pacific at depths of 210–700 m, occasionally to 1,400 m (White et al. 2022). Reaches 113 cm TL and has 1–2 pups per litter. Slender, relatively short snout, and dark markings on fins. Population declines of >96% estimated in southeast Australia, 99% suspected in India, 86% suspected in Mauritania, population increase in Gulf of Mexico, and refuge in Western Australia; overall suspected population decline of 50–80%. IUCN Red List – Endangered.

***Centrophorus westraliensis,* western gulper shark** – endemic to Western Australia at depths of 600–750 m. Reaches 91 cm TL; biology unknown. Smooth skin, elongate snout, and dorsal fins with a narrow blotch. Poorly-known and further information on range and abundance needed. IUCN Red List – Data Deficient.

***Deania calceus,* birdbeak dogfish** – found in eastern Atlantic, Indian, western and southeast Pacific Oceans at depths of 60–1,500 m. Reaches 162 cm TL and has 1–17 pups per litter. Rough skin, extremely long flat snout, juveniles with blackish fin markings. Population declines vary across its range and overall estimated as 20–30%; estimated increasing population in Northeast Atlantic, Australia and New Zealand, 86% decline suspected in Mauritania, and suspected 65% decline in Taiwan, Province of China. IUCN Red List – Near Threatened.

***Deania profundorum,* arrowhead dogfish** – occurs in Atlantic, Indian, and western Pacific Oceans at depths of 205–1,800 m. Reaches 97 cm TL and has 5–7 pups per litter. Smooth skin, extremely long flat snout, and a subcaudal keel. Population declines vary across its range and overall inferred as 20–30%; inferred to be stable in the Northwest Atlantic, declining in West Africa and Philippines, and significant refuge at depth across its range. IUCN Red List – Near Threatened.

***Deania quadrispinosa,* longsnout dogfish** – found in southeast Atlantic, Indian, and western Pacific Oceans at depths of 150–1,360 m. Rough skin, extremely long flat snout, sometimes fins white-edged. Population declines vary across its range and overall inferred as 20–30%; 84% estimated decline in southeast Australia, stable in New Zealand, inferred decline in Taiwan, Province of China, and refuge at depth across its range. IUCN Red List – Vulnerable.

10. Consultations

11. Additional remarks

CITES history for gulper sharks

Gulper sharks were first raised at CITES in 2004 as a group of particularly high conservation priority based on their extremely rapid depletion in target fisheries driven by international demand for their liver oil. An FAO Deep Sea Workshop in December 2003 had recommended that "a precautionary approach to the management of these and other deepsea species is absolutely essential" including monitoring of catches, landings and trade at species level, preparation of good identification guides, improved use of observers, and development of standard carcass forms to improve reporting (AC 20 WG8 Doc 1, CoP 13 Doc 35). In 2007, it was noted that gulper sharks were among some of the least productive elasmobranchs and Parties landing and exporting gulper sharks were requested to adopt fisheries management advice to ensure their exploitation and trade was sustainable and report to the subsequent Animals Committee on measures implemented (CoP 14 Doc 59.1). In 2008, gulper sharks were again raised as species of concern for consideration for inclusion in the Appendices if their management and conservation status does not improve (AC 23 Doc 15.2). In 2011, the Pew Charitable Trusts recommended listing gulper sharks on Appendix II (AC 25 Inf. 7). In 2012, Australia raised gulper sharks (*C. harrissoni*, *C. moluccensis*, and *C. zeehaani* (now *C. uyato*)) as species that were overfished and required additional action to enhance their conservation and management. Action for these species in Australia was implemented as spatial closures, reduced catch limits, and quantitative targets (AC Doc 16.2 Annex AU). Gulper sharks (*Centrophorus* spp.) were then raised by Israel as a 'species of concern' in 2015 (AC28 Doc 17.1.2).

For two decades, significant concerns about gulper shark depletions have been raised at CITES with calls for their improved management and conservation. The species proposed meet the criteria for listing within Appendix II of CITES. Listing the species will assist in ensuring where trade occurs that proper processes are adhered to in implementing CITES requirements. Given at least some of the species occur in ABNJs, consideration will need to be given to implement Introduction for the Sea and the issuing of relevant Certificates and Permits. A successful amendment to the Appendices with the inclusion of these species should be accompanied with a discussion at the proceeding Animals and Standing Committees so as to consider and recommend any supportive action that may be required to assist Parties in conducting NDF's, ascertaining Legal Acquisition Findings, Introduction for the Sea and the consideration of traceability requirements, particularly for the trade in liver oil products.

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Annex 1: Range States for all Centrophoridae.

Sources: Ebert et al. 2021a, b and IUCN Red List Assessments where range in addition to Ebert et al. 2021a, b is supported by publications. ü= extant, ?= presence uncertain.

