Double Refuge Octopus Pot Retrieval System

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Australian Government

Fisheries Research and Development Corporation

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Table of Contents

Non Technical Summary

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OBJECTIVES

Development of an efficient and workable Refuge Octopus Pot Retrieval System designed for smaller craft (<7m) that mechanically pulls the octopus pots from the water; places the pots on a rack allowing for quick and efficient retrieval of octopuses from pots by operator and mechanically guides the pots back to the water.

Non Technical Summary

Outcomes achieved:
The objective was achieved. A system was developed that improved efficiency by reducing retrieval and re-setting time and operator fatigue, improving on-board safety. As the octopus fishery is a new development industry in Western Australia there is a potential for the retrieval system to be further developed and produced for existing as well as new entrants to the fishery. The prototype retrieval system will be available for observation in a working capacity at Green Head.

The author and son, Glenn, have been involved in the octopus fishery since 1988 having been drawn to the idea by the “Report on the third phase survey for commercial harvesting of octopuses in W.A. waters” carried out by the Department of Fisheries and Japanese advisors in 1981. Having tried and carried out numerous trials with refuge octopus pot designs and fishing methods over the years (bearing in mind octopus for seafood represented only represented a small percentage of the catch with the majority being used as bait) along with the increased demand as an eating product, has resulted in an increase in price making it more viable to be able to fish the octopus on a commercial basis, the need was there to be able to operate in the fishery on a more efficient capacity.

Having already designed, built and trialled a double refuge octopus pot suitable for W.A. conditions we needed an injection of funds to construct a hydraulic retrieval system suitable for a 7 metre aluminium boat, which is powered by twin 115 hp outboard motors. These funds were made available by way of a grant from FRDC with quality advice being given in completing the application for the funds by Richard Stevens from the W.A Fishing Industry Council.

The octopus pot retrieval system was designed to be manufactured in five stages:

1. ***Manufacturing of tipper, roller and rope feed*** - was first made up of material around the yard such as timber, pvc, old metal etc… It was fitted to the boat and trialled by hand hauling pots which proved to be reasonably successful. This prototype was then given to an engineering firm in Jurien Bay to be built out of aluminium and stainless steel. After several sea trials and alterations we were delighted with the finished result. The main problem was getting our concrete ballast over the roller whilst holding the boat over the line.

2. ***Fitting of hydraulic power pack -*** this was a relatively easy part of the project and the most expensive. This was achieved with direct coupling a Hydraulic pump to a 9 hp petrol motor which was fitted to the inside of the boat transom, covered and made weather proof. Also coupled direct was a deck hose pump to flush out all the sand etc. This worked extremely well.

3. ***Fitting of winch head and hydraulic drive -*** a small 15 inch lobster head winch with capstan was coupled to hydraulic motor. Once again we had to make several adjustments and conducted several sea trials to gain maximum efficiency and all turned out well.

4. ***Manufacture and fitting of rack for twenty pots -*** as we fish short lines of pots i.e. 20 pots 3 fathoms apart, heavy ballast and float each end to allow us to pull from either end depending on wind direction, we needed a rack to hold the tow ballast and 20 pots direct off the winch allowing easy access to pots, containment of octopus and ease of resetting the line. Glenn first made up a prototype out of old material and after several trials the rack worked well, then came the hard part, how to contain the octopus once pots arrived onto rack. We were sure the octopus would not stay in the pot once on the rack and would come out except for the odd one which we assisted, so we had to be able to catch the octopus and stop their escape. We came up with the idea of covering the sides and bottom of rack with shade cloth so that when the octopus came out of the pot it dropped onto the shade cloth, could not gain any suction and remained in the shade cloth. This worked like a dream and solved the majority of out problems. We later modified the system so that we had a hinged back which was lowered for setting the pots, we made a chute in the bottom of a shade cloth bag which sloped into a moveable basket that we also lined with shade cloth, which the octopus found their way into and were left to be dealt with once the line was reset and travelling to the next line. As the rack was made out of aluminium to minimise weight, it was covered with polyvinyl chloride (pvc) conduit and pvc angle which could be easily changed when damaged or worn.

