Lineage

Spring Distribution of Golden Mackerel

1. Electronic databases were used to generate initial maps of species distribution.

    a. 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. Records of golden mackerel were mainly from the west coast (approximately Raglan to Hokitika) with small numbers from Cook Strait, the Puysegur–Snares Shelf, inside 500 m depth off the Canterbury coast, and the Chatham Rise. There was no observer coverage of the purse-seine fleet, which is responsible for most golden mackerel catch on the east coast of the North Island. Thus, the **obs** database only provides partial information on distribution for this species.
    b. 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 3 September 1997 were extracted on 15–16 July 2003. Further surveys have been added to **trawl** and **fish_comm** since 1997. 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. Because of the paucity of information from other sources, these data provided important information for this species, particularly south of about 36 ºS on both coasts, but there were gaps in research trawl effort in key areas (e.g., the northeast coast of the North Island).
    c. 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.
    d. Databases of commercial trawl and purse-seine catches (**TCEPR** and **CELR**) were not used because catches of golden mackerel are recorded under the combined code JMA for all three species of jack mackerel. Recreational fishing databases (**rec_data**) were not used because fishers do not reliably distinguish the three species, and other data sources cover the same geographic range. Similarly, the aerial sightings database (**aer_sight**) does not separate golden and horse mackerel. Databases of commercial tuna longline catches (**TLCER)** and observer records from tuna longlines (**l_line**) 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. Records from Russian trawl surveys

(**trawl**) were not used because they were historic (pre 1987), and species identification (i.e., separation of golden and horse mackerels) is considered unreliable.

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. Anecdotal information from a senior fish-spotting pilot who has worked in the purse-seine industry since 1976 was summarised to determine the position of any hotspots of this species in northern waters. These hotspots apply to both golden and horse mackerel, and were included in annual, spring, and summer distribution maps.

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 golden mackerel were the obs and fish_comm databases.
    c. Golden mackerel occur through most New Zealand and Australian waters. It is present at Lord Howe Island and possibly Norfolk Island, but has not been recorded from the Kermadec Islands (Francis 1993).
    d. In New Zealand, golden mackerel occurs throughout mainland waters from the Three Kings Islands to the northern Snares Shelf, although their presence in Fiordland is unknown. There were a few records from Mernoo Bank (obs database), at the western end of the Chatham Rise, but it is unknown whether these are valid or result from mis-identifications of other species, particularly horse mackerel. There is a single Museum of New Zealand specimen from the Chatham Islands. Golden mackerel appears to be absent from most of the Chatham Rise east of Mernoo Bank. The known depth range for this species is 0–150 m.
    e. The spring distribution differed from the annual distribution only in the positions of hotspots on the west coast and the reduced size of the hotspot in the Hauraki Gulf. Two were evident on the west

coast: the first was small, west of Farewell Spit; the second was larger, occupying a large proportion of the North Taranaki Bight.

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.

Anderson, O.F.; Bagley, N.W.; Hurst, R.J.; Francis, M.P.; Clark, M.R.; McMillan, P.J. (1998). Atlas of New Zealand fish and squid distributions from research bottom trawls. *NIWA Technical Report 42*. 303 p.

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Francis, M.P.; Hurst, R.J.; McArdle, B.H.; Bagley, N.W.; Anderson, O.F. (2002). New Zealand demersal fish assemblages. *Environmental Biology of Fishes 65*: 215-234.

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Stephenson, A.B.; Robertson, D.A. (1977). The New Zealand species of *Trachurus* (Pisces: Carangidae). *Journal of the Royal Society of New Zealand 7*: 243–253.

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.