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WESTERN AUSTRALIAN
INSTITUTE OF TECHNOLOGY

DEPARTMENT OF PHYSICS

REPORT ON THE PROJECT

**“To improve Echo Sounder and
Sonar performance in Australian
prawn fisheries — prototype
development”.**

Dr J.D. Penrose

REPORT ON THE PROJECT -

"TO IMPROVE ECHO SOUNDER AND SONAR PERFORMANCE

IN AUSTRALIAN PRAWN FISHERIES - PROTOTYPE

DEVELOPMENT"

Dr. J.D. Penrose

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1. INTRODUCTION

This report deals with the operation of the twin sounder installation, referred to in earlier project reports, during 1979. For the period 1978/79 a grant of \$2,750 was recommended for building and testing the prototype device. In order to meet construction deadlines on the vessel "Territory Chief" it was necessary to build and install the sounder system by late 1977, as outlined in the last report to the Fishing Industry Research Committee. That report also dealt with the system performance during the 1978 banana prawn season. The present report covers work done during the 1979 season in the Gulf of Carpentaria.

From consultation with Kailis Groote Eylandt Fisheries in early 1979, it was apparent that, during the period since sounder installation, then well over a year, some system degradation had developed, and that tuning, maintenance and some upgrading should be undertaken before the onset of the 1979 banana prawn season. Mr. M.G. Kailis requested that some WAIT personel, preferably the author, should spend some time on the trawler during the season. This suggestion was clearly valid, but could not be implemented without appropriate funding. Accordingly an application was directed to the Fishing Industry Research Committee for sufficient funds to maintain technical back up on board the vessel during the season. In the interim, to ensure the system was operational prior to the start of the banana prawn season, arrangements were made to second Mr. D. Cartledge from his new employers, The University of Western Australia, and to send him to Groote Eylandt to carry out system maintenance and upgrading. Mr. Cartledge build the original system and has extensive commercial experience in sounder repair and maintenance. Mr. Cartledge's report forms section 2 of this document.

In late March the FIRC decision not to grant funds for the 1979/80 period was announced and, in view of the expenditure both on system development and field servicing already incurred, it became clear that insufficient resources were available to permit further field backup in the Gulf of Carpentaria. A request was made for advice from the master of the Territory Chief and a report was received via Kailis Groote Eylandt Fisheries in December 1979. This report forms section 3 of this document.

2. FIELD EXERCISE REPORT (Field Technician - D. Cartledge)

2.1 Program Description

OBJECTIVES

1. To carry out maintenance to the dual Benmar installation aboard freezer trawler "Territory Chief" at Groote Eylandt.
2. Update crew usage of the installation.
3. Assess the situation for future observations of the equipment during the banana prawning season.

PREPARATION

On advice from the boat it was assumed that sounder alignment would be necessary and some modification to the synchronisation system would be beneficial. To this end an oscilloscope, function generator and associated equipment were taken in the field kit.

MAINTENANCE

The work required to restore the sounders was much as expected - The Port Sounder required some alignment and a minor repair was carried out on one section of the alarm to restore complete serviceability.

Though cross synchronisation between the sounders in "dual mode" still appeared to be operating normally, some additional wiring was installed to enable both sounders to operate from a common reference pulse generator if required. The additional wiring posed no problems and the function was satisfactory.

TRAINING

The present skipper Mr. Charles Melville was brought up to date on the overall installation and given pointers in setting up the sounders and alarm system. His past experience using Kodens type sounders was limited and some practise will be necessary before full results are realised.

FUTURE OBSERVATION

The skipper is very happy to accomodate Dr. J.D. Penrose and Mr. Chris Simpson for later observation during the banana prawning season. He advises that mid March would be probably suit Dr. Penrose and that contact should be made about that time with Mr. Rod Bailey at Kailis's Groote installation when it may be possible to fly out to the Territory Chief in the vicinity of Tumborumba or to join the boat directly at Groote. Arrangements for Mr. Simpson to commence his biological monitoring can be similarly made.

CONCLUSION

Though the trip was shorter than anticipated owing to the requirements of the boat, the lack of reasonable prawn densities in the area made further observation impractical. No difficulties can be seen at this stage. Good densities of banana prawn have already been observed in the eastern gulf and the possibilities for a successful trial of the installation prevail.

2.2 Time Log - Groote Field Exercise (February 1979)

0745 - 19-2-79 Depart Perth via M.M.A.

1800 Cent. Aust. Time

Arrive Groote Eylandt.

Proceeded directly to "Territory Cheif"

On discussion with skipper (Charles Melville) and a brief assessment of the equipment will wait until morning before commencing work.

0630 - 20-2-79 Alignment commenced on Port Sounder

0930 C.A.T. Called John Penrose at home via O.T.C. to advise of the situation.

REM. 20-2-79 Competed full alignment of Port Sounder and carried out a check and touch up of STBd unit. Included extra dual sync. requirements Operations satisfactory.

- 2000 - 20-2-79 Full test of installation during trawling carried out - Receiver gains balanced and bottom lock gains adjusted for optimum display near bottom.
- Normal depth alarm on Port sounder losing. sensitivity on occasions - will check tomorrow.
- 0800 - 21.2.79 Alarm fault traced to whiskering on circuit board between close solder points in the signal integrator circuit - fault cleared and boards checked.
Unit re-installed and tested.
Sounder stylus found fouled with paper sizing causing a certain lack of clarity; cleared.
- 1000- 21-2-79 As the sounder system is now satisfactory the skipper has decided to return to Groote due to some trouble with water venting into the freezers. He wishes to prepare for immediate departure for the Eastern Gulf areas. So I will have to leave the boat at this stage. Will attempt to obtain a return to Perth on today's flight.
- 1650 Obtained seat on Perth aircraft.
- 0030 - 22.2.79 Arrived Perth Airport.
- 0800 Advised John Penrose of the situation and arranged to de-brief at P.M. today.

