



## Annual distribution of dark ghost shark lineage

### FD0590\_2; FD0591\_1; FD0592\_2; FD0593\_1; FD0594\_2

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.
  - 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. Reported dark ghost shark catches from the Kermadec Fisheries Management Area (FMA 10) were ignored because they likely represent mis-recording of fisheries statistical area 10 (dark ghost shark has not been recorded from the Kermadec Islands).
  - 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. Russian research bottom trawl records: **trawl** database. These data are a subset of the research trawl database **trawl**. All records were extracted on 9 August 2003. Data were used to determine the presence of this species north of 37 °S. Because the data are old (the most recent record was 1987), and there are problems with species identifications, these data were given low weighting.
  - f. 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.
  - g. Museum of New Zealand Te Papa records of this species based on voucher specimens held in their collection were searched for

distributional information that added to the distributional ranges determined from other databases.

- h. 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.
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 dark ghost shark were TCEPR, fish\_comm, and Obs databases and to a lesser extent the Russian trawl survey database. Some records of this species may have been mis-identifications of other closely-related ghost sharks, and further work is required to confirm the distributions shown.
    - c. Dark ghost shark are mostly found in central and south New Zealand waters, with hot spots found to the east and south of the South Island including the Chatham Rise and Chatham Islands, Auckland Islands and Pukaki Rise in depths of about 400 to 600 m.
    - d. Dark ghost shark are thought to be endemic to New Zealand (Paul 1991) and occur predominantly in depths between 70 m and about 850 m throughout New Zealand waters including the west Norfolk Ridge.

## 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.

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- Paul, L. (1991). Marine Fishes. 80 p. Reed Books, Auckland.
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