

Appendix 14 - Broadhurst, M.K. 2003. Reducing unwanted bycatch and improving selectivity in NSW prawn fisheries. *Professional Fisherman*, October 2003, p. 16-17.

Reducing unwanted bycatch and imp

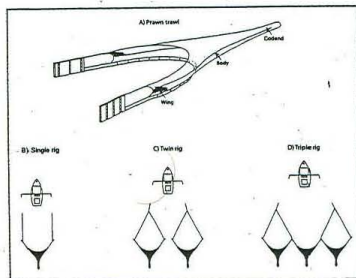


Fig. 1. A) typical prawn trawl and B) single-, C) twin- and D) triple-rigged configurations

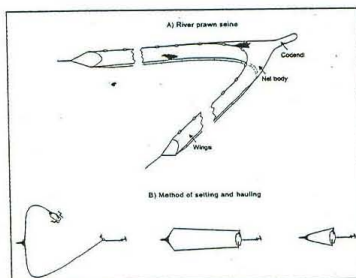


Fig. 2. A) river prawn seine and B) the method of setting and retrieving the gear

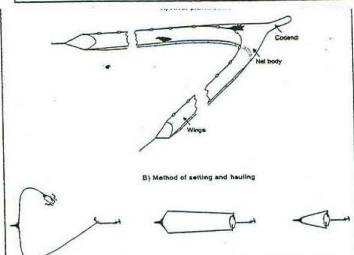
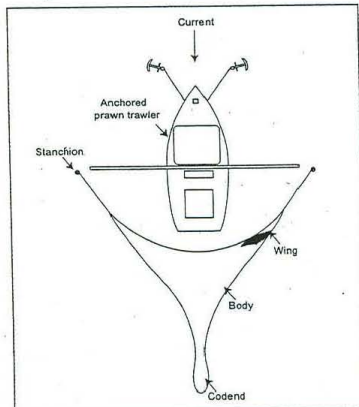


Fig. 3. Typical stow net configuration used in NSW

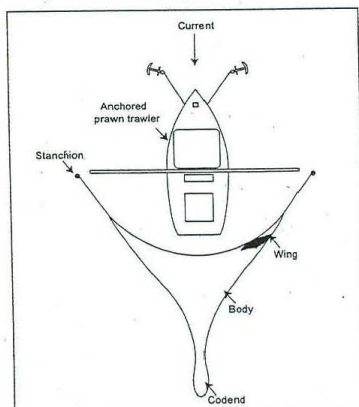


Fig. 3. Typical stow net configuration used in NSW

Prawns form the basis of several important commercial fisheries throughout New South Wales with a total value of more than \$26 million per annum.

Catches include six species, although eastern king (*Penaeus plebejus*), school (*Metapenaeus macleyi*) and greasyback prawns (*Metapenaeus bennettiae*) account for more than 98 per cent of the total annual production (approximately 2,000 tonnes). These species are targeted throughout coastal and estuarine areas using four types of fishing gears that include: trawls (Fig. 1), seines (Fig. 2), stow nets (Fig. 3) and trap nets (Fig. 4).

Trawls are the most widely-used gear, with up to 246 vessels towing single and twin-rigged nets (Fig. 1B and C) to mostly target school prawns during the day throughout four estuaries and 312 vessels towing triple-rigged nets (Fig. 1D) to target king prawns at night offshore from Newcastle to the Queensland boarder. Seines are the second most common gear (Fig. 2) and are used by up to 191 fishers working in about 15 rivers and coastal lagoons.

Although the designs of seines vary slightly among these areas, the basic fishing method involves using anchors, buoys and ropes to set and haul a single net in a semi-circular configuration from small dories (Fig. 2B). Similar in principle to trawls, seines actively direct prawns along the wings and the body of the net and into the codend (Figs 1 and 2). In contrast to these towed gears, stow and trap nets are static and catch prawns by exploiting their migratory behaviour within estuaries. These gears are secured to the bottoms of rivers and coastal lagoons using anchors and stanchions and are usually fished at night between the last and first quarter phases of the moon. Stow nets are fished by up to 180 operators throughout six rivers. Prawns and other organisms move into the

stationary stow net (which resembles a trawl or short seine) and are washed

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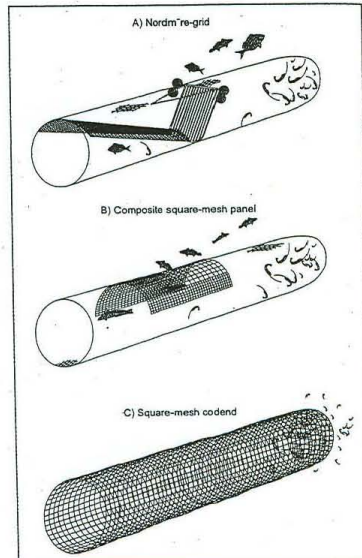


