

THE SIZE OF THE MALDIVIAN TUNA LIVEBAIT FISHERY

R.C.Anderson
Marine Research Section

INTRODUCTION

Tuna pole and line fishing is the most important fisheries activity in the Maldives. Nearly 90% of the total recorded catch is caught by pole and line. This type of fishing is infact composed of two separate fisheries: an inshore one for livebait and an offshore one for tuna. Without a good supply of livebait there could be no tuna fishery.

Tuna catches by mechanized pole and line vessels (masdhonis) reached a record of nearly 77,000t in 1993. Fishing effort, in terms of numbers of days fishing by masdhonis, has also been increasing, to a record of over 220,000 days in 1993. Livebait utilization must have increased as well. For the period 1985-87 total livebait utilization was roughly estimated at 5100 ± 1300 t per year (Anderson and Hafiz, 1988). Both tuna catches and pole and line fishing effort have increased about 50% since then. The aim of this report is to provide an updated estimate of livebait catches in the Maldives.

METHODS

Details of tuna catch and fishing effort by masdhonis are collected and compiled by the Ministry of Fisheries and Agriculture, and are summarized in Table 1.

Details of patterns of livebait utilization by species and region have been described by Anderson and Hafiz (1988) and Anderson and Saleem (1994). The pattern of bait utilization in the southern atolls (i.e. south of the Kudahuvadho Channel) is different from that in the central and northern atolls (Anderson, 1992; Anderson and Saleem, 1994). Data are summarized in Table 2.

Table 3. Weights of livebait catches by masdhonis.

Source: MRS unpublished data.

Date	Location	No.Hauls	Weight	Main varieties
22.09.93	L.Maamendhoo	13	43.5 kg	<i>Muguraan</i> and <i>Boadhi</i>
23.09.93	L.Maamendhoo	12	46.3 kg	<i>Muguraan</i> and <i>Thaavalha</i>
31.01.94	G.A.Villingili	12	33.8 kg	<i>Boadhi</i>
15.08.94	G.A.Kolamaafushi	10	58.8 kg	<i>Muguraan</i>
21.08.94	G.A.Kolamaafushi	17	39.9 kg	<i>Muguraan</i> and <i>Nilamehi</i>
22.08.94	G.A.Kolamaafushi	8	57.8 kg	<i>Muguraan</i> and <i>Rehi</i>

RESULTS

The average weight of livebait caught before each of six day's tuna fishing was 46.7kg (Table 3). Anderson and Hafiz (1988) suggested that Sprats and Anchovies (*rehi*, *hondeli* and *miyaren*) are taken in larger than average amounts, both because they are normally available in huge numbers when present, and in order to offset their high mortality in captivity. The weight of the one catch with *rehi* was 57.8 kg. The average weight of the five livebait catches without *rehi* was 44.5 kg. As a rough working estimate it is suggested that the average weight of *rehi*, *hondeli* or *miyaren* catches are 60 kg; average weights of catches of other species are estimated at 45 kg.

In 1993 a total of 222,548 days fishing by mechanized masdhonis and 1057 days fishing by sailing masdhonis was recorded by MOFA (Table 1). Although the great majority of masdhonis go for pole and line tuna fishing, an unknown minority do not. As a rough approximation it is assumed that all the mechanized masdhonis go for pole and line fishing while none of the sailing masdhonis do.

As noted by Anderson and Hafiz (1988), Anderson (1992) and Anderson and Saleem (1994) there are significant differences in livebait species composition on either side of the Kudahuvadhoo Channel. Thus for present purposes the Maldives may be considered to be composed of two biogeographic regions: the northern and central atolls being one, and the southern atolls the other. While there may be subregional differences within these two major regions there are insufficient data at present to quantify them. There are undoubtedly also significant interannual variations, but again insufficient data to quantify them.

The quantity of livebait caught and used for a day's fishing was weighed on six separate fishing trips during 1993-94. These data are summarized in Table 3.

Table 1. Pole and line fishing effort, and mechanized pole and line vessel catch rates for the decade 1984-1993.

Source: MOFA, Basic Fisheries Statistics.

Note: Tuna catch excludes Dogtooth Tuna, a reef species.

Year	Number of days fishing			Mechanized masdhoni	
	Mechanized Masdhoneis	Sailing Masdhoneis	Total Masdhoneis	Tuna catch (t)	Tuna catch rate (kg/day)
1984	153,460	6,220	159,680	41,747	272
1985	162,430	4,681	167,111	50,602	312
1986	161,910	3,354	165,264	51,987	321
1987	158,785	2,355	161,140	50,326	317
1988	184,353	1,242	185,595	66,395	360
1989	183,944	911	184,855	66,398	361
1990	193,045	1,317	194,362	68,947	357
1991	198,320	424	198,744	70,029	353
1992	204,808	3,602	208,410	72,115	352
1993	222,548	1,057	223,605	76,735	345

Table 2. Approximate percentage composition of livebait catches in the north and centre (Haa Alifu to Meemu and Dhaalu) and in the south (Thaa to Seenu) of the Maldives. Source: Modified from Anderson and Saleem (1994).

