N.S.W. STATE FISHERIES

KAPALA CRUISE REPORT NO. 80

Report on TIS measurements taken during
Cruises 82-15, 82-16 and 82-20

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1. OBJECTIVE

To measure trawling gear with the Trawl Instrumentation System (TIS).

2. GEAR

The TIS was fully described in Cruise Report No. 76. Despite considerable effort the door spread measuring units were still unserviceable.

The nets measured were:-

(a) 56 m headline Engel balloon trawl

(b) 38 m headline Belbara 4-seam trawl

(c) 41 m headline Icelandic 4-seam trawl

The Engel net was rigged with 53 m bridles and 45 m sweeps and towed with 2.5 m (8 ft) Vee doors and 2.4 m polyvalent doors (Fig. 1).

The Belbara net was rigged with 13 m bridles and 137 m sweeps; the Icelandic net with 27 m bridles and 55 m sweeps. Both these nets were towed with 2.25 m x 1.07 m flat wooden doors (Fig. 2).

The Belbara and Icelandic nets and accessory gear were loaned by the owner/skipper of the Eden trawler Belbara for the TIS experiments. The rigging of the nets, bridles and doors was unchanged from their operation on Belbara.

The principal dimensions of the Belbara (Fig. 3) are:-

L.O.A.	17.3 m
Beam	5.3 m
Draft	2.3 m
Main Engine	168 kW (225 hp)

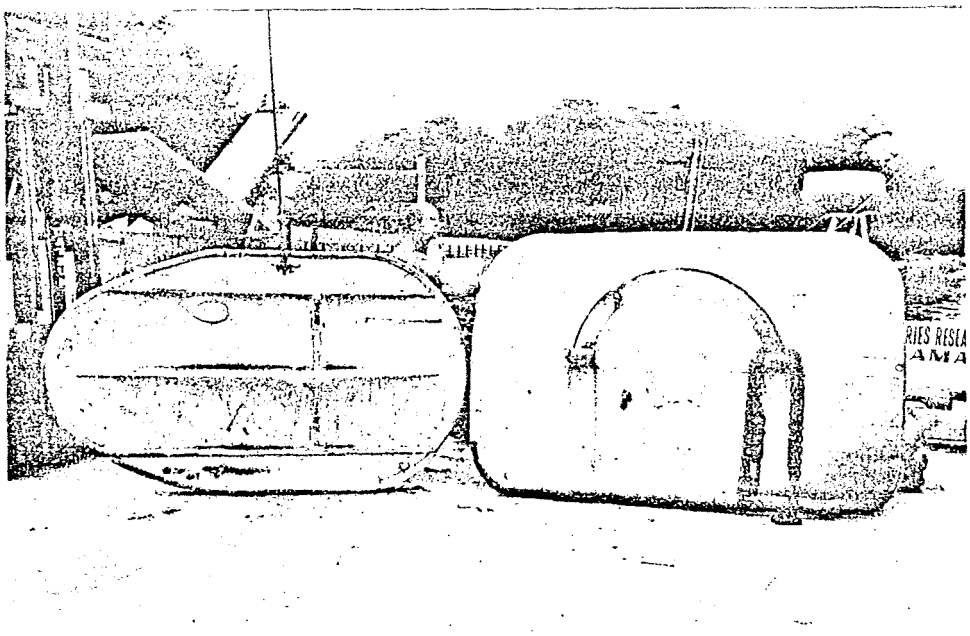


FIGURE 1: A 2.4 m polyvalent door and a 2.5 m Vee door showing their relative surface areas.

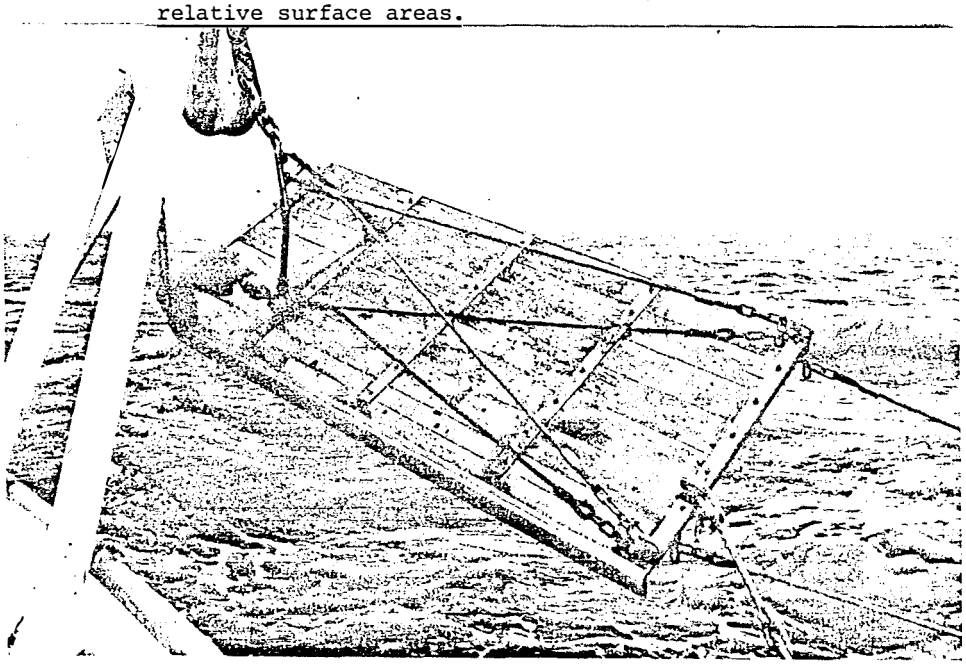


FIGURE 2: The starboard 2.25 m x 1.07 m wooden flat door ready for shooting.

