Abstract—Three experiments were performed in an estuarine squid-trawl fishery in New South Wales, Australia, to test modifications to trawl nets. Lateral mesh openings were experimentally increased and physical bycatch reduction devices (BRDs) were placed in codends. These modifications aimed to reduce nontargeted catches of fish, while maintaining catches of the targeted broad squid (*Photololigo etheridgei*) and bottle squid (*Loliolus noctiluca*). Compared to conventional codends made with 41-mm diamond mesh, codends made with different posterior circumferences and larger 45-mm mesh had no significant effect on the catches of any species. The best performing configurations involved the installation of BRDs designed to separate organisms according to differences in behavior. In particular, versions of a composite square-mesh panel reduced the total weight of bycatch by up to 71% and there was no significant effect on the catches of squid. The results are discussed in terms of the probable differences in behavior between fish and squid in codends. After this study, a square-mesh panel BRD was voluntarily adopted throughout the fishery.

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Experiments in gear configuration to reduce bycatch in an estuarine squid-trawl fishery

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The incidental catch of nontarget organisms (termed "bycatch") by commercial fishing gears will remain an important issue in the management of fisheries. Article 7.6.9 of the Food and Agriculture Organization's Code of Conduct for Responsible Fisheries (FAO, 1995) notes "States should take appropriate measures to minimize waste, discards, catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and negative impacts on associated or dependent species, in particular endangered species." Several options are available for achieving these aims (Hall, 1996), but the most common strategy involves technological improvements to fishing gears that reduce unwanted mortality due to fishing (Kennelly and Broadhurst, 2002).

Much research into gear design to reduce bycatch has been undertaken in demersal trawl fisheries and especially those targeting shrimp (for reviews see Kennelly, 1995; Broadhurst, 2000). This research reflects the seriousness of bycatch issues in these fisheries and, in particular, the incidental mortality of key species such as marine turtles and juveniles of commercially and recreationally important fish. Considerably less work has been done on bycatch in other fisheries, including those targeting cephalopods.

The global catch of squid has been estimated at 2.8 million tonnes (t) per year (FAO[1]). Squid are harvested with highly-selective jigs or less selective gill nets, seines and, more commonly, trawls (Rathjen, 1991; Morais da Cunha and Moreno, 1994; Simón et al., 1996). Large-scale use of pelagic gill or drift nets has been restricted because of concern about incidental catches (e.g., Burke et al., 1994; Piatt and Gould, 1994). Despite their widespread use, very little work has been done to modify towed gears so that they selectively harvest squid. In one of the few studies relevant to this issue, Glass et al. (1999) attached video cameras to the anterior sections of trawls targeting longfin squid (*Loligo pealeii*) in the Atlantic Ocean and observed that squid positioned themselves considerably higher in the trawl than fish. It was suggested that this difference in behavior could be used to separate catches.

[1] Food and Agriculture Organization (FAO). 2005. FAO Fisheries Global Information System. www.fao.org/fi/figis [accessed on 23 Nov 2005]. Average annual global production of all squid species for 2000 to 2003.