

## Red bait (*Dipterygonotus leucogrammicus*, Bleeker)

### Resources in the Western Coastal Waters (Between 7° N to 8° N) of Sri Lanka

By

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#### INTRODUCTION

A substantial contribution to the production of blood fish in the island is made by pole and line fishing for Skipjack tuna. The traditional pole and line fishery for Skipjack tuna, which has been in existence for over fifty years in Sri Lanka is mainly confined to the Southern, Eastern and North-Eastern parts of the island. In the East and North-East, the fishing is carried out by fishermen from the South migrating to these areas during the South-West monsoon.

Improvement and expansion of pole and line fishery is expected to make a significant contribution to the production of Skipjack tuna from the waters around Sri Lanka. The major limiting factor in the development of this fishery is the availability and fishery for live bait. The most popular live bait among the local pole and line fishermen is the Red bait or 'Hingura' (*Dipterygonotus leucogrammicus*, Bleeker). In earlier publications, Sivasubramaniam (1967 and 1976) and Joseph (1974 and 1975) have described how the fishery for Red bait is conducted, the reasons for the popularity of Red bait among the local pole and line fishermen and how the availability of Red bait has affected the production of Skipjack tuna by pole and line fishing.

The UNDP/FAO sponsored Fishery Development Project carried out a survey of live bait resources around the coastal waters of the island with a view to improve and expand the pole and line fishery for Skipjack tuna in the country. The results of the survey showed that Red bait is widely distributed around the island and not concentrated in the Southern and Eastern areas of the island as thought earlier. Resources of Red bait were located in other coastal areas which are not being exploited at present by the local pole and line fishermen. This wide distribution, as well as the location of new bait grounds for Red bait, is of great significance to the development of the existing traditional live bait fishery. This paper highlights the Red bait concentrations encountered in the Western coastal areas, between the latitudes 7°N and 8° on the West coast.

#### FISHING GEAR AND METHODS

The survey of live bait resources in the area under consideration was carried out from 1972 to 1975. Due to the South-West monsoon prevailing from May to October on the Western side of the island, investigations and fishing operations were carried out, beginning from November each year to April the following year. Thus, the period of investigations in this area from 1972 to 1975 could be divided into three main periods, each of six months duration as follows :—

November 1972 to April 1973

November 1973 to April 1974

November 1974 to April 1975

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During 1972–1973, two 11 ton class steel boats (11 L 17 and 11 C 24) belonging to Ceylon Fisheries Corporation were used for carrying out the survey and conducting experimental fishing operations. These boats were replaced by a 38 ft. G.R.P. boat acquired by the Department of Fisheries, during the periods 1973–1974 and 1974–1975. All these boats were fitted with echosounders, winches and other necessary equipment to carry out purse-seine and lampara net fishing using light attraction in the night. A description of the equipment fitted, method of survey, selection of light stations, and conduction of fishing operations using purse-seine and lampara nets have being given in earlier publications by the Author (1974 & 1975).

Two types of fishing gear, namely the purse-seine and lampara net, have been used to carry out experimental fishing in this area. The lampara net was used extensively during the period 1972–1973, but was later discontinued as it could not compare favourably with the performance of the Purse-seine. Therefore, during the periods 1973–1974 and 1974–1975, only the purse-seine has been used in conducting fishing operations. In this paper too, only the catches made by the purse-seine have been used in analysis.

Purse-seines of two different sizes have been used in this area from 1972–1975. The purse-seine used during 1972–1973 period was shortened mid-way during the 1973–1974 period and this shorter net was also used during whole of 1974–1975 period. The dimensions of the two nets used were as follows :—

			<i>Purse-seine I</i>	<i>Pures-seine II</i>
<b>Hung length along:</b>				
Cork line	..	..	.. 224 M	.. 175 M
Lead line	..	..	.. 224 M	.. 175 M
Stretched depth	..	..	.. 30 M	.. 30 M
Hanging ratio	..	..	.. 0.80	.. 0.80
<b>Mesh size:</b>				
In body	..	..	.. 16 mm SM	.. 16 mm SM
In bunt or bag	..	..	.. 11 mm SM	.. 10 mm SM

## RESULTS AND ANALYSIS

The monthly distribution of effort (in the form of number of purse-seine operations), the total catches made and the monthly variation in the percentage composition of the major varieties in respect of the whole area for the period 1972 to 1975 is given in table I.

