

**Fishery-independent swept area survey abundance estimates of chokka squid *Loligo reynaudii* by size category****Deon Durholtz<sup>1</sup> and Tracey P. Fairweather<sup>1</sup>**

A preliminary evaluation of demersal survey abundance indices by size category has been requested as a potential improvement to the inputs of a revised squid assessment model.

Fishery-independent research surveys aimed at estimating the abundance of demersal species (primarily the two species of hake) have been conducted in summer on the West Coast (WC) and in autumn on the South Coast (SC) each year since 1985. While some winter (WC) and spring (SC) surveys have been conducted, budgetary and/or operational constraints have prevented these surveys from being routinely conducted. Surveys typically encompass the area between the coastline and 500 m isobath, although the survey area has been extended to the 1 000 m isobath since 2011 (although note that abundance estimates for input to assessments are still calculated for the historical survey area < 500 m for consistency purposes until a time series of suitable duration for the extended survey area is available). For each survey, 120 trawl stations are selected using a pseudo-random stratified survey design. The survey area is subdivided by latitude (WC) or longitude (SC) and depth into several strata, and the number of stations selected within each stratum is proportional to the area of the stratum. Areas of rough ground that cannot be sampled using demersal trawls are excluded from the station selection process, and it is assumed that fish densities in these areas are the same as those in adjacent areas. Trawling is conducted only during the day to minimise bias arising from the daily vertical migration of hake, which are known to move off the sea floor and into the water column at night to feed. All organisms in the catch, including benthic invertebrate macrofauna, are identified to species level where possible, in some cases also separated by gender (hake, chondrichthyans and cephalopods), and the catch weight of each species is then recorded. The size composition of the catch of each species is measured and more detailed biological analyses are conducted on sub-samples of commercially important species (hake, kingklip, monkfish, Agulhas sole and chokka squid). Such biological analyses include individual fish length and weight measurements, macroscopic estimation of maturity stage, gonad and liver weight measurements and samples, evaluation of stomach contents and extraction of otoliths for age determination.

Abundance indices are calculated from the survey data using the swept-area method, which, in part, relies on fishing methods and gear remaining unchanged between surveys. In 2003, it was considered necessary to change the trawl gear configuration on the FRS *Africana* because net-monitoring sensors showed that the gear was being over-spread (i.e. the wings of the net were being pulled too far apart, which reduced the vertical opening and frequently lifted the foot rope off the seabed). In selecting a new gear configuration, particular emphasis was placed on minimising the possible effect of herding on the abundance indices. The impact of this gear change on squid abundance estimates has yet to be properly evaluated, and squid assessments have effectively ignored this change. Note that when funding or operational issues have prevented the Departmental research vessel FRS *Africana* from conducting the survey, commercial vessels have been used for this purpose in some years.

Because length frequency data from either the entire catch or from a representative sub-sample are available for chokka squid, an abundance index per size category could be calculated. The size categories used for this purpose in this document were selected to align with those in the commercial catch by size ("pack") data that are being used in revising the squid assessment model. The size categories considered are:

Extra-small: < 15 cm mantle length (ML)