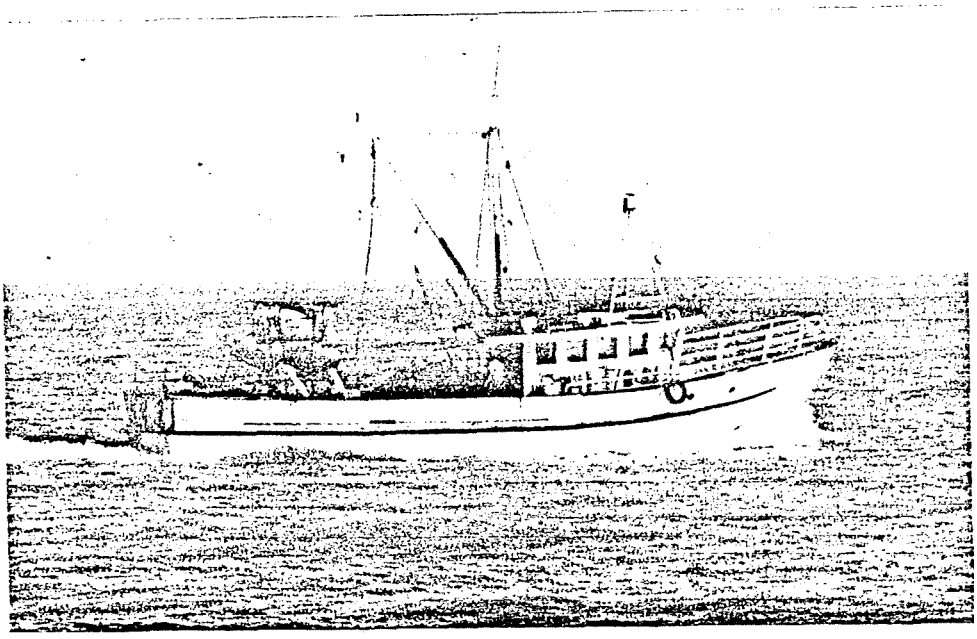


FIGURE 3: The Eden trawler Belbara

3. METHODS

The method was similar to that described in Cruise Report No. 76. Each net and door combination was towed at various log speeds, and was maintained at each log speed for about 20 minutes while ground speeds were calculated using radar and/or satellite navigator fixes. When possible, reciprocal trawls were carried out in opposite directions.

4. RESULTS

No problems were encountered with the TIS and clear readings were obtained during all trawls.

The trawls with the Engel net were conducted off Bate Bay during Cruises 82-15 and 82-16, and with the Belbara and Icelandic nets off Eden during Cruise 82-20. Operation and incidental catch data are presented in Table 1.

4.1 Engel balloon trawl with Vee and polyvalent doors

A description and net plan of the Engel trawl were contained in Cruise Report No. 56, and the Vee and polyvalent doors were compared in Cruise Report No. 65.

Three trawls with the TIS were made in 68-70 fathoms; the warp length-to-depth ratios were 3:1.

Comparable measurements were obtained from the two southward trawls; a broken hydraulic line prevented a northward trawl with the Vee doors and adverse sea conditions shortened the trial with the polyvalent doors.

The results are shown in Figure 4.

Southward Trawls:-

With both sets of doors, the headline height of the Engel net ranged from 4 to 7 m, and around 3 knots was 4.3 to 5.2 m which is similar to the design height of 4.5 to 5.0 m.

The wing spread data show the Vee doors consistently spreading more than the polyvalent doors. At the design speed for the Engel net of 3 knots, wing spread by the Vee doors was about 30 m and with the polyvalents about 26 m.

The drag of the two combinations of gear was similar. Between the trawling speeds of 2.25 and 3.20 knots, warp tensions were almost the same; above 3.20 knots, the Vee doors created more drag.

Northward Trawl:-

The northward trawl with the polyvalent doors was into a short steep head sea. Full power was required to achieve a ground speed of about 2 knots and consequently it was impossible to obtain further data and the trawl was hauled. Because Kapala was pitching heavily, the trawl advanced over the bottom in a series of short surges. Figure 6 shows that the wing spread was relatively stable around 27 m, but due to the sharp variations in speed, the headline height oscillated between 5.5 m and 7 m.

Discussion:-

The design of the polyvalent doors is a combination of the cambered and oval styles, embodying the increased efficiency of the cambered type with the ability to traverse hard ground. The polyvalent and Vee doors used in these experiments were of similar length and weight , but the Vee doors had 34% more surface area. In the experimental trawls, the Vee doors achieved 10-15% more spread than the polyvalents, which confirmed our earlier measurements made with SCUBA (Cruise Report No's. 65 and 73) but was larger than expected when the relative efficiencies claimed for the two types of doors were considered.