5. ***The final stage. Modification and feedback on the system efficiency -*** there were a number of minor modifications made as we were working with the system and expect to be able to modify even better. Most of the modifications involved protecting wear areas with Teflon, rubber matting and pvc plus modification to catching basket under shade cloth.

Key Words: Octopus, Fishing gear, Pot Hauler.

Acknowledgements:

This project was only made possible through the funding form FRDC, the expert guidance of Richard Stevens from the West Australian Fishing Industry Council and Michelle Pond of B.E C. who initially helped us over several visits to formulate our application to FRDC. May I also make a mention of my son Glenn for his innovative ideas and many hours designing and making up prototype models plus making modifications to the system and finally to Jurien Marine Fabricators for their engineering skills.

Background:

The author has been involved in the Octopus industry since 1988 and has been located in Greenhead since October 1997. Since January 1998 the business has been fishing octopus and wet fishing in the waters surrounding Greenhead and Leeman. Traditionally the octopus industry has used long lines, i.e. 100 pots or more where as the investigator's system uses short lines with 20 pots per line enabling access to known octopus habitat areas rather than using the hit and miss system that long lines use.

Previous discussions were held with the researchers who were involved in the "Report on the Third Phase Survey for Commercial Harvesting of Octopuses in Western Australian Waters" by Yukichi Kimura and Heikichi Isomae, Department of Fisheries and Wildlife, September 1981. From their research and applicants experience the current double refuge octopus pot was developed.

The concept of the retrieval system was first designed last year with a wooden prototype being created. A business plan was then developed to assess the feasibility of increasing production. On advice from the Fisheries Research & Development Corporation an application for minor funding was made.

As the octopus fishing industry is very small in Western Australia and is classified as a New Development Industry it is difficult for full industry consultation to take place. Richard Stevens from WA Fishing Industry Council has been consulted and he is supporting the project.

There is support from Rocklobster industry, as the greatest predator of the Rocklobster is the octopus. By fishing the octopus in a sustainable manner the population of octopuses will be maintained at a level where the predation by octopuses on rocklobster will be reduced while potentially allowing for a natural increase in the rocklobster population to occur.

One of the major seafood retailers, Sealanes, fully supports the proposal as there is a market for the octopus products that is not currently being met.

Flow of Benefits will be 100% Western Australian commercial sector.

Early Start: Negotiations for investment from FRDC started 12 months ago and as you can appreciate we needed the winch ASAP to allow us to pull a viable number of pots, previously we were pulling the pots by hand which were incurring OH&S issues.

Need:

As the Octopus industry has been identified by the Department of Fisheries as a New Industry the technology and work practices of the industry are still being established. The Double Refuge Octopus Pot Retrieval System will help facilitate the production of the maximum socio-economic benefit from the octopus resources in WA through the increase in production from the usage of the retrieval system. From the increase in production of octopus the benefit will be realised by the Alexanders and the industry. As the product can be value added the product can be further sold to a wholesaler who will then distribute the product. From having a commercially viable industry through the usage of the retrieval system the commercial fishing of the octopus will be sustained at ecologically sustainable levels..

The system is innovative, creative and cost effective and can be applied to other octopus fishing businesses.

Objectives:

Development of an efficient and workable Refuge Octopus Pot Retrieval System designed for smaller craft (<7m) that mechanically pulls the octopus pots from the water places the pots on a rack allowing for quick and efficient retrieval of octopuses from pots by operator and then mechanically guides the pots to the water.

Methods:

Based on the original wooden prototype and experience the Octopus Pot Retrieval System was manufactured in eight stages.