Fig. 5. The A) Nordmøre-grid used in NSW estuarine prawn trawls, B) composite square-mesh panel used in oceanic prawn-trawl codends and C) entire square-mesh codends used in other trawls, seines and stow nets

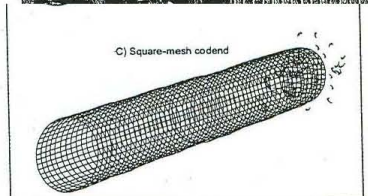
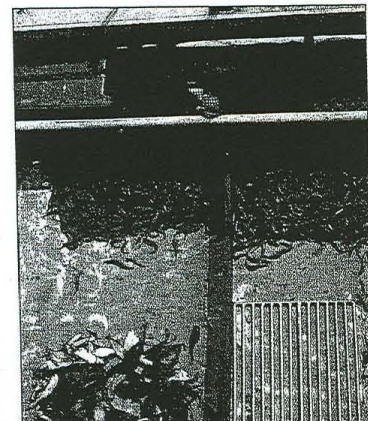
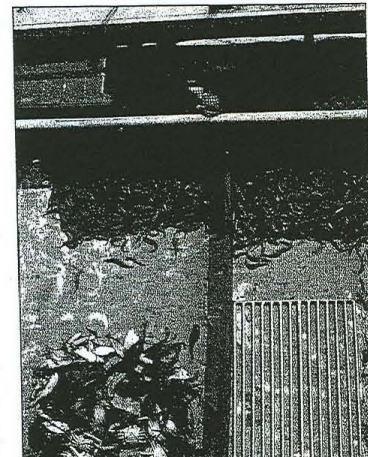


Fig. 5. The A) Nordmøre-grid used in NSW estuarine prawn trawls, B) composite square-mesh panel used in oceanic prawn-trawl codends and C) entire square-mesh codends used in other trawls, seines and stow nets



ing selectivity in NSW prawn fisheries

By MATT BROADHURST*

of netting towards the horizontally orientated bunt at the dory. Fishers facilitate this movement of catch by regularly lifting and hauling sections of the trap net over a dory so that it passes underneath the trap net and the catch is rolled towards the bunt (Fig. 4B).

All of the prawn-catching gears used in NSW are managed by limits on their methods and areas of operation, effort, dimensions and minimum and maximum legal-mesh openings. These legal-mesh openings vary between 40 and 45mm in the codends of trawls, 30 and 36mm throughout seines and stow nets and 25 and 36mm throughout trap nets. Over the past 20 years, the use of all of these small-meshed gears (and especially trawls) throughout areas known to have diverse and abundant fauna has raised concerns. Primarily, these concerns are directed towards the potential for large mortalities of juveniles of commercially and/or recreationally important fish, cephalopods and crustaceans and the possible negative impacts on their stocks. This has led to considerable efforts to reduce unwanted bycatch and improve the selectivity of the various gears.

Owing to their wide-scale use throughout estuarine and oceanic areas, and often large bycatches, trawls have received the majority of attention. The most common method for improving the selectivity of these gears involves installing physical modifications termed "bycatch reduction devices" or "BRDs" in the codends (where the catch is retained and most of the selection processes occur) (Fig. 5A and B). BRDs are designed to allow unwanted organisms to escape, while maintaining catches of the targeted species. For many estuarine prawn trawls, a BRD comprising a rigid aluminium grid located at an angle in the trawl (termed the "Nordmøre-grid" - Fig. 5A) was shown to be effective in reducing up to 90 per cent of unwanted bycatch with no effect on the catches of prawns (Fig. 6). In openings vary between 40 and 45mm in the codends of trawls, 30 and 36mm throughout seines and stow nets and 25 and 36mm throughout trap nets. Over the past 20 years, the use of all of these small-meshed gears (and especially trawls) throughout areas known to have diverse and abundant fauna has raised concerns. Primarily, these concerns are directed towards the potential for large mortalities of juveniles of commercially and/or recreationally important fish, cephalopods and crustaceans and the possible negative impacts on their stocks. This has led to considerable efforts to reduce unwanted bycatch and improve the selectivity of the various gears.

