



Lineage

Annual distribution of elephant fish

FD0600_1; FD0601_1; FD0602_1; FD0603_1; FD0604_1

1. Electronic databases were used to generate initial maps of species distribution.
 - a. Commercial fishing returns (larger vessels): **TCEPR** database. All records from 1 October 1989 to 30 September 2005 were extracted on 17 October 2005. Data were used to estimate mean annual catch and catch rate (kilograms per kilometre towed) in 0.25 degree rectangles. Only the top five species caught are reported on these forms so information on the absence of a species is not available. Records of elephant fish from depths greater than 200 m, and on the Chatham Rise, Campbell Plateau, and north of Auckland are probable mis-identifications or mis-codings, and were ignored (elephant fish has never been recorded from these depths or regions in research trawl tows). Records from the eastern Bay of Plenty are plausible given the frequent capture of elephant fish in research trawl tows between East Cape and Mahia Peninsula.
 - b. Commercial fishing returns (smaller vessels): **CELR** database. All records from 1 October 1989 to 30 June 2003 were extracted on 15–17 July 2003. Data were used to estimate mean annual catch in statistical areas. Information from statistical areas 1–10 was down-weighted because of likely mis-recording of Fishstock 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. Records of elephant fish from the Kermadec Islands, Chatham Islands and southern Campbell Plateau were ignored as other sources do not support their presence in these regions.
 - c. Scientific observer records from larger vessels: **obs** database. All records from 1 March 1990 to 30 September 2005 and stored in the new data format were extracted on 20 October 2005. Data were used to estimate mean annual catch and catch rate (kilograms per kilometre towed), and proportion of tows that caught the species, in 0.25 degree rectangles.
 - d. Research bottom trawl records: **fish_comm** database. This database is a groomed version of the research trawl database **trawl**. All records from 2 September 1978 to 30 September 2005 were extracted on 19 May 2006. Data were used to estimate total catch, proportion of tows that caught the species, and catch rate (kilograms per kilometre towed) in 0.25 degree rectangles.
 - e. Recreational fishing database: **rec_data**. All records were extracted on 24 July 2003. Data were used to determine the presence of a species in a variety of statistical reporting areas.

- f. Databases of commercial tuna longline catches (**TLCER**), observer records from tuna longlines (**I_line**), and aerial sightings (**aer_sight**) were not used as they contained no records of this species, or the number of records was too small to provide useful additional distributional information. Records from Russian trawl surveys (**trawl**) were not used because they were historic (pre 1987), and there were no records of elephant fish from areas not covered by New Zealand research trawl surveys. No data were available from the **Museum of New Zealand** database.
2. Literature sources were searched for distributional information that added to the distributional ranges determined from databases.
 - a. Unpublished electronic bibliography of New Zealand fishes compiled by L. J. Paul and held on a NIWA computer.
 - b. Aquatic Sciences and Fisheries Abstracts.
 - c. *New Zealand Professional Fisherman* and *Seafood New Zealand* for 1986–2002.
 - d. *New Zealand Fishing News* for 1998–2002.
 - e. Scientific papers, unpublished reports and university theses available to the expert who prepared the distributional layers.
3. Other sources.
 - a. Nil.
4. Summary
 - a. Maps 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 elephant fish were TCEPR, CELR, obs and fish_comm databases.
 - c. Elephant fish occur in south-eastern Australia and New Zealand. In New Zealand, elephant fish range from the eastern Bay of Plenty to the southern margin of the Snares Shelf. They may also straggle in small numbers north of Cape Egmont as far north as Kaipara Harbour (Gorman 1963), but this requires confirmation. There are no reliable records from the Chatham Rise, Chatham Islands or Campbell Plateau. Elephant fish are most abundant around South Island, with high densities occurring in Pegasus Bay, Canterbury Bight and Te Waewae Bay. Elephant fish range from the surface to at least 186 m (Waite 1909), but they are rarely found deeper than 100 m.
 - d. Data from TCEPR, CELR, obs, and fish_comm databases were examined for seasonal variations in distribution, but none were found. Elephant fish aggregate in shallow inshore waters around the South Island during spring to mate and lay their eggs, and their

abundance remains high during summer (Gorman 1963). These aggregations disperse in autumn and winter, but commercial catch data show no evidence that elephant fish move in large numbers into water deeper than 100 m; they probably simply disperse more widely across the continental shelf. Research trawl surveys of Pegasus Bay and Canterbury Bight suggest that elephant fish occur in slightly deeper water in winter than in summer (Beentjes and Stevenson 2000, 2001), but the results are difficult to interpret because the winter surveys did not sample depths of 10–30 m, where a high proportion of the elephant fish biomass occurred in the summer surveys. Failure to detect seasonal variations in elephant fish distribution is likely due to the low spatial resolution of the CELR data (statistical area only), which represent most of the commercial catch, and the fact that research trawl surveys of other parts of the South Island are usually carried out at the same time of the year.

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.
- Beentjes, M.P.; Stevenson, M.L. (2000). Review of the east coast South Island winter trawl survey time series, 1991-96. *NIWA Technical Report 86*. 64 p.
- Beentjes, M.P.; Stevenson, M.L. (2001). Review of the east coast South Island summer trawl survey time series, 1996-97 to 1999-2000. *NIWA Technical Report 108*. 92 p.
- Coakley, A. (1971). The biological and commercial aspects of the elephant fish. I. The commercial fishery. *New Zealand Marine Department Fisheries Technical Report 76*. 25 p.
- Francis, M.P.; Hurst, R.J.; McArdle, B.H.; Bagley, N.W.; Anderson, O.F. (2002). New Zealand demersal fish assemblages. *Environmental Biology of Fishes* 65: 215-234.
- Gorman, T.B.S. (1963). Biological and economic aspects of the elephant fish *Callorhynchus milii* Bory in Pegasus Bay and the Canterbury Bight. *New Zealand Marine Department Fisheries Technical Report 8*. 54 p.
- Hurst, R.J.; Bagley, N.W.; Anderson, O.F.; Francis, M.P.; Griggs, L.H.; Clark, M.R.; Paul, L.J.; Taylor, P.R. (2000). Atlas of juvenile and adult fish and squid distributions from bottom and midwater trawls and tuna longlines in New Zealand waters. *NIWA Technical Report 84*. 162 p.

Hurst, R.J.; Stevenson, M.L.; Bagley, N.W.; Griggs, L.H.; Morrison, M.A.; Francis, M.P. (2000). Areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand coastal fish. *Final Research Report for Ministry of Fisheries Research Project ENV1999/03, Objective 1*. 302 p.

Jones, J.B.; Hadfield, J.D. (1985). Fishes from Porirua and Pauatahanui Inlets: occurrence in gill nets. *New Zealand Journal of Marine and Freshwater Research* 19: 477-484.

Waite, E.R. (1909). Scientific results of the New Zealand Government trawling expedition, 1907. Government Printer, Wellington. 116 p.