

Recent Survey on Diving Fishers in Japan

Motohiko MOHRI

ABSTRACT

A questionnaire survey was distributed to 2,135 Costal Fisheries Cooperative Associations (CFCA) in 1986-87 to obtain updated informations on diving fishers in Japan.

Out of 2,135 CFCAs, 764 were conducting diving fishery. The number of male diving fishers was 12,264 and that of female was 3,037. The breath-hold divers made 63.6% of all diving-fishing divers. The fishers in their forties occupied 30.1%, indicating that the average age was getting higher and they were in want of successors.

The energetics of diving-fishers were measured using two types of diving data loggers, one developed by Henderson et al, and the other by Vine Bionic Systems. Both loggers have the same operational characteristics. The subjects were 4 unassisted divers (Cachido-Ama) who wore wet suits and swim fins, and 9 assisted divers (Funado-Ama). The depth and R-R intervals were recorded every second, and total time in water, total diving time, total surface time, total number of dives per day, average depth of single dive, average deepest dive, average single dive time, average longest dive, descent velocity, ascent velocity, descent time, ascent time and bottom time per dive were calculated.

The average diving duration time and depth in Cachido-Ama were 37.0 ± 0.4 sec and 6.9 ± 0.1 m and in Funado-Ama 68.5 ± 4.3 sec and 9.7 ± 0.5 m, respectively. Total diving time was 63 ± 12 min in Cachido-Ama and 26 ± 2 min in Funado-Ama. But total bottom time in Funado-Ama was 45.0 sec much longer than in Cachido-Ama. Funado-Ama was thought to be more profitable for underwater fishing.

Key Words : Ama, Cachido, Funado, Diving Fishers, Dive Data-Loggers

Introduction

In Japan, a country surrounded by the sea, there are numerous fisheries cooperative associations to which diving fishers, that is Ama, belong. The Ama are, male or female divers, who live by catching fish and collecting shellfish and seaweed from the seabed. Their recorded activities can be found in the old literature, such as the Gishi-Wajin-Den and the Kojiki, both thought to be written approximately 2,000 years ago. Ama expressed in the Chinese character in those days could be a single character that meant sea or combination of two characters pronounced Ama-be that meant sea and part, respectively. Districts where Ama lived were called Kai-fu-Go or Kai-fu-Gun whose names are still present in various places in Japan today (Nakamura, 1978).

Many limited area survey on the distribution of Ama in Japan have been reported (Chiba Educational Committee, 1981; Nukada, 1965, Ooyama et al, 1980; Tanaka et al, 1981; Otsuka et al, 1982; Kakihana et al, 1984; Shiraki et al, 1985; and Hong et al, 1991). The first nation wide survey of such kind was reported by Takeuchi and Mohri (1987). This paper

presents data on the characteristics and condition of diving fishers and the differences between Cachido- and Funado-Ama, based upon the 1987 national survey.

Methods

1 Survey Procedure

Questionnaire sheets were sent out to total 2135 coastal fishery cooperative associations all over Japan. All questionnaires were completed and returned because of follow-up achieves which included telephone, fax and on-site visit. Details of the survey and the questionnaires have been reported previously (Takeuchi and Mohri, 1987).

2 On-site Visit Survey

On-site visit surveys were conducted at Matsuwa in Miura peninsula on four Cachido-Ama divers in September 1989 and nine Funado-Ama divers at Shiromazu in Bohsoh peninsula in September 1990. The diving depth, R-R interval of the heart rate, water temperature and chest skin temperature at one point were recorded every second during each dive using a data logger made by Henderson et al. at the State University of New York at Buffalo (Henderson et al, 1991) and a data recorder from Vine, Inc., Tokyo. The Cachido-Ama using wet suits and a pair of fins performed breath-hold diving from the surface. On the other hand, Funado-Ama wearing only a pair of shorts, descended with an aid of weight which ranged between 8 to 12 kg, from a boat to the bottom of the sea, then ascended to the surface by their own effort. The Funado-Ama divers protected themselves from excessive body heat loss by boarding the best and warming themselves at a stove at certain intervals.