Range States	***C. atromarginatus***	***C. granulosus***	***C. harrissoni***	***C. isodon***	***C. lesliei***	***C. longipinnis***	***C. moluccensis***	***C. seychellorum***	***C. squamosus***	***C. tessellatus***	***C. uyato***	***C. westraliensis***	***D. calceus***	***D. profundorum***	***D. quadrispinosa***
Albania											ü				
Algeria											ü				
Angola		ü			ü				ü		ü		ü	?	
Anguilla		ü									ü				
Antigua and Barbuda		ü									ü				
Aruba		ü									ü				
Australia		ü	ü				ü		ü		ü	ü	ü		ü
Bahamas		ü							ü		ü				
Barbados		ü									ü				
Belgium									ü						
Belize		ü									ü				
Benin		ü			ü						ü		?	?	
Bosnia and Herzegovina											ü				
Brazil		ü							?						
Cabo Verde											ü				
Cameroon		ü			ü						ü		?	?	
Cayman Islands		ü									ü				
Chile									ü				ü		
China		ü		ü											
Colombia		ü									ü				
Comoro Islands											ü				
Congo					ü						ü		?	ü	
Congo Democratic Republic					ü						ü		?	ü	
Costa Rica		ü									ü				
Côte d'Ivoire		ü			ü						ü		?		

Range States	C. atromarginatus	C. granulosus	C. harrissoni	C. isodon	C. lesliei	C. longipinnis	C. moluccensis	C. seychellorum	C. squamosus	C. tessellatus	C. uyato	C. westraliensis	D. calceus	D. profundorum	D. quadrispinosa
Croatia											ü				
Cuba		ü									ü				
Curaçao		ü									ü				
Cyprus											ü				
Denmark									ü						
Dominica		ü									ü				
Dominican Republic		ü									ü				
Ecuador													ü		
Ecuador (Galápagos)									ü						
Egypt											ü				
Equatorial Guinea		ü			ü						ü		?	ü	
Faroe Islands									ü				ü		
France		ü							ü		ü		ü		
French Guiana		ü									ü				
Gabon		ü			ü				ü		ü		?	ü	
Gambia		ü			ü				ü		ü		?	ü	
Germany									ü						
Ghana		ü			ü						ü		?		
Gibraltar									ü		ü		ü		
Greece											ü				
Grenada		ü									ü				
Guadeloupe		ü									ü				
Guatemala		ü									ü				
Guinea					ü				ü				?	ü	
Guinea-Bissau					ü				ü				?	ü	
Guyana		ü									ü				
Haiti		ü									ü				
Honduras		ü									ü				
Iceland									ü				ü		

Range States	*C. atromarginatus*	*C. granulosus*	*C. harrissoni*	*C. isodon*	*C. lesliei*	*C. longipinnis*	*C. moluccensis*	*C. seychellorum*	*C. squamosus*	*C. tessellatus*	*C. uyato*	*C. westraliensis*	*D. calceus*	*D. profundorum*	*D. quadrispinosa*
India	ü	ü					?		ü		ü				
India (Andaman Islands)	ü	ü					ü								
Indonesia	ü	ü		ü		ü	ü		ü				ü		
Ireland									ü		ü		ü		
Israel											ü				
Italy											ü				
Jamaica		ü									ü				
Japan	ü	ü					ü		ü	ü	ü		ü		
Lebanon											ü				
Liberia					ü								?		
Libya											ü				
Madagascar		ü			ü						ü		ü	ü	
Malaysia							ü								
Maldives		ü		?					ü	ü					
Malta											ü				
Martinique		ü									ü				
Mauritania		ü			ü				ü		ü		ü	ü	
Mauritius		ü							ü						
Mayotte		ü									ü				
Mexico		ü									ü				
Monaco											ü				
Montenegro											ü				
Montserrat		ü									ü				
Morocco		ü			ü				ü		ü		ü	ü	
Mozambique		ü			ü		ü				ü				ü
Myanmar		ü					ü				ü				
Namibia		ü							ü		ü		ü	ü	ü
Netherlands									ü						
New Caledonia			ü				ü								ü
New Zealand			ü						ü				ü		ü

Range States	C. atromarginatus	C. granulosus	C. harrissoni	C. isodon	C. lesliei	C. longipinnis	C. moluccensis	C. seychellorum	C. squamosus	C. tessellatus	C. uyato	C. westraliensis	D. calceus	D. profundorum	D. quadrispinosa
Nicaragua		ü									ü				
Nigeria		ü			ü						ü		?	ü	
Norway									ü		ü				
Oman	ü			?										ü	
Pakistan	?													?	
Palestine, State											ü				
Panama		ü									ü				
Papua New Guinea	ü	ü				ü	ü								ü
Peru													ü		
Philippines		ü		ü		ü	ü		ü					ü	
Portugal		ü							ü		ü		ü		
Portugal (Azores)									ü				ü	ü	
Portugal (Madeira)		ü							ü		ü		ü		
Puerto Rico		ü									ü				
Réunion							ü								
Saint Kitts and Nevis		ü									ü				
Saint Lucia		ü									ü				
Saint Vincent and the Grenadines		ü									ü				
Sao Tome and Principe		ü											?		
Senegal		ü			ü				ü		ü		?	ü	
Seychelles		ü		?				ü							
Sierra Leone					ü								?		
Somalia	ü	ü												ü	
South Africa		ü					ü		ü		ü		ü	ü	ü
Spain		ü							ü		ü		ü	ü	
Spain (Canary Islands)		ü			ü				ü		ü		ü	ü	
Sri Lanka	ü	ü		?			?		?		ü				