1. Manufacture of Tipper, Roller and Rope Feed. – Using high quality stainless steel, a tipper was manufactured and the roller and rope feed manufactured and fitted. The rollers ensure the ease of the pots into the rack.
2. Fitting of Hydraulic Power Pack – A Hydraulic Power Pack was fitted to ensure that the hydraulic had enough power to pull the pots out of the water onto the rollers and then into the rack. It was essential that the pack is able to operate in wet and extreme conditions and that it did not fail once subject to weight and pressure.
3. Fitting of Winch Head and Hydraulic Drive – the winch head was made of material that will withstand and operate on continually exposure to corrosive seawater. The hydraulic drive is necessary to drive the rope feed and retrieve the pots from the water.
4. Manufacture and Fitting of Rack for twenty or more pots. – The rack allows for the pots to be drawn from the water via the winch and hydraulic drive and guided onto the rack. Once in the rack access to the pots is easy and efficient retrieval of the octopus from the pots is possible. Once the pots are empty the rack can

then be swung around to allow for the return of the pots to the water.

5. The final stage is the modification and feedback on the systems efficiency. – The system once designed, manufactured and installed was monitored for efficiency and workability.

6. Test base was established – records have been kept since 14/9/01 establishing each lines catch rate on every pull. It currently takes 10 minutes to physically pull each line, process and return to the water. We are currently pulling 11 lines with 20 double refuge pots per line, with the intention with this new system to build that up to 25 lines per day in the targeted octopus grounds. Catch rates are up to 50% with this time of year being around 30%. The records used for comparison will reflect the time of year tested. There are currently 1,240 double refuge pots in the water.
7. Feedback was given from the applicant to the manufacturer on any modifications required. After a period of twelve weeks of testing and modification the project was then completed. After each modification a record of the modification was kept and the record keeping process as described above was completed.
8. A final comparison report has been produced to show the comparison of data, assumptions made and operating conditions for each test against the manual pulled data.

Results/Discussion:

The octopus pot retrieval system was designed to be manufactured in five stages:

1. ***Manufacture of tipper, roller and rope feed -*** We first made up a prototype from old material around the yard (photo 1), did sea trials by hand hauling, worked well for pots but had some difficulty bringing ballast over side whilst holding boat over line (this was one of the main problems using a small boat without a keel in the wind) but believed we would overcome the problem so gave prototype to an engineering firm in Jurien Bay to be manufactured out of stainless steel and aluminium. After several trials and alterations we had the roller/feed working with the 40 kg ballast coming over at an acceptable rate (photo 2). After testing in actual working conditions there were a few more modifications made, rubber mat and Teflon attached to areas of wear (photo 3). The unit was made for easy removal whist travelling on road.

Photo 1

Photo 2

Photo 3

2. ***Fitting of hydraulic power pack -*** this unit was the most expensive and easy part of project being put together by the Jurien engineering firm and a hydraulic specialist. This was achieved by direct coupling a hydraulic pump to a 9 hp petrol motor which was also attached to a deck wash pump, used for clearing away sand etc. and washing the octopus. The unit was fitted to the inside of boat transom covered and made weather proof (photo 4), the covers were later modified, the exhaust was fitted through the back of boat transom to limit some of the noise factor. The whole unit was mounted on a heavy plate so it could be slid out for easy maintenance etc. The motor came with an electric start which we later wired a second switch up near the helm for easy control. This all worked extremely well (photo 5 - modified covers and hydraulic reservoir tank).

