



Lineage

Annual distribution of Four-rayed rattail

1. Electronic databases were used to generate initial maps and summary tables of species distributions.
 - a. Commercial fishing returns: **Catch-effort data**. All records from 01 Oct 1989 to 07 November 2006 were extracted on 9 November 2006. A summary of estimated catches by statistical area was created from these data. Many of these records did not have position information, but those that did were used to create draft maps of species distributions. Information from statistical areas 1–10 was down-weighted because of likely mis-recording of FMA or QMA instead of statistical area. Only the top five species caught are reported on these forms so information on the absence of a species is not available.
 - b. Commercial fishing returns: **Landings data**. All records from 01 Oct 1989 to 07 November 2006 were extracted on 9 November 2006. From this extract a summary of landings by species, year, and fishstock (either the species QMAs or the generic FMAs numbered 1–10) was created.
 - c. Scientific observer records from larger trawlers: **obs** database. All records from 24 August 1989 to 3 October 2006 and stored in the new data format were extracted on 13 November 2006. Data were used to create draft maps of the species distribution, showing also the positions of trawls not catching the species. This database provides an important check against how well observed vessel data matches the larger commercial catch-effort data.
 - d. Research bottom trawl records: **fish_comm** database. This database is a groomed version of the research trawl database **trawl**. All records from 14 March 1961 to 7 July 2005 were extracted on 8 November 2006. Data were used to create draft maps of the species distribution, showing also the positions of trawls not catching the species. The database is however limited to seasons in which surveys have been carried out, and is not therefore as extensive as the commercial catch-effort coverage.

2009 update: Catch-effort and landings data, the observer database (**cod**), and the **trawl** database were re-examined for the period 31 August 2006 to 13 May 2009. Numerous new records of the four-rayed rattail were available from **trawl** and a lesser number from **cod**, and although none were from locations outside of the full range previously described for this species, the new data expanded the known depth range.

2. Literature sources were searched for distributional information that added to the distributional ranges determined from databases.
 - a. O'Driscoll et al. (2003). Areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand deepwater fish, pelagic fish, and invertebrates. *NIWA Technical Report 119*.
 - b. Unpublished electronic bibliography of New Zealand fishes compiled by L. J. Paul and held on a NIWA computer.
 - c. Aquatic Sciences and Fisheries Abstracts.
 - d. *New Zealand Professional Fisherman and Seafood New Zealand* for 1986–2006.
 - e. *New Zealand Fishing News* for 1998–2006.
 - f. Scientific papers, unpublished reports, species monographs, and university theses available to the expert who prepared the distributional layers.
 - g. Other online sources such as OBIS, Fishbase, Google, and the ISI Web of knowledge.
3. Other sources.
 - a. Nil.
4. Summary
 - a. Maps and summary tables generated from the electronic databases were provided to an expert scientist who integrated this information with other information from the literature, and expert opinion, and produced hand-drawn distributional zones on a template map containing depth contours at 250 m, 500 m, and 1000 m. These maps were then digitised and imported into a GIS software package as layers. The areas of the zones were calculated, and the layers were linked to attribute and metadata files.
 - b. The primary sources of distributional data for four-rayed rattail were the fish_comm databases and Anderson et al. (1998).
 - c. Four-rayed rattail occur in New Zealand, southeast Australia (NSW, Vic. Tas), Chile, and in the South Atlantic off Argentina and the Agulhas Plateau. They are benthopelagic (living on or near the bottom) at 700–1200 m.
 - d. In New Zealand, four-rayed rattail is widespread but may be absent from the northern tip of the North Island. The southern limit of distribution is also unknown but the species is known from the south side of the Campbell Plateau. Probably they occur off the south-west of the South Island but the area is not suitable for bottom trawling so there are no recorded catches from the area. Mostly they have been caught in central and southern waters but this may reflect fishing and research sampling effort. Hotspots are also difficult to define because of the restricted spatial and temporal research sampling. They are found on flat ground and also on hills within their depth range (700–1200 m). On the north Chatham Rise they can be particularly abundant and in some orange roughy abundance bottom trawl surveys are the second most abundant species by weight after orange roughy. There are no known

spawning grounds and spawning period is also uncertain because of the lack of seasonal deepwater research sampling. They are small fishes, generally less than about 40 cm TL and are taken as a by-catch of target fishing for species such as orange roughy, black oreo, and smooth oreo. They are generally discarded or converted to fishmeal if the trawler has this equipment.

5. References

The following sources provided useful information on the distribution of this species. This is not an exhaustive list of all references to the species.

Anderson, O.F.; Bagley, N.W.; Hurst, R.J.; Francis, M.P.; Clark, M.R.; McMillan, P.J. (1998). Atlas of New Zealand fish and squid distributions from research bottom trawls. *NIWA Technical Report 42*. 303 p.

Cohen, D.M.; Inada, T.; Iwamoto, T. Scialabba, N. (1990). FAO species catalogue. Vol. 10. Gadiform fishes of the world (Order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date. FAO, Rome. 442 p.

Iwamoto, T.; Graham, K.J. (2001). Grenadiers (Families Bathygadidae and Macrouridae, Gadiformes, Pisces) of New South Wales, Australia. *Proceedings of the California Academy of Sciences* 52(21):407–509.