



Annual distribution of bigeye tuna lineage

FD0190_2; FD0191_1; FD0192_1; FD0194_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 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. South Island records are believed to be mis-identifications or mis-codings and were ignored.
 - b. 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. All records are south of the known distribution shown by other sources and are believed to be mis-identifications or mis-codings, so they were ignored.
 - c. 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.
 - d. Scientific observer records from tuna longline vessels: **I_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.
 - e. Databases of commercial fishing (**TCEPR**), research bottom trawl records (**fish_comm**), recreational fishing (**rec_data**), Russian trawl surveys (**trawl**), aerial sightings (**aer_sight**), and Museum of New Zealand Te Papa records were not used because there were no records of bigeye tuna in these databases.
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 bigeye tuna were TLCER, CELR, and I_line databases.
 - c. Bigeye tuna occurs worldwide in tropical and subtropical waters, except in the Mediterranean Sea. In the New Zealand region, it occurs from tropical waters to the North Taranaki Bight off the west coast and north of Cook Strait off the east coast of the North Island. In New Zealand waters, nearly all bigeye tuna are found seaward of the 1000 m contour. The known depth range is 0–600 m.
 - d. Data from TLCER, CELR, and I_line databases were examined for seasonal variations in distribution. Juvenile bigeye tuna are primarily found in tropical waters of the Pacific Ocean. Most bigeye tuna found in New Zealand waters are adults larger than 110 cm fork length. The seasonal movement of bigeye tuna is southwards in summer months with most bigeye tuna occurring north of about 38 °S on the west coast and about 40 °S on the east coast. The southern extent of the distribution retracts northward as surface waters cool and reach their northernmost extent in winter. A hot spot for this species occurs to the north-east of northern New Zealand.

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.

Carocci, F.; Majkowski, J. (1996). Pacific tuna and billfishes, atlas of commercial catches. FAO, Rome. 9 p, 28 maps.

Collette, B.B; Nauen, C.E. (1983). FAO Species Catalogue, Volume 2. Scombrids of the world. *FAO Fisheries Synopsis* 125(2). 137 p.

Dagorn, L.; Bach, P.; Josse, E. (2000). Movement patterns of large bigeye tuna (*Thunnus obesus*) in the open ocean, determined using ultrasonic telemetry. *Marine Biology* 136: 361-371.