

All Sharks including Deepwater Sharks

Observer bycatch data (% of total catch weight):

1. MEC – all sharks = 2.3%
NOS = 0.5%
Centrophoridae/gulper sharks = 0.8%, mostly SND
Squalidae/DW dogfishes = 0.4%, mostly ETB
All others = 0.6%, mostly BSH
2. 7A – all sharks = 1.8%
NOS = 0.8%
Centrophoridae/gulper sharks = 0.8%, all CSQ, SND
Squalidae/DW dogfishes = 0.2%, mostly CYO, CPD, ETB, CYL
All others = 0.2%
3. NWR – all sharks = 3.4%
NOS = 1.2%
Centrophoridae/gulper sharks = 0.2%, mostly SND
Squalidae/DW dogfishes = 1.5%, mostly ETB
All others = 0.5%, mostly PLS, BSH
4. ESR – all sharks = 2.9%
NOS = 0.9%
Centrophoridae/gulper sharks = 0.8%, mostly SND
Squalidae/DW dogfishes = 0.9%, mostly ETB, CYP
All others = 0.3%, mostly BSH

Literature

Anderson (2011) Fish and invertebrate bycatch and discards in orange roughy and oreo fisheries from 1990–91 until 2008–09. New Zealand Aquatic Environment and Biodiversity Report No. 67. 60p.

Gives estimates of discards from the combined orange roughy fisheries from 1990-91 to 2008-09.

Most deepwater sharks and other sharks are discarded (see Appendix 1).

O’Driscoll RL, MacGibbon D, Fu D, Lyon W, Stevens DW (2011). A review of hoki and middle depth trawl surveys of the Chatham Rise, January 1992–2010. New Zealand Fisheries Assessment Report 2011/47. 72p. + App.

Gives biomass trends and mean length trends for some deepwater sharks from Chatham Rise trawl surveys from 1992 to 2010 (Table 7 and appendices). Extracts from Table 7 for deepwater sharks below.

Species code	Biomass trend	Length distribution	Mean length trend
BSH	no change		
CYP		bimodal	no change
ETB	no change	unimodal	no change
ETL	no change	multimodal	no change
SND	no change	multimodal	no change

Parker SJ, Francis MP (2012) Productivity of two species of deepwater sharks, *Deania calcea* and *Centrophorus squamosus* in New Zealand. New Zealand Aquatic Environment and Biodiversity Report No 103. 44p.

Estimated the age composition, growth functions, maturity ogives, and natural mortality of two species of deepwater sharks, *Deania calcea* and *Centrophorus squamosus*. Age determination was problematic and the age-derived parameters need to be treated with caution. Both species have life history attributes resulting in low productivity. Although imprecise, biomass trends from Chatham Rise and Antarctic trawl survey series suggest a flat or modest increase in biomass since the early 1990s.

Dunn MR, Szabo A, McVeagh, MS, Smith PJ. (2010) The diet of deepwater sharks and the benefits of using DNA identification of prey. *Deep-Sea Research I* **57**: 923–930

Examined stomachs from the sharks *Dalatias licha*, *Centrophorus squamosus*, *Centroscymnus owstoni*, *Centroselachus crepidater*, *Proscymnodon plunketi*, and *Galeorhinus galeus* from three research trawl surveys on Chatham Rise, east of New Zealand. The prey of *D. licha*, *C. squamosus*, and *P. plunketi* were predominantly benthic or demersal fishes and cephalopods. The prey of *C. owstoni* and *C. crepidater* were predominantly mesopelagic fishes and squids. *G. galeus* foraged throughout the water column. Scavenging of discards from commercial fishing vessels was likely in *C. squamosus*, *P. plunketi*, and *G. galeus*. The diet of all species except *C. crepidater* was dominated by hoki.

Blackwell RG (2010) Distribution and abundance of deepwater sharks in New Zealand waters, 2000–01 to 2005–06. New Zealand Aquatic Environment and Biodiversity Report No. 57. 51p.

Examined trends in relative biomass, size structure and spatial distribution of seven species of squaloid deepwater sharks, SND shovelnose dogfish (*Deania calcea*), ETB Baxter's dogfish (*Etmopterus baxteri*), ETL lucifer dogfish (*Etmopterus lucifer*), CYO Owston's dogfish (*Centroscymnus owstoni*), CYP longnose velvet dogfish (*Centroselachus crepidater*), CSQ leafscale gulper shark (*Centrophorus squamosus*), and BSH seal shark (*Dalatias licha*) common over the middle and lower New Zealand continental slope in depths greater than 600 m. Shovelnose dogfish also occurs on the upper and middle slope (400–600 m in depth). Baxter's dogfish is restricted to New Zealand and Australia, while the others have a worldwide distribution in temperate waters.

Available abundance indices for six of the deepwater shark species showed little change or an increase in relative abundance on the northeast Chatham Rise between 1986 and 2002. The relative abundance indices for Baxter's dogfish were more variable, where indices declined on the northeast Chatham Rise between 1986 and 2002. (Note that O'Driscoll et al. (2011) provides updated biomass trends for a number of these species.)

The commercial fishery data for deepwater dogfish are unreliable. The Observer Programme data were also unreliable because of poor species identification, misreporting, and between-year variability in observer coverage. The trawl survey series cover only a small part of the known distribution of these species, and it is not known how representative the results are.

Anderson OF (2009b). Fish discards and non-target fish catch in the New Zealand orange roughy trawl fishery, 1999–2000 to 2004–05. New Zealand Aquatic Environment and Biodiversity Report No. 39. 40 p.

Gives fish discards and catch estimates for deepwater sharks from the combined orange roughy fisheries up to 2004-05.

Francis MP, Lyon WS (2012) Review of research and monitoring studies on New Zealand sharks, skates, rays and chimaeras, 2008–2012 New Zealand Aquatic Environment and Biodiversity Report No. 102.

Provides a summary of all research published between 2008 and 2012 on New Zealand sharks, skates and rays.