Range States	***C. atromarginatus***	***C. granulosus***	***C. harrissoni***	***C. isodon***	***C. lesliei***	***C. longipinnis***	***C. moluccensis***	***C. seychellorum***	***C. squamosus***	***C. tessellatus***	***C. uyato***	***C. westraliensis***	***D. calceus***	***D. profundorum***	***D. quadrispinosa***
Suriname		ü													
Sweden									ü						
Syrian Arab Republic											ü				
Taiwan, Province of China	ü	ü		ü		ü	ü		ü		ü		ü	?	
Thailand		ü					ü								
Togo		ü			ü						ü		?		
Trinidad and Tobago		ü									ü				
Tunisia											ü				
Türkiye											ü				
United Kingdom of Great Britain and Northern Ireland		ü							ü		ü		ü	ü	
United States of America		ü							ü		ü		ü	ü	
United States (Hawaii)										ü					
Vanuatu							ü								ü
Venezuela		ü							ü		ü				
Virgin Islands (British)		ü									ü				
Virgin Islands (United States)		ü									ü				
Western Sahara		ü			ü				ü		ü		ü	ü	
Total 119 Range States for Centrophoridae (including Territories)															

Annex 2: GULPER SHARK IDENTIFICATION

1. Whole animals: Visual and genetic identification

All gulper sharks are relatively small (1–1.6 m in maximum total length). They lack an anal fin and at the point of catch or landing can be differentiated from other deepwater sharks by their teeth; upper teeth relatively broad and blade-like and lower teeth much larger, low, wide and blade-like. Gulper sharks have large green or yellowish eyes and two dorsal fins with grooved fin spines. *Centrophorus* species have a moderate-sized snout and elongated free rear tips on the pectoral fins, and *Deania* species have a very long snout. Identification guides show species-specific differences.

Gulper sharks can be identified to the species level and differentiated from other sharks, including other deepwater sharks, using mitochondrial DNA markers. Genomic reference materials are stored in NCBI Genbank for all gulper sharks.

2.1 Product: Liver Oil

2.1.1 Genetic identification

Shark liver oil products can be genetically identified to species. Shark species were identified in facial oil, mask, and foam containing squalene and in shark liver oil pills. Research is ongoing to improve genetic techniques to identify gulper sharks within raw and processed shark liver oil and products.

2.1.2 Squalene content

Gulper sharks can be identified from the proportion of squalene in the liver oil as their livers contain the highest percentage of squalene (ranging from 70–94% in *Centrophorus* spp. and 70% in *Deania calceus*). Other sharks have a lower squalene content (<70% squalene) in their liver oil, with two exceptions being the deepwater species, Kitefin Shark (*Dalatias licha*) (40–79%) and Longnose Velvet Dogfish (*Centroselachus crepidater*) (61–73%).

Anecdotal evidence indicates gulper shark liver oil is differentiated in trade from that of other species as it is the most valuable oil. This separation enables identification of the oil as coming from gulper sharks. Gulper shark liver oil may sometimes be mixed with that of other deepwater sharks and/or coastal shark also used for their liver oil. If the squalene content in the liver oil is high (>70%), this indicates the likely presence of gulper sharks (and possibly the other two deepwater species), and if necessary for compliance, this would be cause to conduct genetic testing as outlined in 2.1.1.

Methods to determine squalene content

Hand-held refractometers

Hand-held refractometers are used by some traders to assess squalene content. Refractometers can detect the presence of gulper sharks in the liver oil but may not be precise enough to separate species of gulper shark. The refractometers are most reliable for measuring squalene content in raw or limited processed liver oil; they are not as accurate as Raman spectrometers. Refractometers are low cost (start at USD$100) and simple to use.

Raman and Infrared Spectroscopy

Squalene content in shark liver oil can be rapidly determined with 99% accuracy using Raman Spectroscopy. It can also be measured using Infrared Spectroscopy though this is slightly less accurate. Raman spectrometers are routinely used by customs and border protection agencies for non-destructive detection of products such as drugs and pharmaceuticals. Small hand-held Raman spectrometers are mostly a moderate cost (start at USD$900) and simple to use.

Carbon stable isotope

Carbon stable isotope analysis can identify the likely provenance of squalene in commonly available off the shelf pharmaceutical products. Previous research showed squalene derived from Southeast Australia and New Zealand was distinguishable from squalene derived from India, the Arabian Seas, and Northeast Africa. This analysis provides a tool to support traceability and regulation of gulper shark products if listed. This method is routinely used to determine provenance for commercial products such as beef, wine and honey, and requires laboratory analytical equipment.

2.2 Product: Fins and meat

Gulper shark fins and meat can be genetically identified to species. Fins are difficult to visually separate into species though there are some species-specific features detailed in guides that enable identification. Meat is not possible to visually identify to species.

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