Lineage

Spring Distribution of Skipjack Tuna

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 June 2003 were extracted on 16 July 2003. 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. Skipjack tuna are not usually caught by trawl so records are almost certainly the result of accidental captures during setting or retrieving gear. Many of the few records of skipjack tuna were south of the extreme range indicated by other sources, and were probable mis-identifications of mis-codings, so they were ignored. The few acceptable records essentially duplicate information in other data sets.
    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. South Island records of skipjack tuna were south of the extreme range indicated by other sources, and were probable mis-identifications of mis-codings, so they were ignored.
    c. Scientific observer records from larger vessels: **obs** database. All records from 1 March 1990 to 30 June 2003 and stored in the new data format were extracted on 28 July 2003. 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. Most of the few records of skipjack tuna were south of the extreme range indicated by other sources, and were probable mis-identifications of mis-codings, so they were ignored.
    d. Tuna longline fishing returns: **TLCER**. All records were extracted on 17 July 2003. 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 2002 were extracted on 11 August 2003. 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. Aerial sightings database: **aer_sight**. On 5 August 2003, data were extracted for 1976 onwards (for 0.5 degree squares) and for 1 January 1986 onwards (for actual positions). Data were used to estimate total tonnage, number of schools, and tonnes per hour of flying. Records were consulted but they did not add anything to information available from other sources.
g. 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.
h. 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.
i. Databases of research bottom trawl records (**fish_comm)** and records from Russian trawl surveys (**trawl**) were not used because they had very few or no records, in the case of Russian trawl data a single specimen (pre 1987) was reported without position.

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 their expert opinion to produce 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 skipjack tuna were TLCER, CELR, and l_line databases.
    c. Skipjack tuna occurs worldwide in tropical and subtropical waters, except in the Mediterranean Sea. In the New Zealand region it

occurs from tropical waters to about 42 ^{o}S). The known depth range of skipjack tuna is 0–100 m.

d. Data from TLCER, CELR, and l_line databases were examined for seasonal variations in distribution. Juvenile skipjack tuna migrate to temperate waters of the South Pacific in summer and remain in New Zealand waters until April or May. Adults occur in small numbers and are caught by longline throughout the year. Skipjack tuna migrate southwards in summer, with most occurring north of about 39 ^{o}S on the west coast and north of about 38 ^{o}S on the east coast. They return northward as surface waters cool, reaching their northernmost extent in winter.
e. In spring, most skipjack tuna are found off the continental shelf north of 36 ^{o}S. No hotspots are evident.
f. Spring, for the purposes of NABIS, is defined as being the months of October, November and December. This definition is based on research regarding the spatial and temporal variability of sea surface temperature in the New Zealand region (Uddstrom and Oien 1999).

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.

Boggs, C. H. (1992). Depth, capture time, and hooked longevity of longline-caught pelagic fish: timing bites of fish with chips. *Fishery Bulletin* 90: 642-658.

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.

Uddstrom, M.J.; Oien, N.A. (1999). On the use of high-resolution satellite data to describe the spatial and temporal variability of sea surface temperatures in the New Zealand region. *Journal of Geophysical Research. Oceans 104 C9*: 20729-20751.