Results and Discussions

I. Questionnaire Survey

At the 2,135 fishery cooperative associations to which the questionnaire was sent 887 (41.27%) were engaged in diving activities. Ama divers belong to 764 (35.95% of the total) of the 887 associations. Divers in the remaining 123 associations were engaged in other diving jobs, such as maintenance of stationary net fishery and culture fish preserve than diving fishery. Thus, 87.12% of all diving activities were devoted to the diving fishery.

The total number of diving fishers was 22,800 (i.e., 18,000 male and 4,800 female divers). Among those, 12,267 males and 3,037 females were specialized diving fishers, totalling up to 15,301 divers (Fig. 1). Female Ama characterized by the Chinese characters for female and sea were distributed in Shima peninsula (in Mie prefecture), Shimoda (at the tip of Izu peninsula in Shizuoka prefecture, Oshima island (near Mikuni in Fukui prefecture), Wajima (located in Noto peninsula in Ishikawa Prefecture), Hekura island (enclosed by Noto peninsula), and Shirahama (on Bohsoh peninsula in Chiba prefecture). Areas of diving fishery conducted solely by female Ama were ten places in Ise-Shima district in Mie prefecture and on place each at Oshima, Wajima and Hekura island. There were two female Ama at Matsumae-Gun in Hokkaido, which was recognized to be the northern limit of Ama in Japan.

The age distribution of divers was 30.1% in forties, 25.4% in thirties, 24.2% in fifties, 12.1% in twenties, and 0.9% in teens and seventies. In the male diver's population, forties (30.2%) was the largest age group, then thirties (29.0%) and fifties (20.4%). Female divers had a different age distribution, with the fifties age group occupying 39.7%, forties (29.8%) and sixties (4.2%). Older female divers accounted for the largest portion of population,