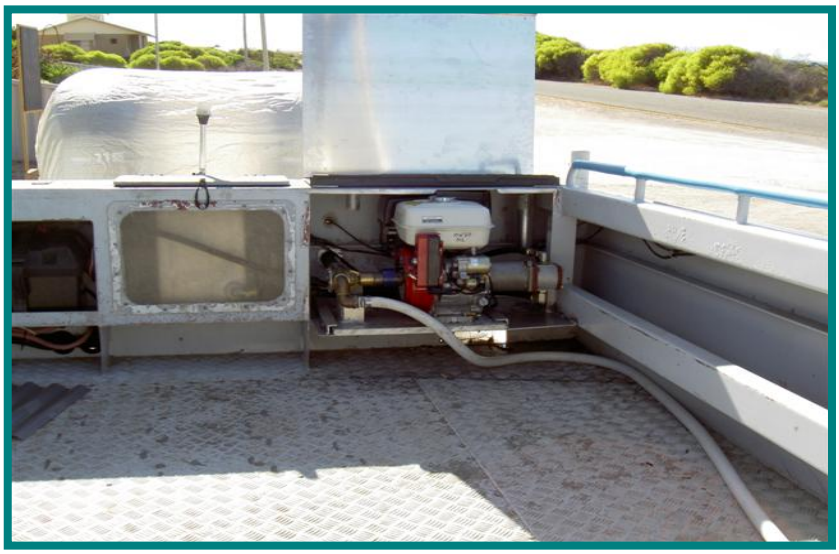

Photo 4

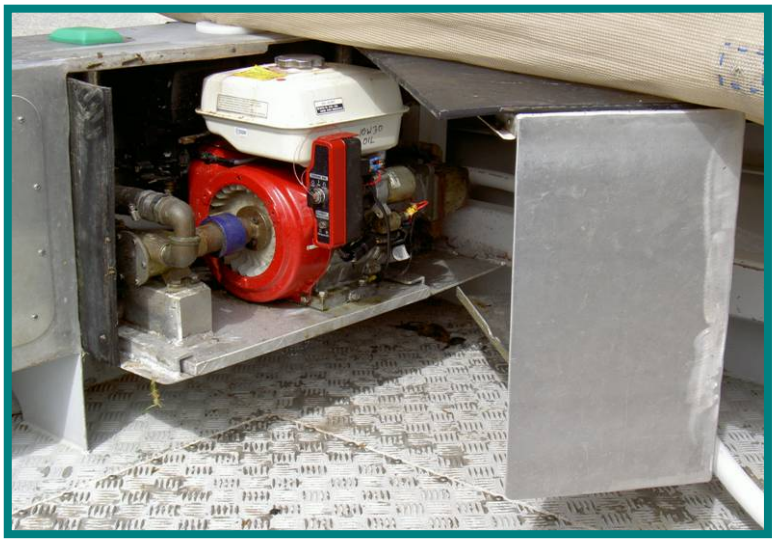

Photo 5

3. ***Fitting of winch head and hydraulic drive -*** due to size of boat we used a 15 inch lobster winch head coupled to the hydraulic motor. Once again we had to make several adjustments to position the winch and table after sea trials. We also needed to cover impact and wear areas with rubber mat and Teflon (photo 6). To complete this component a control unit was located within easy reach of operation of the skipper (photo 7). Again we are very happy with finished result.

