# Lineage

## Annual distribution of blue shark

## FD0440_1; FD0441_1; FD0442_1; FD0443_1; FD0444_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. Most of the records in this database are of catches made by trawling, which only occasionally catches blue sharks.
    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.
    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. Tuna longline fishing returns: **TLCER**. All records were extracted on 17 May 2006. Data were used to estimate mean annual catch and catch rate (kilograms per hook) in 0.25 degree rectangles. However, the latitudes and longitudes used were for the set start position, and because longline length is often greater than 140 km, the resolution of the data is about 1 degree square.
    e. Scientific observer records from tuna longline vessels: **l_line** database. All records between 1 October 1992 and 30 September 2005 were extracted on 9 December 2005. Data were used to estimate catch rate (number per 1000 hooks) in 0.25 degree rectangles. However, the latitudes and longitudes used were for the set start position, and because longline length is often greater than 140 km, the resolution of the data is about 1 degree square.
    f. 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.

g. Databases of research trawl surveys (**fish_comm** and **trawl**), recreational fishing catches (**rec_data**), and aerial sightings (**aer_sight**) were not used as they contained no records of this species, or the number and/or geographical distribution of records was too limited 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 blue shark were TLCER, l_line and obs databases, and published literature.
    c. Blue sharks occur worldwide in tropical to cool temperate waters, mainly between 50 $^{o}$N and 40 $^{o}$S (Compagno 1984, Last and Stevens 1994, Yatsu 1995).
    d. In the New Zealand region, blue sharks range as far south as the southern edge of the Stewart Island – Snares Islands Shelf. There are no known records from the Campbell Plateau, but it is possible that the species penetrates that far south because blue sharks reach about 52 $^{o}$S in the central South Pacific Ocean (Yatsu 1995). Blue sharks have not been recorded from the Hauraki Gulf. Blue sharks are most abundant during summer and autumn as a result of a southward migration as water temperature increases. Hotspots may be more common and widespread than indicated, Northland, north Taranaki, east cape, and Fiordland, but the available abundance data are insufficient to confirm this (the tuna longline fishery, which is the main fishery that catches blue sharks, is concentrated in specific areas around New Zealand). Blue sharks may be found close to shore in a few metres of water, especially in areas where the continental shelf is narrow, but they are most

common in oceanic waters or over the outer half of the continental shelf. The full depth range of blue sharks is unknown, but they range from the surface to at least 1000 m.

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.


Bagley, N.W.; Anderson, O.F.; Hurst, R.J.; Francis, M.P.; Taylor, P.R.; Clark, M.R.; Paul, L.J. (2000). Atlas of New Zealand fish and squid distributions from midwater trawls, tuna longline sets and aerial sightings. *NIWA Technical Report 72*. 171 p.

Compagno, L.J.V. (1984). Sharks of the world. An annotated and illustrated catalogue of shark species known to date. *FAO Fisheries Synopsis 125, vol. 4, part 2*.

Hartill, B. (1999). Billfish and gamefish tagging. *Seafood New Zealand 7(4)*: 26-27.

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.

Last, P.R.; Stevens, J.D. (1994). Sharks and rays of Australia. CSIRO, Hobart. 513 p.

Roberts, C.D. (1991). Fishes of the Chatham Islands, New Zealand: a trawl survey and summary of the ichthyofauna. *New Zealand Journal of Marine and Freshwater Research 25*: 1-19.

Yatsu, A. (1995). Zoogeography of the epipelagic fishes in the South Pacific Ocean and the Pacific sector of the Subantarctic, with special reference to the ecological role of slender tuna, *Allothunnus fallai*. *Bulletin of the National Research Institute of Far Seas Fisheries 32*. 145 p.