TABLE I

Monthly Distribution of Effort, Species composition for whole area during 1972–1975

		Nov.	Dec.	Jan.	Feb.	Mar.	Apr.
No. of sets	..	.. 25	.. 10	.. 08	.. 15	.. 16	.. 13
Total catch (kg.)	..	.. 15,180	.. 3,855	.. 5,120	.. 6,825	.. 5,555	.. 3,232
Catch/set (kg.)	..	.. 607.2	.. 385.5	.. 640.0	.. 455.0	.. 347.2	.. 248.6
Sardine	..	.. 48.0%..	.. 70.7%..	.. 10.5%..	.. 44.6%..	.. 21.4%..	.. 79.1%
Red bait	..	.. 27.7	.. 1.8	.. 26.4	.. 27.8	.. 35.3	.. 11.6
Herring	..	.. 13.6	.. 6.9	.. 16.6	.. 7.9	.. 32.1	.. 4.3
Anchovy	..	.. 4.2	.. 12.9	.. 34.8	.. 6.7	.. 3.1	.. 1.2
Silver Belly	..	.. 1.9	.. 4.5	.. —	.. —	.. 2.8	.. 2.0
I. Mackerel	..	.. 2.6	.. 1.0	.. —	.. 5.3	.. 2.7	.. —
Squids	..	.. —	.. 1.6	.. 5.4	.. 2.6	.. 1.7	.. —
Scad	..	.. —	.. —	.. —	.. 4.2	.. —	.. —
Skates	..	.. —	.. —	.. 4.9	.. —	.. —	.. —

An examination of the catches made by the two purse-seines of different sizes show that the difference in size had not made any significant difference in the performance of the two nets. The average catch per set obtained for the two nets for the whole period of survey also do not show any significant difference. In fact the smaller purse-seine recorded a slightly higher average catch per set figure than the larger one, which could be attributed to factors other than the size of the net.

	No. of Sets	Total catch (kg)	Catch/set
Purse-seine I	38	15,620	411.1
Purse-seine II	52	22,192	426.8

Table II shows the distribution of effort and the total catch realised for the whole area during 1972-1973, 1973-1974 and 1974-1975, and also the percentage species composition of major varieties of fish caught by the purse-seine during these periods. As mentioned earlier the lampara net was used much more extensively than the purse-seine during the 1972-1973 period. This would account for the relatively low number of sets by the purse-seine during 1972-1973 compared with those for 1973-1974 and 1974-1975 periods, even though the total number of light stations was more or less same for 1972-1973, 1973-1974 and 1974-1975.

TABLE II

	Nov.—Apr. 1972—1973	Nov.—Apr. 1973—1974	Nov.—Apr. 1974—1975
No. of light stations	45	55	42
No. of sets	13	37	37
Total catch (kg)	4,405	16,300	17,962
Av. catch/set	338.8	440.5	485.5
Sardines	30.1%	34.5%	51.1%
Red bait	36.2	30.8	23.9
Herring	24.1	06.5	13.5
Anchovy	00.6	13.6	05.1
Others	09.0	14.6	06.4

The average catch per set also showed a gradual increase from 1972-1973 period to 1974-1975. This could probably be due to a number of factors. With each subsequent period, the knowledge gained regarding the fishing area and conditions was enhanced and this helped in the selection of best possible light stations. The experience gained with time by the crew in the operation of purse-seine also helped to achieve better catch rates with each subsequent period.

Generally, only a single purse-seine operation had been carried out per night. Thus, the average catch per operation given in table II can be considered as the mean catch rate per effective bait fishing day, for 1973-1974 and 1974-1975. As the lampara net was also used during 1972-1973 period, it is not possible to obtain a mean catch rate for the purse-seine alone. The mean catch rate per bait fishing day (considering the total number of light stations) would be 296.4 kg for 1973-1974 and 427.6 kg for 1974-1975.

The percentage species composition of the major varieties of fish caught by the purse-seine for the different periods show that the contribution by Red bait range from 23.9% to 36.2% ; being the most dominant or the second most dominant variety in the catches made during the different periods. It is important to note that these figures have been realised as a result of highly selective fishing carried out to ascertain the resources of Red bait in this area. As such this percentage species composition does not reflect the true picture of the fish community in the area.

## MONTHLY VARIATION IN RED BAIT CATCHES

An attempt has been made here to observe the seasonal and annual variations of Red bait catches for the different periods despite the fact that there has not been any fishing operations during certain months in certain years.