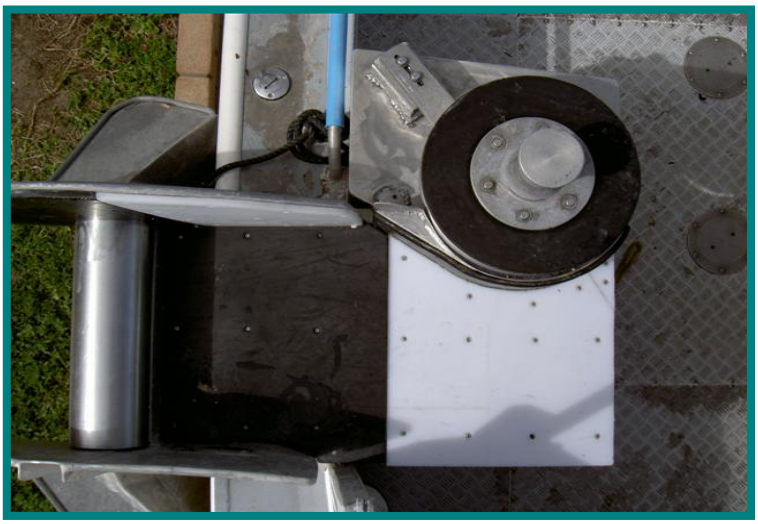

Photo 6

Photo 7

4. ***Manufacture and fitting of rack for twenty pots -*** our fishing method is to use short lines of 20 pots with ballast and float each end to allow us to pull from either end depending on wind conditions thus we needed a rack to hold the two ballasts and 20 pots once being pulled on board. Glenn first made up a prototype out of old material for sea trials. The rack was designed to be pivoted from a point on the transom to allow it to be swivelled inside gunnell when travelling on road. It needed to be positioned so as to allow pots to come around winch, directed onto rack and positioned to inspect for octopus and be ready for resetting, that was the easy part. Now how to contain the octopus as they ejected themselves out of the pot and stop their escaping (the octopus do not like being stuck up on rack in the wind so look for an avenue of escape), we came up with the idea of using shade cloth as the octopus have no suction on the cloth, so made up a hammock out of the shade cloth covering both sides and bottom of rack which worked like a dream. We still had the odd octopus to help out of the pot. Later the hammock was modified to slope to a point with a chute into a moveable basket lined with shade cloth and the rear end hinged to drop away so as to allow pots to be reset. This operation allowed a quick turn around from pulling to resetting once making sure all octopus were out of pots, once pots were reset the octopus was sorted and placed in an ice slurry while travelling to next line. As rack was made out of aluminium for the weight factor all wear areas were covered with pvc conduit and angle which could be easily replaced as needed (photo's 8 & 9).

Photo 8

Photo 9

5. ***Final stage. Modification and feedback on the system efficiency -*** during actual operating days several minor modifications are made mainly in the way of protecting wear areas with rubber matting and pvc plus modification to catching basket under shade cloth.

Benefits

The double refuge octopus pot retrieval system was designed for mainly fishing in W.A. waters due to the different weather conditions and waters compared with other parts of Australia. The results, however, are applicable to any octopus fishery that operates with small vessels and restricted deck space. The system improves the efficiency of pot-hauling, the ease of octopus removal and is inherently safer. As the octopus is a great predator of the rocklobster the establishment of an efficient octopus fishery will be of great benefit to the rocklobster industry. OHS issues have been met by mechanically hauling pots as against hand hauling. Due to more efficient fishing operations the octopus can be handled in a more efficient way resulting in a superior product for the market. Finally this system will allow us to pull up to 700 pots per day compared with 220 when hand hauling resulting in an acceptable viable fishery.

Further Development

The double refuge octopus pot retrieval system can be readily adapted to larger boats and different methods of long lining octopus pots. One improvement would be to increase the length of the pot rack, but due to the size of our boat and situation of cabin we are unable to do so, but should we build a suitable boat we will take this into consideration.

Outcomes

As the octopus fishery is a new development industry in the west there is a potential for the retrieval system to be further developed and produced for existing as well as new entrants to the fishery. The prototype retrieval system will be available for observation in a working capacity at Green Head.

Conclusion

The project was developed out of a need to make the double refuge octopus pot retrieval a more efficient and viable system.

In our opinion and experience our double refuge pot we have designed is the most efficient for our fishing grounds and other methods of long lining the pots was not suitable ie. clip on, clip off with main line on drum. This method did not give stability to the pot and we did not consider the clips a good option due to various reasons.

Line hauling with pot returning straight back into water prevented the return of pots to new ground and a greater number of pots were ‘wasted’ on dead ground, plus you end up with big loops in the line. So we are very happy to stay with our fishing method and more than happy with the end result of many hours of developing this system. Having said that there is no doubt we will be able to refine the system even further.

One of the main points in developing this system is it has allowed the pots to be hauled and reset in a lot windier conditions than previously, giving more working days. Another main point was the time factor where previously it took 15 minutes to retrieve, skin, de - weed and reset a line of twenty pots in calm conditions. We can now retrieve, skin the pot, de - weed, attend to catch, reset and travel to next line with less effort in approximately 10 minutes. Currently we are still only pulling 220 to 300 pots per day as we are busy constructing additional pots now that we have a system suitable for hauling a viable number of pots per day ie. up to 700.

The idea of using a hammock of shade cloth to contain the octopus proved to be more successful than we had hoped for, due to the fact from the start of the project the problem of containing the octopus was a major stumbling block. We can now work the system with confidence knowing we are not losing any of our catch and giving us quick and easy access to the octopus to be processed and put in an ice slurry.

References: “Third phase survey for commercial harvesting of octopuses in W.A. waters”, by Yukichi Kimura and Heikichi Isomae, Department of Fisheries and Wildlife, September 1981.

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