Larval fish assemblages in coastal, shelf and offshore waters of south-western Australia.

Barbara Muhling

Abstract
Ichthyoplankton assemblages were investigated during a three-year multidisciplinary project conducted off the coast of south-western Australia. Fish larvae were sampled using replicated oblique bongo net tows along a five-station transect extending from inshore (18m depth) to offshore waters (1000m depth). A total of 148 taxa from 93 teleost families were identified. Larvae of Gobiidae, and Blenniidae were abundant inshore, while larvae of pelagic and reef-dwelling families, such as Clupeidae, Engraulidae, Carangidae and Labridae were common in continental shelf waters. Larvae of oceanic families, particularly Myctophidae, Phosichthydae and Gonostomatidae, dominated offshore assemblages. Inshore larval fish assemblages were the most seasonal, in terms of species composition and abundance, with offshore assemblages the least so.

Multivariate statistical analyses revealed larval fish assemblages to have a strong temporal and spatial structure. Assemblages were closely correlated to water mass type, with species distributions reflecting both cross-shelf and along-shore oceanographic processes and events. The strength and position of the warm, southward flowing Leeuwin Current, and of the cool, seasonal, northward flowing Capes Current were shown to drive much of the variability in the marine environment, and thus larval fish assemblages.

Many of the distinctions between larval fish assemblages on the continental shelf were attributable to patterns of abundance in clupeiform larvae. While larvae of *Engraulis australis* and *Spratelloides robustus* showed clear seasonal and spatial distribution patterns, larvae of *Sardinops sagax* and *Etrumeus teres* were found throughout the year, with high interannual variability in abundance. Abundances of *S. sagax* and *E. teres* larvae were negatively correlated to phytoplankton biomass, and microzooplankton density. Peaks of abundance of both species appeared to be better aligned with favourable transport and retention conditions.

A detailed comparison of the horizontal and vertical distribution of larval fishes revealed that the contrasting oceanographic conditions between summer and winter strongly influenced larval fish assemblages. Although most fish larvae were found above the thermocline, depth distributions differed between taxa, and were shown to influence their offshore transport. Neustonic fish larvae showed potential for significant dispersion during summer, as a result of offshore Ekman transport.

Meso-scale Leeuwin Current eddies were a feature of the oceanography of the region, and their influence on larval fish assemblages was examined in both an anti-cyclonic eddy (warm-core) and a cyclonic eddy (cold-core). The warm-core eddy contained larval fish assemblages that were distinct from those in the cold-core eddy, with lower larval fish densities, especially in the eddy centre. Although the eddies originated near the continental shelf, larval fish assemblages within both eddies were largely oceanic, probably a result of the age of the eddies when they were sampled (about 5 months).

Overall, larval fish assemblages showed strong temporal and spatial structure, and were well aligned to water masses in the region. The unique oceanography off south-western Australia thus has considerable implications for both larval fish transport, and potential recruitment to regional fisheries.