During the season November 1972 to April 1973, fishing operations using the purse-seine had been carried out in this area during the months February, March and April. Fishing was conducted off Negombo, Pamunugama, Chilaw, Udappuwa and Mundal Lake areas. Small quantities of Red bait (5-10% of the total catch) have been recorded in February and March off Mundal Lake, Chilaw and Negombo areas; the dominant varieties being Sardines and Herring which together made up 80-90% of the total catch.

For the season extending from November 1973 to April 1974, experimental fishing operations have been carried out in this area during the months December, January, February, March and April. Considering the distribution of effort for the whole area during this period, it is seen that most of the fishing activities from December to February have been carried out off Negombo and Pamunugama areas, while from March fishing activities have been extended North towards Chilaw area.

The monthly variation in the average catch per set for all varieties and also separately for Red bait is shown in figure I. The monthly variation in the surface water temperature recorded at the fishing stations during this period is also shown. The average catch rate per set showed a maximum during January which gradually declined towards April.

Unlike in 1972-1973, very good catches of Red bait have been recorded during this period from January to April. While there were practically no catches of Red bait during December, 26.4% of the catches made during January, mainly off Hendala and Pamunugama areas, consisted of Red bait. The percentage frequency of Red bait in the catches showed a steady increase, reaching a peak in March (36.6%, 55.3% and 17.9% during February, March and April respectively) and then declining in April. Very good catches of Red bait were made during these three months off Negombo, Pamunugama and Chilaw areas. From figure I, it is seen that Red bait catches showed a peak in February and then showed a gradual decline towards April.

During the period November 1974 to April 1975, experimental fishing activities have been conducted in November, December, February and April, off Negombo, Handala, Pamunugama, Uddappuwa and Chilaw areas. It was observed from the catches that the 27.7% contribution of Red bait to the total catch during November has been due to good catches of Red bait realised off Chilaw and Uddappuwa. During the other months the Red bait catches were not very high, Sardines and Herrings being the dominant varieties in the catches.

In figure 2, the most promising areas for Red bait have been mapped out taking into consideration the results and information available from 1972 to 1975. In the areas marked off Pamunugama, Hendala, Negombo and Wennappuwa the best grounds for Red bait was observed at a depth range of 9-10 fathoms. Good catches have also been recorded in 7-8 fathoms depth range off Negombo. In areas marked off Chilaw and Udappuwa the best Red bait grounds seem to be at a depth range of 7-9 fathoms.