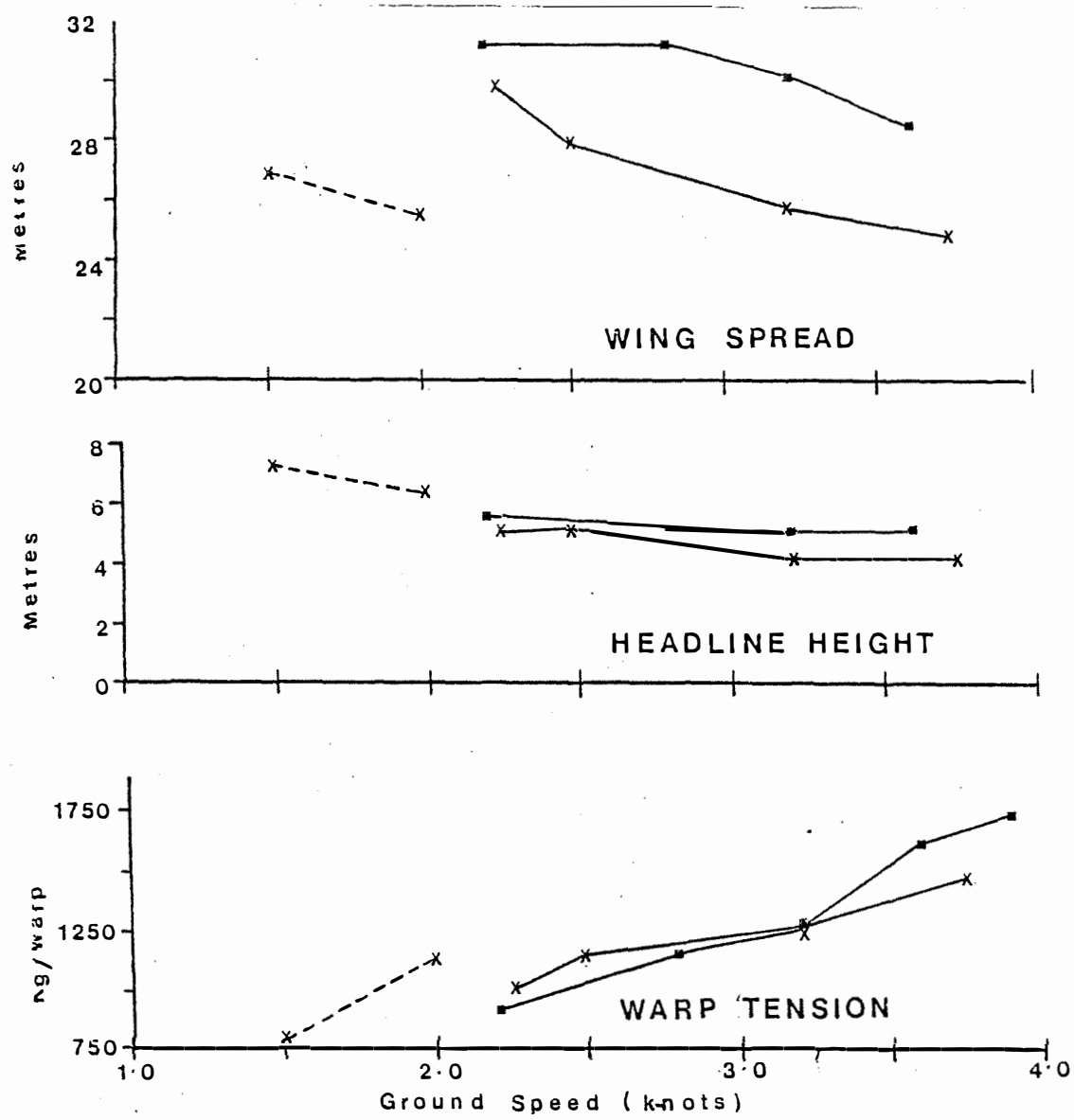


FIGURE 4: Graphs showing the results of TIS measurements of the 56 m Engel net with the Vee and polyvalent doors. Trawling depth was 68-70 fathoms; warp length 210 fathoms.

X- - - - -X polyvalent doors (northward trawl)

X———X polyvalent doors (southward trawl)

■———■ Vee doors (southward trawl)

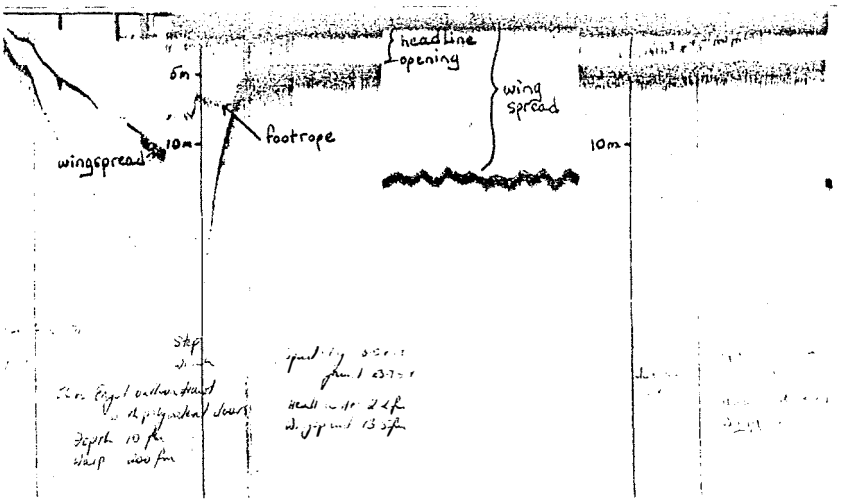


FIGURE 5: Part of the TIS recording from operation 82-16-01 with the Engel net and polyvalent doors. The left side of the trace shows the net still sinking: the wing spread is increasing as the warps are paid out, and the footrope can be distinguished until the net reaches the bottom. At 3.75 knots ground speed, the headline height was 4 m and the wing spread 24.7 m.