Livebait variety		Percentage used in	
English name	Dhivehi name	North	South
Silver Sprat	<i>Rehi</i>	34	25
Blue Sprat	<i>Hondeli</i>	1	12
Anchovies	<i>Miyaren</i>	1	20
Fusiliers	<i>Muguraan</i>	50	25
Cardinalfishes	<i>Boadhi & Fatha</i>	12	12
Damselfishes	<i>Bureki & Nilamehi</i>	1	2
Silversides	<i>Thaavalha & Boduboa</i>	1	3
Others		0	1
Total		100	100

Anderson and Hafiz (1988) estimated that the Maldivian pole and line fishery may have caught something of the order of 3000-3500t of livebait per year in 1978-1981, and about 5100 ± 2800 t per year in 1985-1987. Thus this estimate of 11100 ± 2800 t in 1993 indicates a major increase in livebait catches.

To some extent this increase may be the result of inadequate bait weight sampling. Only three livebait catches (estimated average for hardy species 30 kg) were weighed for the earlier estimates, and only six for the current estimate (average for hardy species 45 kg). The 50% increase in estimated average livebait catch weight is the largest single factor in the 100% increase in estimated total bait catch. However, this may not all be due to experimental error. Over the last decade masdhonis have been increasing in size, and bait catching and holding techniques have been improving. There has undoubtedly been a real increase in average livebait catch weight over this period; it is only the magnitude of the increase that is uncertain.

The second major factor in the great increase in total annual livebait catch over the last few years is the increase in fishing effort. Fishing effort by the pole and line masdhoni fleet increased nearly 40% from about 160,000 days fishing per year in 1985-87 to over 220,000 days in 1993.

A final factor in the increase in total annual livebait catch is the shift in estimated percentage livebait species composition. Largely as a result of estimating livebait composition separately for the southern atolls, the estimated contributions of *hondeli* and *miyaren* have been increased. These species are assumed to have an average catch weight of 60 kg rather than the 45 kg of most other varieties. Infact *hondeli*, *miyaren* and *rehi* contributed nearly 50% to the estimated total livebait catch in 1993, compared with less than 40% in 1985-87.

With an estimated annual catch 11100 ± 2800 t in 1993 the livebait fishery is without doubt the largest reef fishery in the Maldives. An estimated 11400t of "reef fish" were caught in 1993 (MOFA,1994). However, this includes a large proportion of pelagic species such as Rainbow Runners (*Elagatis bipinnulata*; *maaniyamas*). For example, Van der Knaap et al. (1991) estimated that only 38% of "reef fish" landed at resorts was of demersal species.

The livebait fishery is not only the largest but also by far the most important Maldivian reef fishery, because without it there would be no pole and line tuna

Therefore, as a first approximation it is assumed that the livebait species compositions given in Table 2 are representative of the two regions.

Of the 222,548 days fishing carried out by mechanized masdhonis during 1993, 164,941 were recorded from the northern and central atolls, and 57,607 from the southern atolls. Knowing the species composition for both regions it is possible to estimate the total utilization of each livebait variety in terms of numbers of days used.

As mentioned above, the average of *rehi*, *hondeli* and *miyaren* used per day is estimated at 60 kg. The average weight of other species used per day is estimated at 45 kg. However these hardy species, if not used on one day, may be kept for the next. To try to account for this the estimated number days on which they are fished is reduced by 5%. The following catches are estimated:

<i>Rehi</i> (<i>Spratelloides gracilis</i>)	4,230	±	1060 t
<i>Muguraan</i> (Caesionidae)	4,140	±	1040 t
<i>Boadhi & Fatha</i> (Apogonidae)	1,140	±	290 t
<i>Miyaren</i> (Engraulididae)	790	±	200 t
<i>Hondeli</i> (<i>Spratelloides delicatulus</i>)	510	±	130 t
<i>Thaavalha</i> (Atherinidae)	140	±	40 t
<i>Bureki & Nilamehi</i> (Pomacentridae)	120	±	30 t
Others	30	±	10 t
Total	11,100	±	2800 t

A confidence interval of 25% is arbitrarily assigned to these estimates. This may not be too large, particularly considering the uncertainties in estimating the average weight of livebait used per day. There are also major uncertainties in estimating the percentage species composition by region, and there must be considerable variations in livebait species utilization from year to year.

DISCUSSION

Despite the uncertainties, this estimate of 11100 ± 2800t of livebait used during 1993 in the pole and line tuna fishery does at least give an indication of the order of magnitude of the fishery. The Maldivian livebait fishery is infact the largest in the world. The next largest livebait fishery is that of the Solomon Islands (Blaber and Copland, 1990) which catches something of the order of 2000t per year.

fishery. In 1993 a total of nearly 80,000t of fish was landed by the pole and line fleet (MOFA,1994).

Anderson and Hafiz (1988) estimated the average tuna catch per unit bait (CPUB) at about 10 kg (range 7-3 kg) in 1985-87. In 1993 CPUB was closer to 7 kg tuna per kg bait (range 5-9 kg). This apparent decline can largely be explained by the increase in estimated average livebait catch weight. However, the recent decline in Skipjack tuna catch rates has also had an effect.

In conclusion, the total livebait catch by the Maldivian pole and line fleet was estimated at $11100 \pm 2800t$ in 1993. There has been a 100% increase in estimated livebait catches over 7 years. The Maldivian livebait fishery is the largest livebait fishery in the world, and the most important reef fishery in the Maldives. Given this importance, the enormous increase in livebait catches over recent years, and the decrease in catch per unit bait, it would be prudent to increase research efforts into livebait biology, utilization and stock assessment.

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