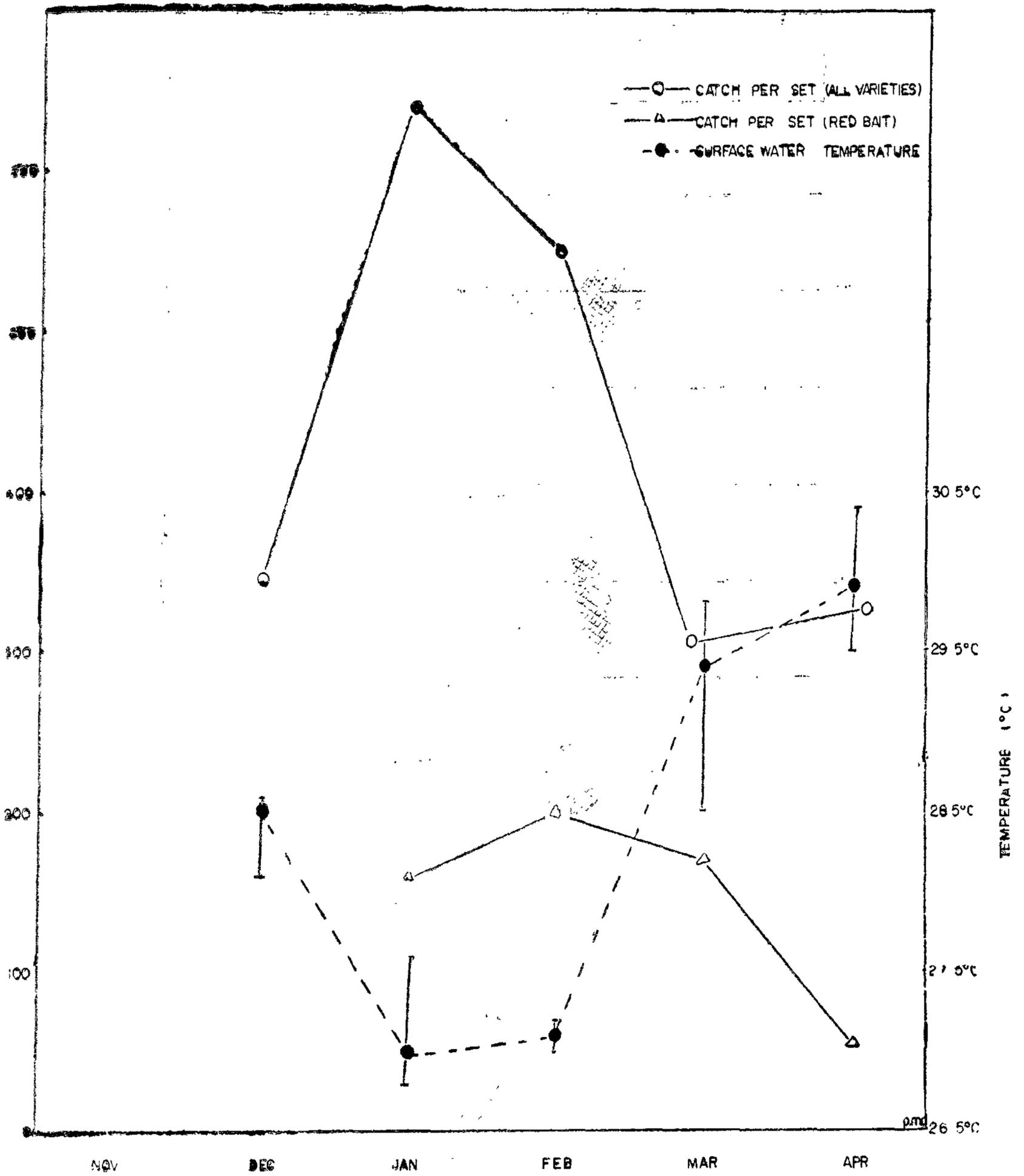


Fig. 1.—Monthly variation in catch per set for Red Bait for the period November 1973–April 1974.