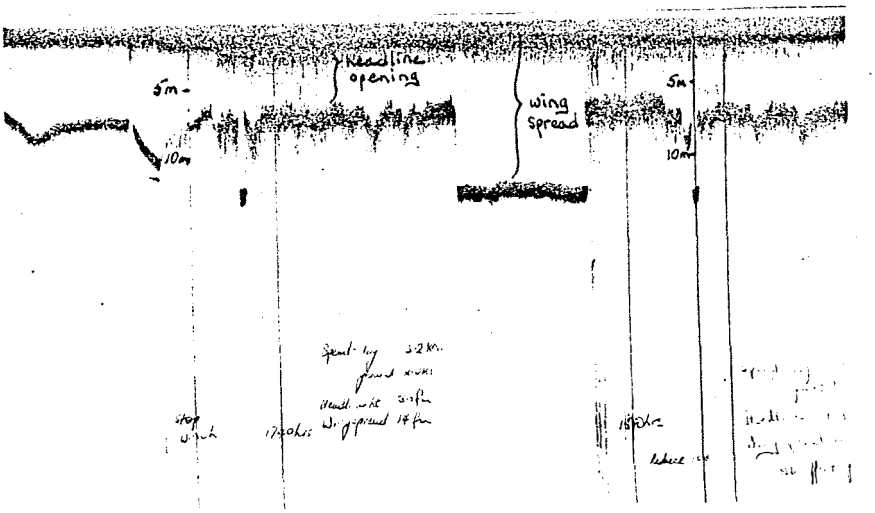


FIGURE 6: Part of TIS recording for operation 82-16-02 with the Engel net and polyvalent doors. This operation was into a short sharp sea; Kapala pitched heavily and the net surged over the bottom. The recording shows the headline opening oscillating widely under these conditions (c.f. Fig. 5).

It is generally recognised that polyvalent doors are hydrodynamically more efficient than Vee doors. This was supported in part by our earlier underwater observations when it was seen that the Vee doors generated large clouds of sand, but the polyvalents created little disturbance indicating very smooth water flow around the doors (Cruise Report No. 65). However, the similar drags measured for the two sets of doors and net at normal trawling speeds during earlier trials and these TIS trawls indicated that the advantages of the polyvalent doors may not be as clear cut as believed.

More data are required and further trials with both sets of gear under uniform sea conditions are planned.

4.2 38 m Belbara trawl

This general purpose 4-seam net was designed for easy construction and repair (Fig. 7). It featured a large mesh (300 mm) lower bosom panel to release unwanted bottom debris. The groundrope was weighted with bights of chain and there were 35 floats on the headline; 4 extra floats were added to compensate for the weight of the TIS cables.

The TIS trials were on firm bottom north-east of Eden in 40-46 fathoms; the warp length was 200 fathoms. During the trawl north, ground speed was progressively reduced from 4.8 knots to 1.6 knots, and then increased to 4.2 knots to provide additional readings. The doors were then hauled to the gallows, Kapala turned about, and the net immediately shot away without emptying the codend. While trawling south, the wind increased to 25-30 knots from the southeast and then increased to 45 knots from the southwest at which point the trial was terminated. During the northward leg there appeard to be a current setting to the north of up to 0.75 knots, but this was less evident when trawling south.

Figure 8 illustrates the data collected for the Belbara net when trawling north and south. The headline height and wing spread varied according to the trawling speed. As the ground speed increased from 2.1 knots to 4.8 knots, wing spread increased from 17.4 m to 20.7 m and the headline height increased from 2.7 m to 3.5 m. The southward trawl showed a slight decrease in wing spread, and at the lower speeds a small increase in warp tension; these differences may have been caused by the current and sea conditions.

4.3 41 m headline Icelandic trawl

This net (Fig. 9) was designed by an Eden netmaker Paul Einarsson for the Belbara. It is a conventional 4-seam trawl, and is based on similar designs that have recently proved very successful in Iceland. The footrope was heavily rigged with a variety of rubber discs, 30 cm plastic bobbins, and chains.

