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**Effects of Trawling Subprogram -
Improving the Efficiency of Prawn Capture: Refining Net
Designs in Australian Prawn Fisheries to Reduce By-catch
and Fuel Costs**

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Project No. 98/226

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OBJECTIVES

1. By December 1998, develop two novel net body configurations using *spectra* 50 mm twine and *momoi* 60 mm twine.
2. By March 1999, complete trials and evaluations of the two novel net designs against a conventional rig. Assess relative levels of by-catch, size composition of prawns and fuel consumption to evaluate effectiveness of the net designs.

NON TECHNICAL SUMMARY

During October 1998 a series of net trials were undertaken in the Gulf St Vincent, South Australia. The trials were aimed at determining the influences on catches and by-catches due to an increase in mesh size and a reduction in twine diameter in the bodies of prawn trawls.

The conventional *gundry* mesh used in the fishery has an inside mesh opening of around 45 mm and a twine diameter of 1.7 mm. This mesh was compared with two other types of mesh with smaller twine diameters and larger inside mesh openings (*spectra* and *momoi*). The diameter of *spectra* mesh is 1 mm, with *momoi* being 1.7 mm in diameter.

For the sake of our analysis and discussion we were interested in determining measures of the material that were comparable. Manufacturers specifications are not necessarily comparable nor do they describe the characteristics of the net once fabricated and stretched. We chose to measure stretched mesh opening from a number of random measures taken from nets that had been fabricated and towed to put the material under strain. The netting material was also independently assessed by FRDC although the material measured had not been pre-stretched by towing. The following table gives a summary of the specifications of the three mesh types tested. The specifications given for each mesh type are the manufacturer’s description, the average measure found in this study and the average measure from the independent assessor.

Mesh type	Manufacturers specifications		Our measure Stretched inside mesh (mm)	Independent measure Stretched inside mesh (mm)
	Centre knot to centre knot (mm)	Twine diam. (mm)		
Gundry (orange)	45 (1¾ inch)	1.7	44.42	45.96
Spectra (white)	52 (2 inch)	1.0	52.43	49.93
Momoi (blue)	57 (2¼inch)	1.7	52.96	52.98

The importance of a standard measure is demonstrated by the results seen for the *spectra* material. The actual mesh opening is larger than one would expect if the manufacturer's centre knot to centre knot measure were simply converted to an inside knot measure. It was noted that the mean size of *spectra* mesh measured in our study and by the independent assessor are different. It is assumed that this difference is accounted for by the difference in treatment of the material measured (ie. ours was pre-stretched).

If ordering material, fishers should use the manufacturer's specifications to avoid confusion.

The trials were conducted using a chartered commercial prawn trawler using a triple rig gear configuration ie. towing three nets. Attached to each trawl was an identical composite square mesh codend. The control (*gundry*) net was always towed in the middle whilst the *momoi* and *spectra* nets were randomly altered between the port and starboard sides. The gear was towed under normal commercial conditions with a shot duration of 25 minutes at 3 knots over a combination of sandy and light coral bottoms. Over five nights a total of 15 replicate comparisons of each configuration were trialed.

Both the *spectra* and *momoi* trawl bodies retained fewer small prawns. Whilst the weight of the catch was maintained it was found that the number of prawns in the catch was reduced significantly (means reduced by 13.7% and 15.6%, respectively). Both the *spectra* and *momoi* also retained significantly less by-catch (a reduction of 29.3% and 20.3% respectively).

The results from this study showed that both new trawl bodies were effective in excluding under-sized prawns and large numbers of small fish, with no significant reductions in weights of targeted prawns. It is also likely that a reduction in twine area associated with the larger mesh size in both new trawl bodies allowed a faster release of water than did the control, possibly contributing to the escapement of some by-catch and smaller prawns.

Because there were no significant differences in the weights of prawns captured between the various trawls, a further increase in the size of mesh in the body (eg. 60 mm) warrants investigation. Alternatively, it may be feasible to examine the utility of trawl bodies comprising composite panels of larger mesh.

The improved net designs may also offer advantages from improved fuel efficiency due to lower drag. The operator of the vessel used in these trials estimated fuel savings of around 10% (J. Raptis pers. comm.).

As a result of this study a majority of commercial fishers in the Gulf St Vincent have adopted the larger meshed trawl bodies.

It is a clear conclusion of this study that the *spectra* and *momoi* mesh tested, significantly reduced the amount of by-catch and improved the selectivity of prawns in comparison to the mesh that was typically used in the fishery. The rapid adoption by industry of the outcomes of this project has resulted in a fleet that has adopted the use of larger mesh sizes. Our findings show that this initiative must provide direct benefits in terms of;

- sustainability of the prawn fishery by improving selectivity for large prawns, and by
- further reducing the impact of fishing on the environment by reducing by-catch.