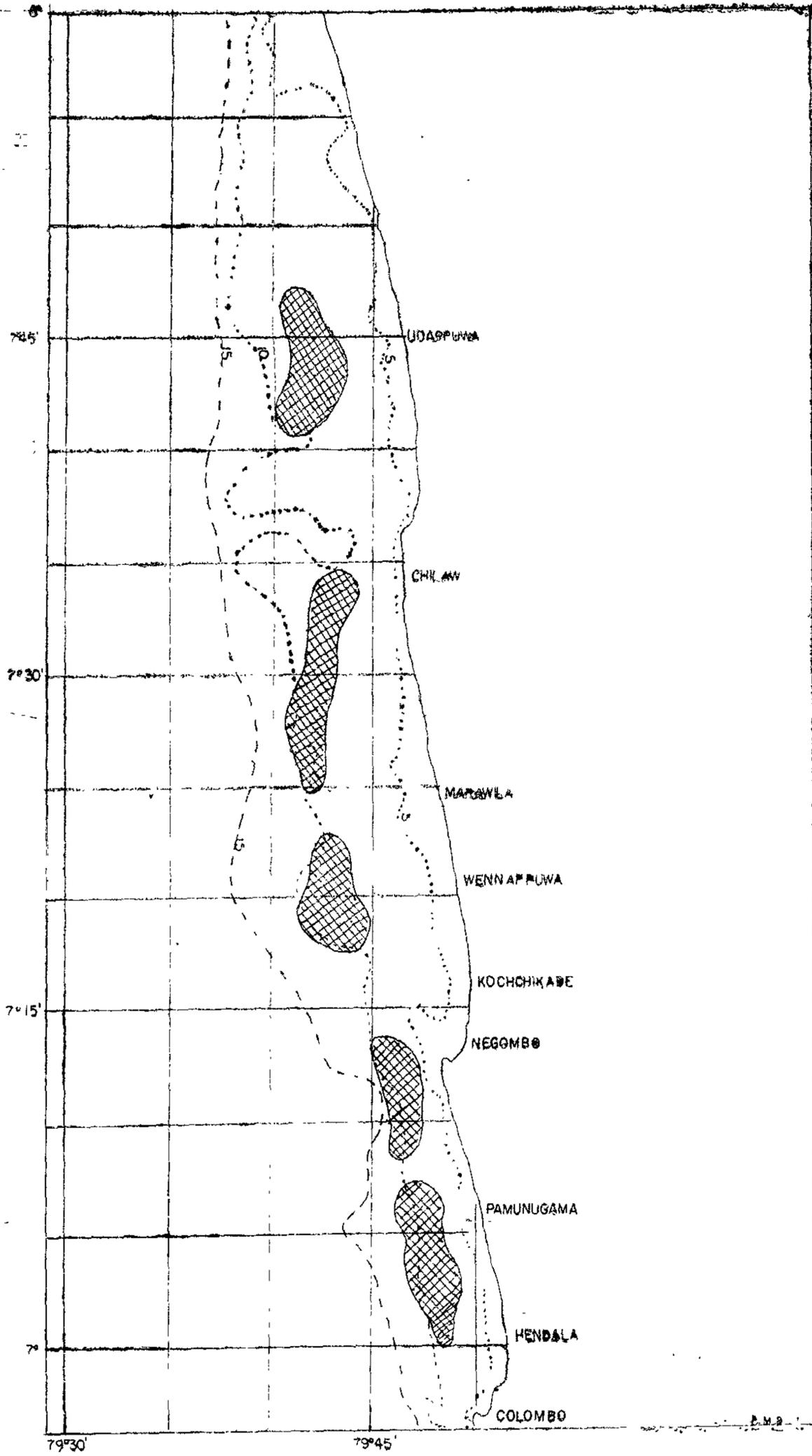


Fig. 2.—Map of West Coast (7° — 8° N) showing the Bait fishing grounds, 1972-75.

## LIVE BAIT FISHERY BY NICHIRO BOATS

During the period March 1973-to October 1974, three pole and line vessels, Seisho Maru—25, Kuroshio Maru—70 and Shinsyu Maru—7 (265 GT, 240 GT and 193G. respectively) belonging to the Nichiro Fishing Company of Japan carried out experimental pole and line fishing for Skipjack tuna around Sri Lanka with a view to establishing a joint commercial fishing venture with the Government of Sri Lanka. These boats conducted their live bait fishery in the night using light attraction techniques. Seisho Maru and Kuroshio Maru used purse-seines (270 M and 240 M in length respectively) while Shinsyu Maru used a lift net to catch live bait.

These vessels have been conducting their live bait fishery on the West coast from November to February. In his analysis on the performance of these vessels, Sivasubramaniam (1975) observed that 36% of the live bait catches had been made close to the Chilaw area, while only 3.5% of the bait catches were made in the coastal waters between Colombo and Galle. The percentage species composition of the major varieties realised for the West coast by these vessels is given below and is similar to that realised by the UNDP/Sri Lanka Project boats during 1972 to 1975. Here too, it must be emphasized that selective fishing had been carried out for Red bait and other varieties that could be used as live bait.

			<i>Nichiro Vessels</i>		<i>UNDP Project Boats</i>
Sardines	..	..	40.7%	..	46.1%
Red bait	..	..	33.5	..	26.1
Herring	..	..	23.1	..	14.9
Others	..	..	2.7	..	12.9

It has also been observed that the average bait catch per day for the three vessels were not significantly different in spite of the differences in their mode of operations. The three vessels have recorded a mean catch rate of 280 kg per bait fishing day and 400 kg per effective bait fishing day. These figures are also similar to those obtained for the UNDP/Sri Lanka Project boats.

## DISCUSSION

The results of the live bait survey carried out by the UNDP/Sri Lanka Fishery Development Project from 1972 to 1975, and the bait fishery carried out by the Nichiro boats from 1973–1974 has shown the location of new bait grounds for Red bait in the Western coastal waters of Sri Lanka within the 7–12 fathom depth range. Due to the unfavourable conditions of the South-West monsoon, bait fishery in this area is possible from November to April. Even though no definite trend was observed regarding the monthly variation in the availability of Red bait to the fishing method used, the results showed very good concentrations of Red bait from November to March.

The location of these new bait grounds can lead to the expansion of pole and line fishing by local boats in this area. The present production of Skipjack tuna is about 12,000 tons per annum while the estimated production is around 30,000 tons per annum. The present production is achieved by the 3½ ton mechanized boats (28 ft) and out-rigger canoes of over 15 ft. in length. These vessels transport the live bait in cane baskets tied on to a side of the canoe or boat, about ¾ submerged in water. Only Red bait and some species of Cardinal fish (Apogonidae) can withstand this crude system of bait handling and transport as practised by the local pole and line fishermen. For bigger boats (about 40–50 ft in length) with inboard bait tanks, and better storage facilities for fish, this area could become a base from where pole and line fishing can be carried out up to a range of 50–60

miles from the shore. In addition to Red bait these boats will be able to utilize a number of other small pelagic fish ; species of Sardines, Apogonidae, Carangidae etc. These varieties of fish have been found suitable as live bait and used along with Red bait by the Nichiro pole and line vessels.

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