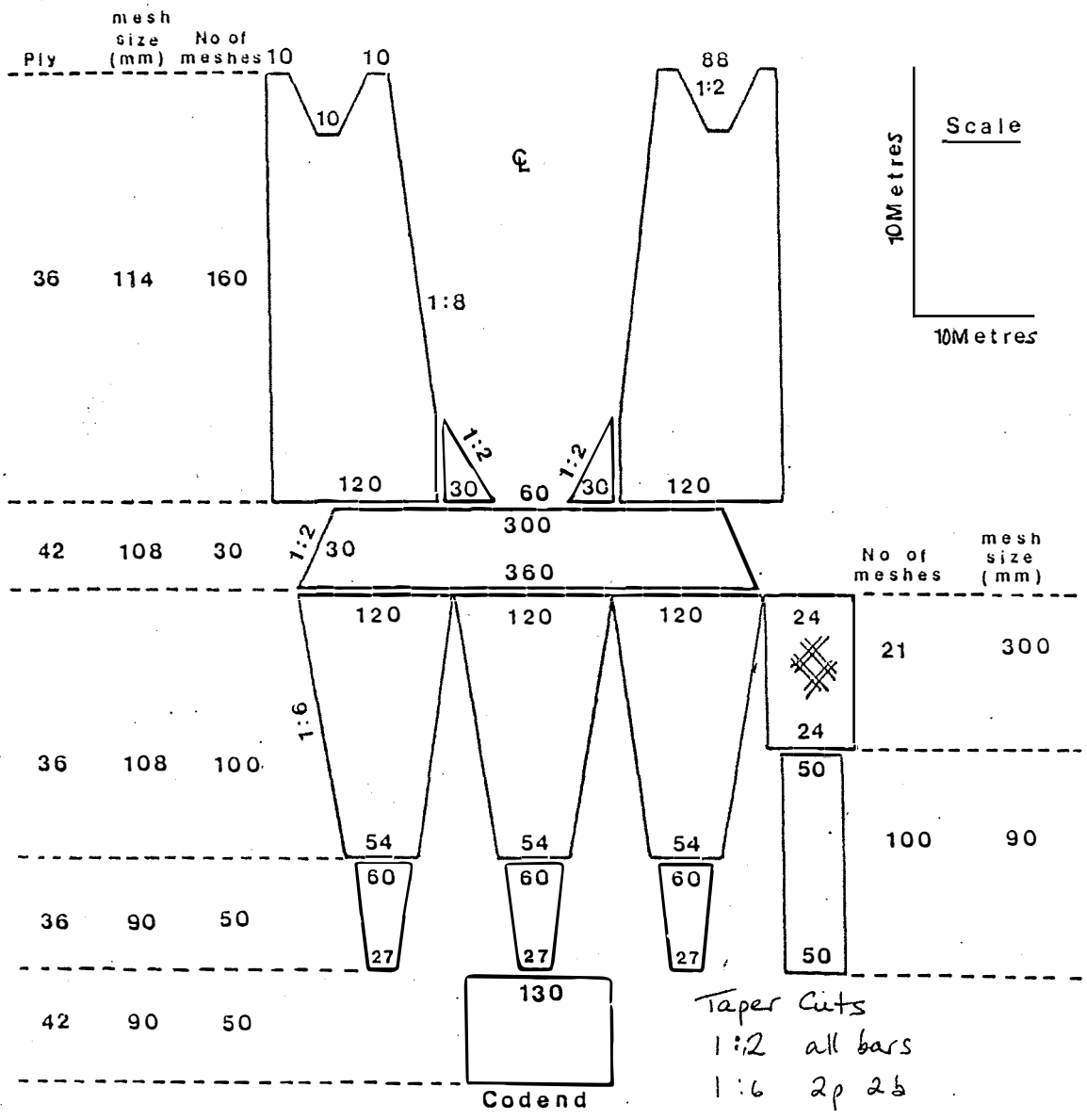


FIGURE 7: Net plan of the 38 m headline Belbara trawl.

Mesh size equivalents are:- 300 mm = 12"
114 mm = 4½"
108 mm = 4¼"
90 mm = 3½"