BACKGROUND

The recently completed FRDC funded research in Gulf St Vincent resulted in the successful transfer of by-catch reduction technology to commercial fishers. The collaborative research demonstrated the benefits that can be derived through liaison and consultation with industry, incorporating their ideas into modifications to improve the selectivity of prawn trawls. The cooperative research effort produced a modified codend that achieved a by-catch reduction of more than 60% whilst at the same time increasing the catch and value of the commercially sized prawns.

Like the majority of the worlds trawl fisheries, South Australia's prawn trawl fisheries have the selectivities of their nets regulated by means of legally defined minimum mesh sizes. However, unlike most trawl fisheries, there have been no formal studies done to determine optimum mesh sizes for the body of the trawl. It was evident in the recent trials in the Gulf St Vincent that the current minimum mesh of 45mm in the body of the trawl is too small and that the trawls may still select large quantities of undersized prawns. Furthermore, experienced industry participants (eg. Les Lowe from Gulf Net Mending Pty. Ltd.) have suggested that the current net configuration creates unnecessary drag.

NEED

We believe that these are good reasons for extending the research already done in Gulf St Vincent to trial novel net designs based on improved *spectra* twine, a material that offers greater strength and less drag than conventional netting. Although it is proposed that the research be done in Gulf St Vincent, using commercial vessels engaged in the fishery, the results will have clear implications for other prawn fisheries such as the NPF. With a favourable result and strong industry endorsement, it is likely that the nets will be rapidly adopted in other prawn fleets around Australia.

OBJECTIVES

1. By December 1998, develop two novel net body configurations using *spectra* 50mm twine and *momoi* 60mm twine.
2. By March 1999, complete trials and evaluations of the two novel net designs against a conventional rig. Assess relative levels of by-catch, size composition of prawns and fuel consumption to evaluate effectiveness of the net designs.

METHODS

A paper detailing the methodology used in this project, the results, a discussion and a list of reference material is attached at Appendix 3.

RESULTS & DISCUSSION

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BENEFITS

Commercial fishers, seafood processors and the community will benefit directly as a result of the research undertaken. The novel net design resulted in a better quality product (in terms of size) being caught and processed. Larger prawns are in greater demand and sell for a higher price. Improved size at capture allows fishers to satisfy the market demand for larger prawns and also delivers a better price to fishers.

The significant reduction in by-catch achieved using the new net configurations and materials have a positive impact on the environment. The community, especially recreational anglers, divers and other user groups of our marine environment will benefit from this improved net selectivity.

The reduced drag of the new mesh delivers greater fuel efficiency and it is estimated that this may be in the order of 10%.

These benefits are not just restricted to the Gulf St Vincent prawn fisherman and Gulf St Vincent environment. It is anticipated that with the wider adoption of the outcome of this project, there will be similar benefits delivered to other Australian prawn fisheries.

FURTHER DEVELOPMENT

The results of this study suggest that even further increases of mesh size in the trawl body (possibly 60 mm) warrants investigation. Alternatively, it may be feasible to examine the utility of trawl bodies comprising composite panels of larger mesh, particularly in the posterior section of the trawl.

CONCLUSION

The objective of assessing relative levels of by-catch, size composition of prawns and evaluating the effectiveness of the net designs has been met.

The *spectra* and *momoi* trawl bodies when compared to the *gundry* were found to be equally as effective in reducing the by-catches of a range of small fish with no significant reduction in the weight of prawns caught. These results indicate that the main factor is the increase in size of mesh.

There was no statistically significant differences between the two new trawl bodies in terms of the size of prawns retained, however both the *spectra* and *momoi* trawl bodies retained proportionally fewer smaller prawns.

A reduction in twine area associated with the increased mesh size in the new trawl bodies enabled a faster release of water, possibly facilitating the escape of smaller prawns and by-catch. Although there were no significant differences detected in the catching performance of the *spectra* (twine diameter 1 mm) and *momoi* (twine diameter 1.7 mm) trawl bodies, the *spectra* trawl body consistently produced a smaller percentage of by-catch.

As a result of this study most fishers operating in the Gulf St Vincent have adopted the larger meshed trawl bodies.

REFERENCES

Literature cited in Appendix 3 is referenced in that document. The following references relate to literature cited in the preceding text.

APPENDIX 1 - INTELLECTUAL PROPERTY

The FRDC's proportion of ownership of the project intellectual property, based on Part C of the application or unless otherwise justified, is 34.73%.

APPENDIX 2 - STAFF

The following staff were engaged on the project;

Simon Boxshall
Matt Broadhurst
Bryan McDonald
Paul McShane
Howel Williams

APPENDIX 3 – METHODOLOGY, RESULTS & DISCUSSION