



Annual distribution of gemfish lineage

FD0680_1; FD0681_1; FD0682_2; FD0683_1; FD0684_2

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. Records of gemfish from the southern Auckland Islands shelf, eastern Auckland Islands gap, Verman Bank, Lord Howe Rise, and a few records deeper than 1100 m are partly supported by scientific observers but are not recorded in research tows or in the literature. Records from these areas were treated as unknown.
 - 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. Records of gemfish from the Kermadecs Ridge and east of the Campbell Plateau are unconfirmed and were ignored.
 - 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. Gemfish have been recorded occasionally from the Auckland Islands shelf, Auckland Islands gap, and the southern Chatham Rise, and there are a few records deeper than 1100 m, but these are not supported by research tows. Records from these areas were treated as unknown.
 - d. 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 30 September 2005 were extracted on 19 May 2006. 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.
 - e. Russian research bottom trawl records: **trawl** database. These data are a subset of the research trawl database **trawl**. All records were extracted on 9 August 2003. Data were used to determine the

presence of this species north of 37 °S. Records on the northern Lord Howe Rise are unconfirmed and are treated as unknown.

- 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. Nothing was reported from outside the range confirmed by trawl surveys.
 - g. NORFANZ voyage: **biods** database. Records from a research trawling and dredging survey of the Norfolk Ridge and Lord Howe Rise carried out in May–June 2003 were extracted on 9 January 2006.
 - h. Databases of commercial tuna longline catches (**TLCER**), observer records from tuna longlines (**l_line**), recreational fishing (**rec_data**), and aerial sightings (**aer_sight**) 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.
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 gemfish were TCEPR, CELR, and fish_comm databases.
 - c. Gemfish occur off southern Australia and New Zealand. Off New Zealand they occur throughout mainland waters from the Three Kings Islands to the southern edge of the Snares Shelf. There are also a few verified records from Wanganella Bank (Clark 1988, Fishery Agency of Japan 1977), the northern Challenger Plateau, the Chatham Islands (Roberts 1991), and the Auckland Islands. Hotspots for this species occur around the north and east coasts of the North Island, north-west of the South Island, off Banks

Peninsula and the Snares Shelf. The known depth range for gemfish is 0–1100 m.

- d. Data from TCEPR, CELR, obs, and fish_comm databases were examined for seasonal variations in distribution. Gemfish aggregate on the outer shelf during spawning and post-spawning migrations. This results in a more northern distribution (i.e., east coast and north-west coast of the North Island) of the northern stock in autumn–winter and a more northern distribution (i.e., west coast South Island) of the southern stock in winter–early spring. These aggregations disappear in summer and fish are more abundant off Southland and off the east coast of the South Island and southern North Island.

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.

Clark M.R. (1988). Records of fishes from the West Norfolk Ridge, north-west of New Zealand. *New Zealand Journal of Zoology 15*: 415-421.

Fishery Agency of Japan (1977). Report of R V *Kaiyo Maru* survey cruises 1976; survey of the central Pacific seamounts. *Fishery Agency of Japan report 52(7)*: 259 p.

Hurst, R.J.; Bagley, N.W.; Anderson, O.F.; Francis, M.P.; Griggs, L.H.; Clark, M.R.; Paul, L.J.; Taylor, P.R. (2000a). 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.

Hurst, R.J.; Stevenson, M.L.; Bagley, N.W.; Griggs, L.H.; Morrison, M.A.; Francis, M.P. (2000b). Areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand coastal fish. *Final Research Report for Ministry of Fisheries Research Project ENV1999/03, Objective 1*. 302 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.