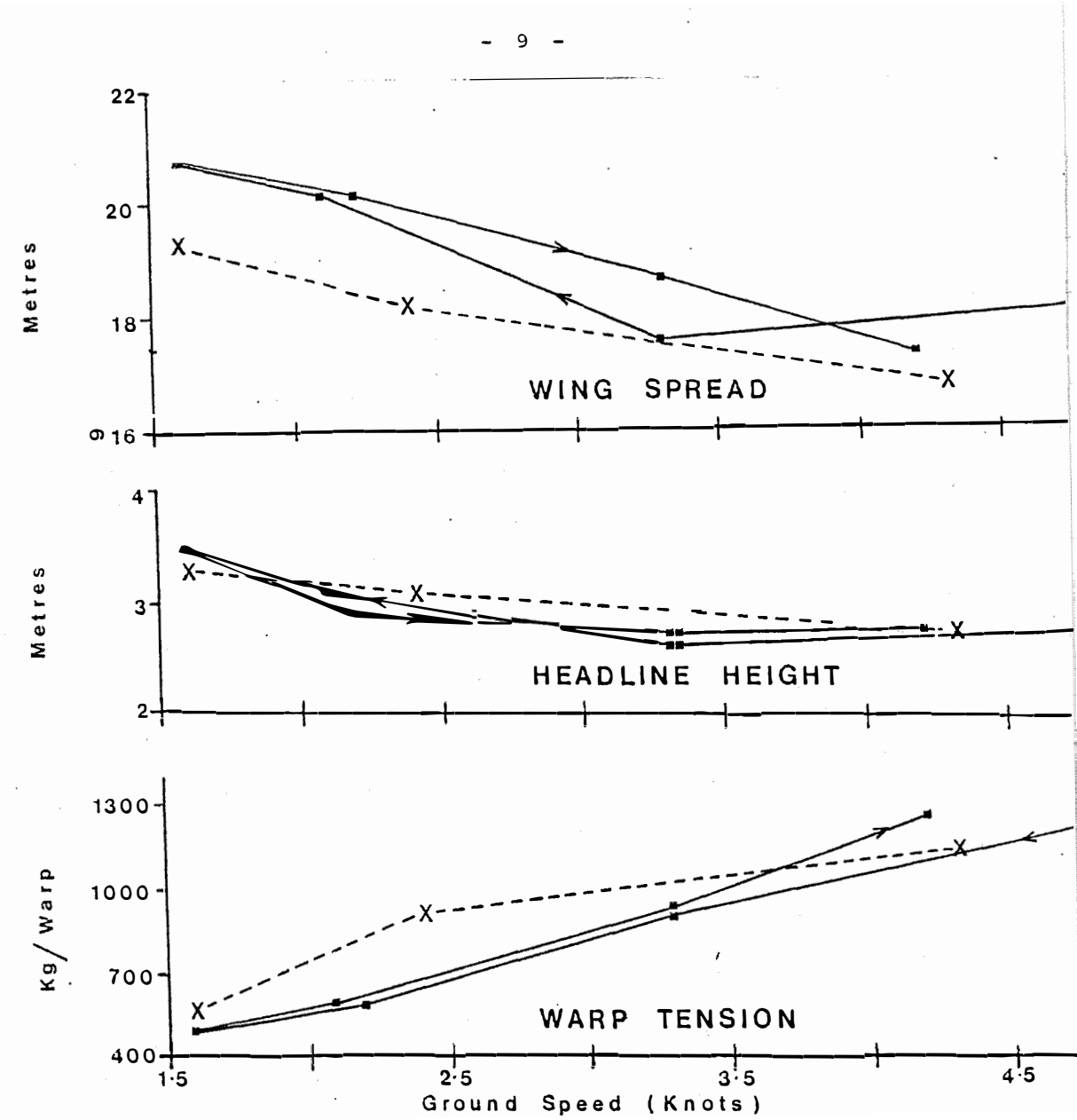


FIGURE 8: Graphs showing the results of TIS measurements of the 38 m Belbara net. Trawling depth was 42-45 fathoms; warp length 200 fathoms. The ground speed of the northward trawl was progressively reduced from 4.8 to 1.6 knots, then increased to 4.2 knots; the arrows indicate the order the data was recorded.

northward trawl ——————

southward trawl X- - - - -X

The trials were conducted on reputedly soft mud bottom off Eden and the results are shown in Figure 10. Both the northward and southward trawls were completed in calm weather with a north setting current of about 0.7 knots. When the first trawl was hauled it was noted that the doors were towing unevenly and adjustments were made. The net was also taking the bottom very hard despite the variety of large diameter discs and bobbins on the footrope, and the bosom was heavily fouled with debris. The lower legs of the bridles were therefore shortened by about 40 cm before the trawl northwards.

The doors towed evenly during the second trawl, but the net was still hard on the bottom. This net had not been fished extensively by the Belbara prior to these trials and it was clear that more adjustments to the rig were required to correctly balance the net. The headline height ranged from 2.9 m at 3.7 knots ground speed, to 4 m at 1.9 knots ground speed. At normal trawling speed around 3 knots, the opening was 3.3 m. Wing spread did not vary greatly with speed. At 2 knots the spread was about 19 m and at 3.7 knots the spread was 17 m.

The Icelandic and Belbara nets were of similar size and the TIS measurements showed little difference between their headline heights and wing spreads. However, the differences in warp loadings particularly at higher trawling speeds, was quite marked. The higher warp loadings of the Icelandic net were presumably due to the heavy groundrope assembly and the net setting very hard on the bottom. Some of the difference may also be attributed to the softer nature of the bottom in the second area.

5. INCIDENTAL FISH CATCHES

Table 1 shows the fish catches taken during the TIS trawls.

Redfish dominated the trawls off Bate Bay with the Engel net; the average catch rate was about 1.5 tonnes per hour.

Catches off Eden with the Belbara and Icelandic nets were relatively small. The main species caught were leatherjackets, tiger flathead, blue warrior and spotted warrior.

The species referred to are:-

Redfish	*Centroberyx affinis*
Leatherjackets	fam. Monacanthidae
Tiger flathead	*Platycephalus richardsoni*
Blue warrior	*Seriolella brama*
Spotted warrior	*S. punctata*

