

Lineage – Scientific methodology

Winter distribution of juvenile blue warehou lineage

1. Electronic databases were used to generate initial maps of species distribution.
 - a. Scientific observer records from larger vessels: **obs_ifs** database. All records from 1 October 1989 to 31 March 2005 and stored in the new data format were extracted on 3 August 2005. Data were used to estimate mean annual catch of juveniles, proportion of juveniles in the catch of the species, and proportion of tows that caught juveniles of the species, in 0.25 degree rectangles.
 - b. Research bottom trawl records: **trawl** database. All records from 1 October 1961 to 5 July 2005 were extracted on 25 August 2005. Data were used to estimate mean annual catch of juveniles, proportion of juveniles in the catch of the species, and proportion of tows that caught juveniles of the species, in 0.25 degree rectangles.

2009 update: An examination of the observer (**cod**) and research (**trawl**) databases was repeated for the period 31 Mar 2005 to 1 May 2009. No new records outside the previous range were found on the observer and research databases and no changes were made to the map of the known winter distributional range of juvenile blue warehou.
2. Literature sources were searched for usable biological and distributional information to add to the distributional range of juvenile blue warehou determined from databases.
 - a. Hurst et al. (2000). Areas of importance for spawning, pupping or egg-laying, and juveniles of New Zealand coastal fish. Final Research Report for MFish Project ENV199903.
 - b. Unpublished electronic bibliography of New Zealand fishes compiled by L. J. Paul and held on a NIWA computer.
 - c. Aquatic Sciences and Fisheries Abstracts.
 - d. *New Zealand Professional Fisherman* and *Seafood New Zealand* for 1986–2005.
 - e. *New Zealand Fishing News* for 1998–2005.
 - f. Scientific papers, unpublished reports and university theses available to the expert who prepared the distributional layers.
 - g. Other online sources such as Fishbase, Google, and the ISI Web of knowledge.

2009 update: Searches of ASFA, Fishbase, and Google Scholar on 26 May 2009 returned no new references that would alter the known winter distribution of juvenile blue warehou in New Zealand waters.

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 juvenile blue warehou were the **obs_ifs and trawl** databases.
- c. Blue warehou are a coastal species found around New Zealand, mainly in depths less than 300 m, particularly around the South Island and lower part of the North Island. There has been the occasional recording from the Chatham Rise and Sub-Antarctic, however there may be identification or species coding issues with these records. Blue warehou average 40–60 cm, reaching a maximum of about 75 cm. Length at maturity is about 37 cm at age 4 (Bagley et al. 1998). They are believed to migrate considerable distances to spawn (Hurst et al. 2000).
- d. Juvenile Blue Warehou have been recorded from most coastal waters around New Zealand, the Stewart/Snares shelf and the Auckland Islands. Young fish are often found in small schools in the shallow waters of harbours and bays (Ayling & Cox 1982). Very small (0+) blue warehou are found in inshore waters less than 75 m off the east and west coast of the South Island and the north of the North Island (Hurst et al. 2000). Juveniles up to 2 years old have a similar distribution but extend slightly more offshore. The depth range for all juvenile blue warehou is 0–500 m from observer data and 0–200 m from trawl survey data. Hotspots of higher abundance occur off Tasman and Golden Bays, Greymouth, Banks Peninsula, and Southland including the edge of the Stewart/Snares shelf.
- e. In winter the distribution of juvenile blue warehou is patchy and possibly reflects the focused effort from the commercial vessels on the west coast South Island and few trawl surveys at this time of year. Patches of juveniles have been recorded from west coast North Island, Tasman and Golden Bays, west and east coasts of the South Island, and Puysegur Bank. The depth range of juveniles in winter is 0–500 m (research data show depths between 0 and 100 m and observer data 0 to 500 m). This difference of maximum depth is possibly explained by vessels fishing the canyon features

off South Westland and tows starting in deep water and ending up much shallower.

- f. The distribution of observer tows and research surveys where blue warehou were measured will influence the distribution map and juvenile blue warehou may occur outside the 100% distribution shown.

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.

Ayling, T. & Cox, G. J. 1982: Collins guide to the sea fishes of New Zealand. Collins, Auckland. 343 p.

Bagley, N.W., Ballara, S.L., Horn, P.L., and Hurst, R.J. 1998: A summary of commercial landings and a validated ageing method for blue warehou, *Seriolella brama* (Centrolophidae), in New Zealand waters, and a stock assessment of the Southern (WAR 3) Fishstock. New Zealand Fisheries Assessment Research Document 98/20. 46 p.

Hurst, R. J. 1985: Common Warehou. In Colman, J.A., McKoy, L.J. & Baird, G.G. (Comp. & Eds.), Background papers for the 1985 Total Allowable Catch recommendations, pp. 63–65. Fisheries Research Division, N.Z. Ministry of Agriculture and Fisheries. (Unpublished report, held in Fisheries Research Centre library, Wellington).

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

Jones, J. B. 1988: Blue warehou. New Zealand Fisheries Assessment Research Document 88/11. 21 p. (Draft report held in NIWA library, Wellington).

Paul, L.J. (2000). New Zealand fishes: identification, natural history and fisheries. Revised edition. Reed, Auckland. 253 p.