Small: 15 – 18 cm ML

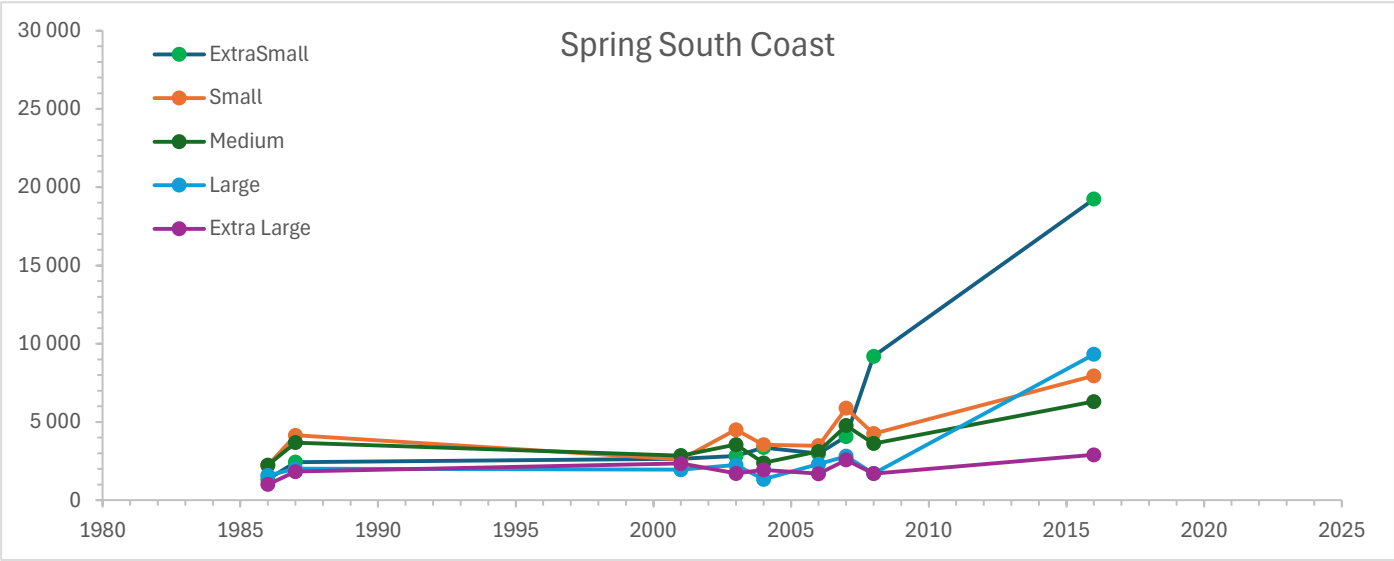
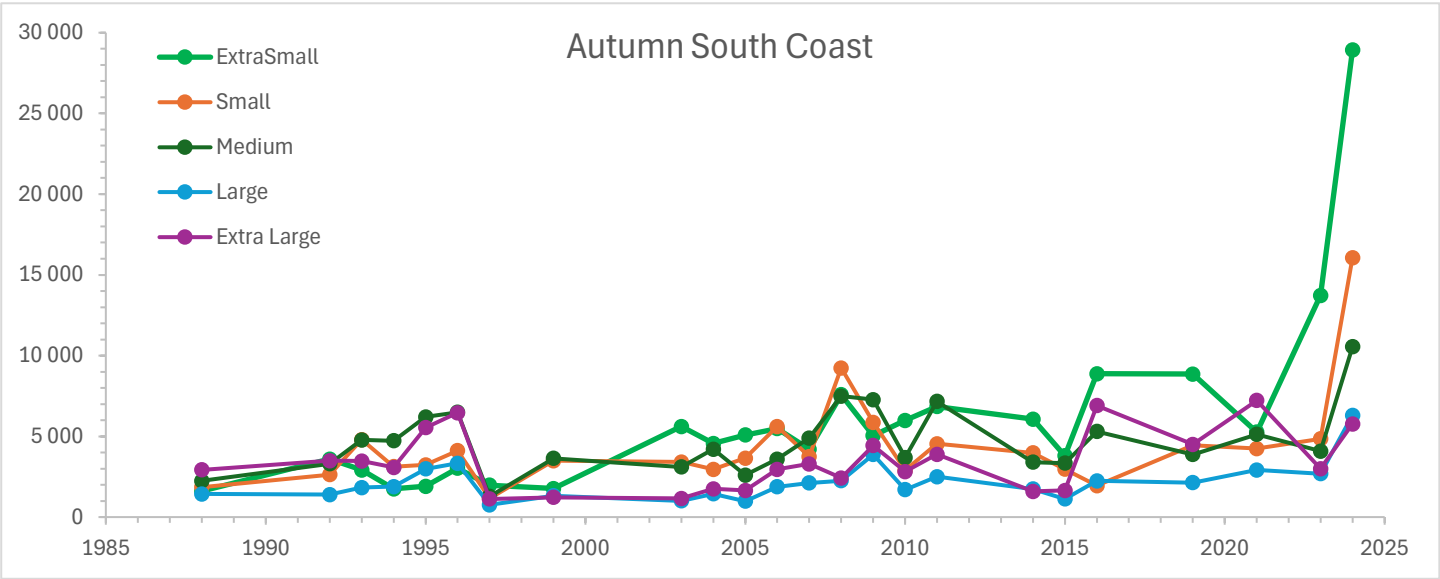
Medium: 18.1 – 25 cm ML

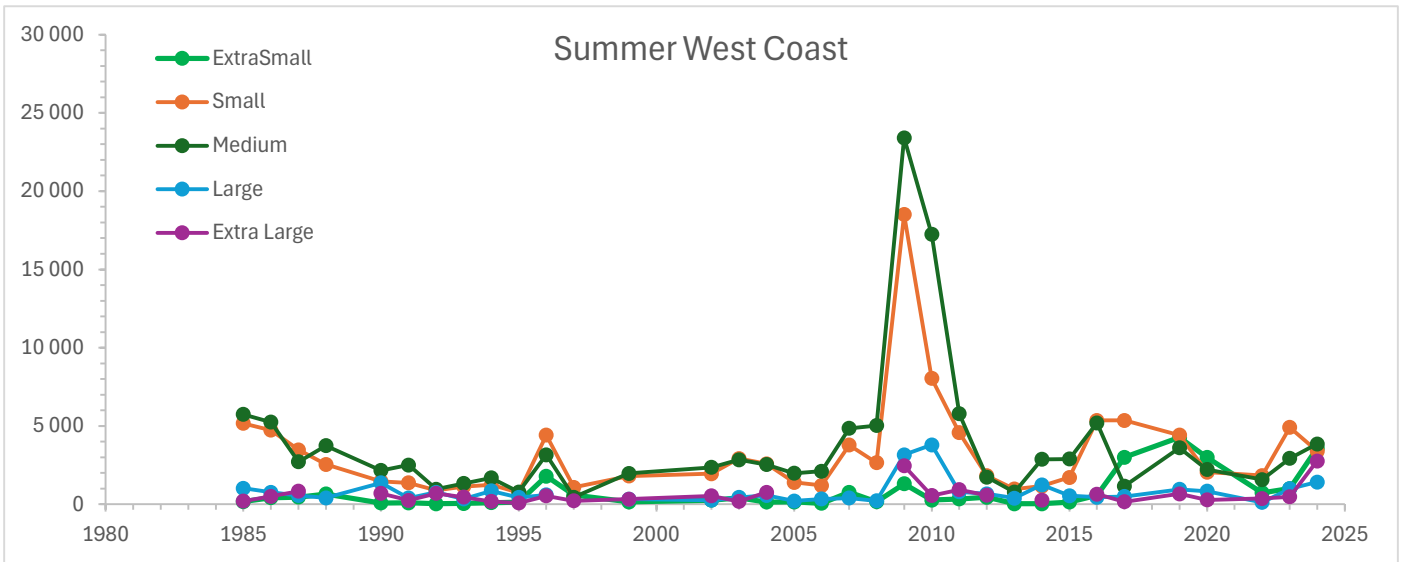
Large: 25.1 – 30 cm ML

Extra-large: > 30 cm ML

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**Figure 1:** Abundance estimates (tons) by size category for chokka squid, derived from fishery-independent demersal research surveys. Note that the various vessel-gear combinations are not accounted for in these data.