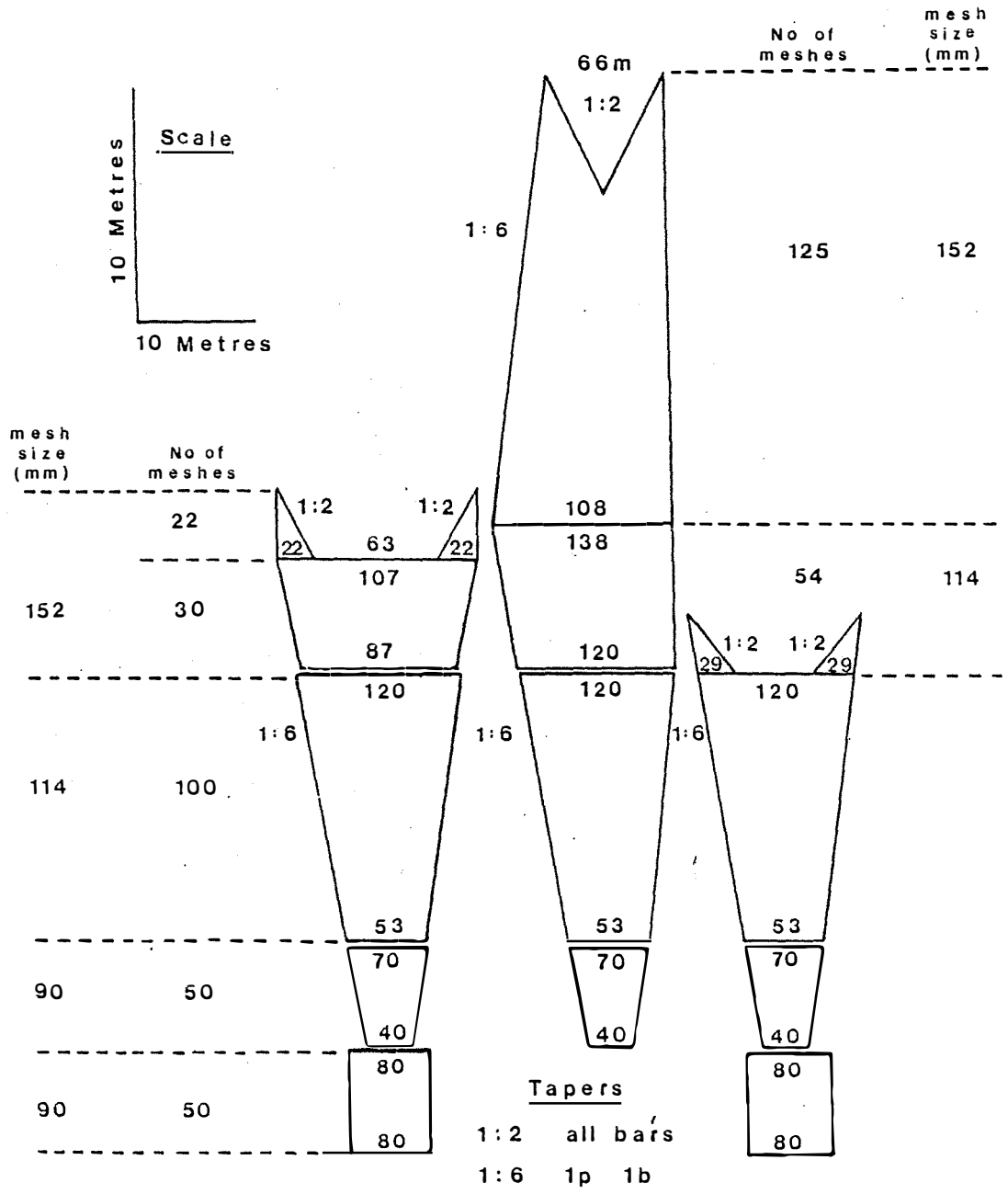


FIGURE 9: Net plan of the 41 m headline Icelandic trawl.

Mesh size equivalents are:- 152 mm = 6"
114 mm = 4½"
90 mm = 3½"