2.3 Benmar Sounders

The present inclusions to the standard Benmar sounders to allow reliable "dual mode" operation are :

1. Pulses from Pin 2 of the Starboard Sounders Reference Pulse Generator are fed to a toggle switch mounted on centre front of the Port Sounder to allow that unit to operate from 'its' own or the Starboard generator.
2. The Port control flip-flop is locked antiphase to Starboard Flip Flop when both sets are running (via diode and 50 K Ω resistor cross coupling).
3. The Port Scanner gate is reset by the starboard reset pulse if the port pulse does not come first.

NOTE A roll of color film was taken which includes shots of the installation and of the Benmar Control circuit with included variations.

3. MASTER'S REPORT REFERENCE DUAL BENMAR ECHO SOUNDERS

The conception of the dual sounders is excellent but the set-up requires some modification, the transducers on the hull are not only angled out, they appear to angle towards the stern (this is viewing them from the ground with the boat on the slips and using the boats normal trim line as datum). In this I could be wrong but it is the impression I had when I was looking at them.

It was also noted while the boat was slipped that the barnacle encrustation

on the hull was heavy around the transducers and on the diaphragm of the transducer, this and the stern were the only places on the hull where barnacle build up was exceptional.

The alarm system I would do without as the noise it makes would drive one up the wall and with the sound turned off watching for lights flashing I would be as well looking at the sounders.

The trace on my dual system was poor compared to a single sounder as fitted on one of the other boats, even when working the same ground and the same patch of prawns, and I could not improve this no matter how the settings on the sounder were set or adjusted.

The starboard sounder worked better than the port sounder so far as the bottom expansion went and when using the bottom expansion on the port sounder the normal bottom sounding faded out, this all made the comparing of one side against the other futile.

After trying the system for four weeks I stopped using the port sounder completely and concentrated on the starboard sounder. I did not use the alarm after the second day.

In a slight wind slop neither of the sounders were any good as with the boat rolling or pitching the trace became just a fuzzy line.

I think the transducers are set too far forward on the hull and the angle of spread is too great, also the build up of barnacles could have caused a loss of strength, but even after refit with everything clean it still is not the best, although the starboard sounder has a better trace.

I would have liked one of the developers of the system to have been on board during the season to see the system work in operational conditions, then perhaps the faults (whether in the equipment of mine) could have been sorted out at the time. This was suggested before the start of the season and I was more than willing to have one or even two extra people on board for this reason.

I did keep all the rolls of paper used during the season but they were thrown out when in refit. I do have a couple of papers from after refit but none with banana prawn markings, however, these do show the difference between the two sounders.

The dual sounders also caused radio interference on the main radios irrespective of one or both sounders being on. This could be stopped for short periods by switching over the switch for selecting the trigger unit which was fitted prior to the start of the banana season.

C.R. Melville,
Master,
TERRITORY CHIEF.

4. CONCLUSIONS

The comments made by Mr. Melville concern firstly the orientation of the transducers on the hull. This was done in consultation with the master (in 1977), Mr. P. Arbuthnot and while the vessel was under construction on the slip. Unless the mountings have been damaged it is unlikely that they are angled too greatly, either in the athwartships or alongships directions.

The transducers may be too far forward on the hull. The original request to the builders was for the units to be placed further aft. This was opposed by the builder at the time because it would have meant (based on recollections of conversations held in 1977) that the transducer leads would have interfered with tanks or bilge compartments at the bottom of the vessel aft of the bridge. It may be that this problem is the source of the loss of system performance when wind slop is present. At this stage it is not possible to comment effectively on the question of barnacle encrustation.

Mr. Melville's comments on the alarm system are of particular interest. He clearly finds it of no assistance. Mr. Arbuthnot in 1978 commented favourably ("the audio-visual alarm is however a N1 winner" - see last report to FIRC). This device clearly suits some skippers and not others.

The overall problem of sounder performance which Mr. Melville reports on is a matter for concern. His report is undated and was clearly prepared long before its arrival at WAIT in December 1979. It isn't clear whether it was prepared before or after Mr. Cartledge's visit in February 1979. If, as is likely, it refers to the system performance after Mr. Cartledge's visit, then further maintenance was called for and/or the placement of transducers well forward has reduced overall system performance due to bubbles and turbulence being fed under the hull. Without, however, the opportunity to be fully involved on board the vessel during operational activity it is extremely difficult to form an accurate assessment of how best to interpret the valuable comments made by Mr. Melville. Such involvement, because of the distance to Carpentaria and the duration of the banana prawn season, is inevitably costly and without appropriate funding it is difficult to see how further progress can be made.

5. RELATED WORK

As part of the work done in the overall marine acoustics program funded by the Fishing Industry Research Committee and described in the major report submitted in early 1978, attention was given both to target strength measurement and to the computer simulation of echo sounder performance. This work has led to a cooperative venture between the WAIT group and personell of CSIRO Division of Fisheries and Oceanography. This work, now well advanced, involves an analysis of the signal processing methodology described by Peterson, Clay and Brandt (J. Acoust. Soc. Am. 60, 618-622 (1976)). This technique is in principle usable on vessels such as the CSIRO "Courageous" and can be used to considerably improve the information available from sophisticated sounding systems, for certain types of fisheries targets. The WAIT program uses a computer simulation technique to evaluate the effects of a number of factors such as fish size distribution and mixtures of species on the quality or results obtained using the Peterson Clay and Brandt system. This work arose out of discussions held at a CSIRO sponsored workshop on Underwater Acoustics in Biological Oceanography held at Cronulla in February 1979. Dr. J. Penrose gave an invited paper at this workshop.