



Lineage

Annual distribution of broadbill swordfish lineage

FD0520_1; FD0521_1; FD0522_1; FD0523_1; FD0524_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.
 - 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: **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.
 - 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 trawls (**fish_comm**), Russian trawl surveys (**trawl**), recreational fishing (**rec_data**) and aerial sightings

(**aer_sight**) were not used as they contained no records of this species.

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 broadbill swordfish were TLCER, I_line, and CELR databases.
 - c. Broadbill swordfish are found in tropical, temperate and sometimes cold waters of all oceans. The latitudinal range extends from 50 °N to 45 °S in the western Pacific. Swordfish distribution is largely governed by water temperature. It is a pelagic species found where surface waters are warmer than 13 °C. Tagging studies show that swordfish undergo long distance migrations. The swordfish found in New Zealand are part a stock found throughout the south-western Pacific Ocean, and possibly the whole Pacific Ocean. In New Zealand, swordfish commonly occur around the North and South islands, especially north of 43 °S, but they range south as far as 49 °S. Swordfish make diurnal vertical movements between the surface at night and deeper water during the day, to about 650 m, although they may dive to 1000 m.
 - d. A seasonal pattern can be seen in swordfish distribution, with southward movement in warm months and northward movement in cold months; however the seasonal range limits are hard to define and map, so the annual distributions are shown on the seasonal maps, apart from hotspots.

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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