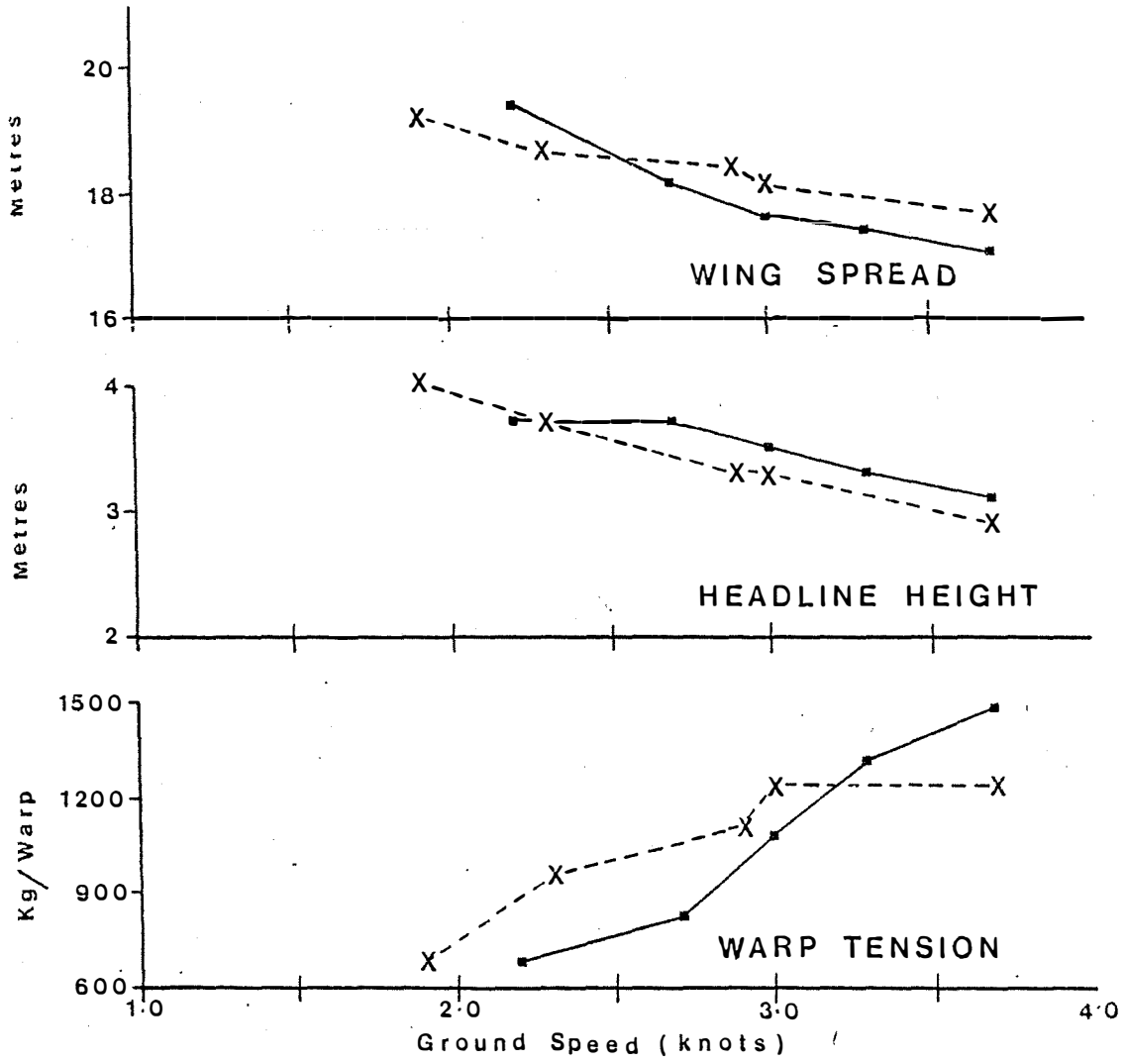


FIGURE 10: Graphs showing the results of TIS measurements of the 41 m Icelandic net. Trawling depth was 40 fathoms; warp length 200 fathoms.

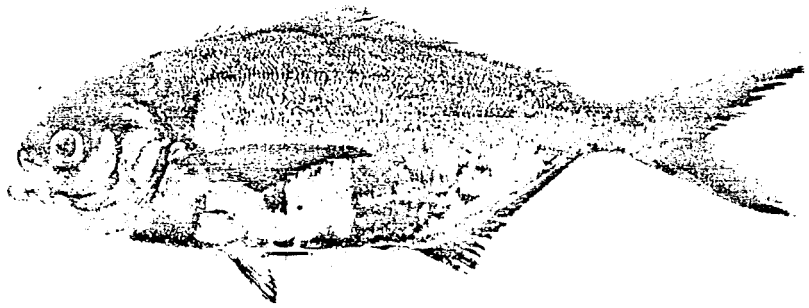
northward trawl ———

southward trawl X- - - - -X

The common names "blue warrior" and "spotted warrior" are suggested for S. brama and S. punctata. They are commonly caught around south-eastern Australia and are commercially valuable. However, the names used colloquially for these species are confusing and unattractive. Names for S. brama include warehou, snotgall trevalla and sea bream, and for S. punctata include spotted warehou, mackerel trevalla and mackerel snotgall; collectively, they are often referred to as "snottynose trevally" or "snotties".

In New Zealand, where there is a large fishery for these species, they are called blue warehou (S. brama) and silver or spotted warehou (S. punctata); fishermen usually refer to them as warriors (a corruption of the Maori name warehou).

The name "warrior" is therefore suggested for Australian usage. The two species would then be known as "blue warrior" and "spotted warrior" - names that are descriptive, attractive and not common to other fish.



Blue Warrior *(Seriolella brama)*

Spotted Warrior *(Seriolella punctata)*

TABLE 1: OPERATION AND CATCH DATA FOR TIS TRAWLS CONDUCTED DURING CRUISES 82-15, 82-16 AND 82-20

Operation	Date	Start Time	Start	Finish	Depth (fm)	Fishing Time (mins)	Total Fish Catch (kg)	Main Species (kg)
82-15-01	28. 9.82	1615	34°10' 151°14'	34°16' 151°12'	70	125	2060	redfish (2,000)
82-16-01	7.10.82	1325	34°09' 151°15'	34°14' 150°12'	68	105	4575	redfish (4,500); tiger flathead (20)
02	7.10.82	1740	34°16' 151°11'	34°15' 151°12'	70	45	780	redfish (750)
82-20-01	10.11.82	0845	37°02' 150°05'	36°50' 150°06'	45-46	180		
02	10.11.82	1215	36°50' 150°06'	36°55' 150°03'	40-46	140	450	leatherjackets (150); blue warrior (60); tiger flathead (95)
04	12.11.82	0825	37°02' 150°03'	37°08' 150°04'	41-43	125	280	leatherjackets (70); blue warrior (40); spotted warrior (50)
05	12.11.82	1210	37°07' 150°03'	37°02' 150°04'	41-38	100	300	leatherjackets (75); misc. small fish (200)