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Fig. 7. Sizes of small prawns discarded from NSW's prawn fisheries

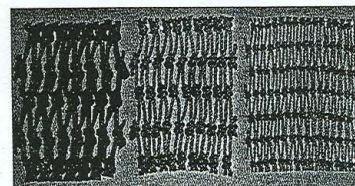


Fig. 8. Diamond-shaped meshes used in the codends of otter trawls (left and middle) and seine and stow nets (right)

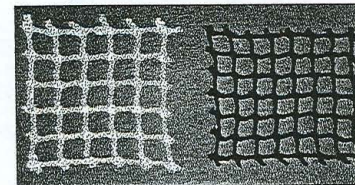


Fig. 9. Square-shaped meshes used in codends to improve size selectivity

like whiting (*Sillago spp.*) and flatheads (*Platycephalus spp.*) to escape, with no effect on the catches of prawns or important byproduct.

The BRDs developed for prawn trawls have alleviated many of the problems associated with the issue of bycatch in NSW. These sorts of modifications generally have not been required in seines, stow nets and trap nets because



Fig. 7. Sizes of small prawns discarded from NSW's prawn fisheries

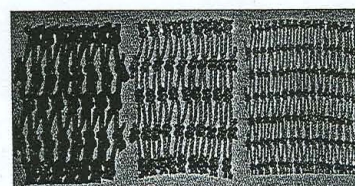


Fig. 8. Diamond-shaped meshes used in the codends of otter trawls (left and middle) and seine and stow nets (right)

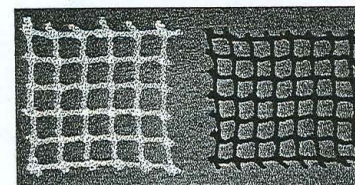


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like whiting (*Sillago spp.*) and flatheads (*Platycephalus spp.*) to escape, with no effect on the catches of prawns or

openings (Fig. 8). Trap nets also have similar-sized, diamond-shaped meshes throughout, but their method of operation ensures that these meshes remain wide open during fishing and this allows small organisms ample opportunities to escape.

The simplest way to improve the selectivity of trawls, seines and stow nets is to ensure that they also maintain sufficient openings during fishing. This can be achieved by orientating meshes in the codend so that they are square shaped (Fig. 9). More specifically, research has shown that codends made entirely from square mesh (Fig. 5C) between approx. 60 and 80 per cent of the size of the conventional diamond-shaped meshes are quite effective in significantly reducing the numbers of small unwanted prawns and other organisms, with no effect on the catches of target species. Where required, these square-mesh codends can be combined with BRDs (e.g. in trawls) to considerably improve the overall selectivity of the fishing gear.

The modifications developed to improve the selectivity of NSW's prawn-fishing gears should greatly reduce the mortality of many of the species comprising bycatches and the potential for negative impacts on their stocks. Research examining the fate of small individuals of species such as bream (*Acanthopagrus australis*), mullet (*Argyrosomus japonicus*), sand whiting (*Sillago ciliata*) and school prawns after escaping from relevant BRDs and different mesh configurations provides strong support for positive benefits, with all species sustaining minimal physical damage and few long-term mortalities (between 0 and 11 per cent).

The NSW Fisheries Conservation Technology Unit is continuing to research ways of modifying prawn-fishing gears so they are more selective for the targeted species and their optimal sizes. As with all other previous gear-related research, this the codend so that they are square shaped (Fig. 9). More specifically, research has shown that codends made entirely from square mesh (Fig. 5C) between approx. 60 and 80 per cent of the size of the conventional diamond-shaped meshes are quite effective in significantly reducing the numbers of small unwanted prawns and other organisms, with no effect on the catches of target species. Where required, these square-mesh codends can be combined with BRDs (e.g. in trawls) to considerably improve the overall selectivity of the fishing gear.

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