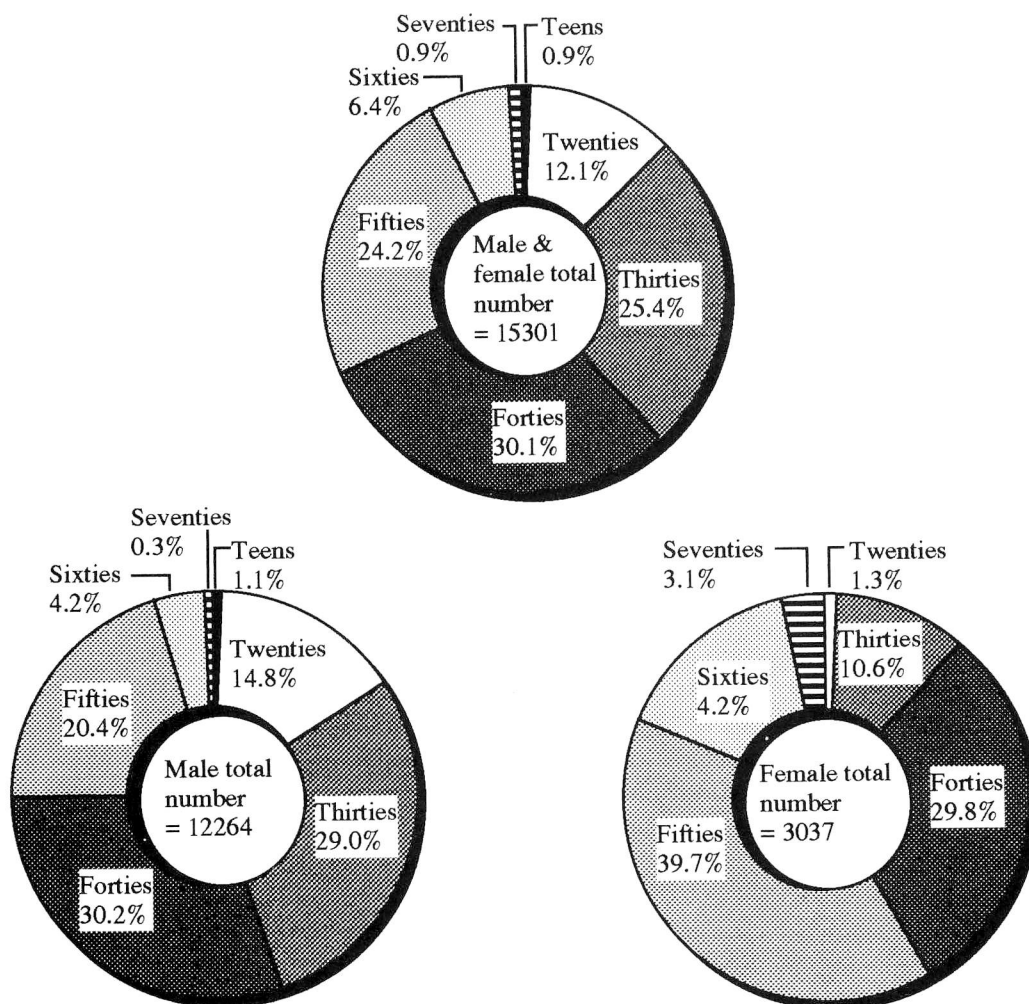


Fig. 1 Age distribution of divers

compared to the male diver's population. The fraction accounted for by divers older than sixty years old was 4.5 and 7.3% for the male and female population, respectively, while the fraction accounted for by teens and twenties age group was 15.9 and 1.3% in male and female, respectively. These observations suggested that there was a severe lack of successors in female divers in contrast to the modest number of successors for male divers.

Despite the fact that underwater breathing apparatus have been available for many years, breath-hold diving is still a popular method of dive among diving fishers. In fact breath-hold diving is the only method used in 63.6% of 764 fisheries cooperative associations. There are two ways of breath-hold diving; one is called Cachido and other is called Funado.

For a diving costume, Ama merely wore waist strings or undershorts before white clothes costume was introduced in mid-1955 (Nakamura, 1978). When wet suits became popular in the diving community in 1960s, Ama divers wore them. In recent years, 77.3% of Ama use wet suits (Fig. 2). The main purpose of wet suits is to preserve body heat in water, and the efficacy of wet suits for that purpose has been well documented (Park et al, 1983; Shiraki

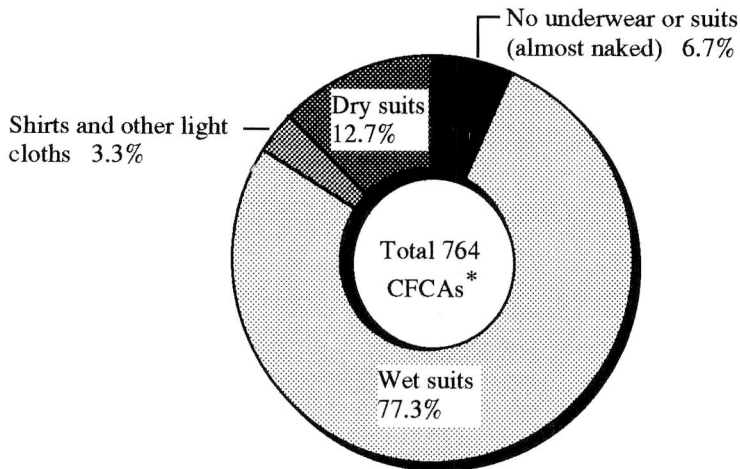


Fig. 2 Diving costume of divers
(*CFCA: Coastal Fisheries Cooperative Association)

et al, 1986; Wolff et al, 1985). For the reason of natural resources preservation, 6.7% of fisheries cooperative associations have not approved the use of any body temperature conservation means including wet suits and shirts, except for female Ama wearing thin clothes.

II. Diving Characteristics of Male Cachido- and Male Funado-Amas

The physical characteristics of male Cachido- and male Funado-Ama divers are shown in Table 1. There was no statistically significant difference between the two groups. The diving career of Funado (25.4 ± 2.4 years) was not significantly greater than that of Cachido (19.0 ± 2.3 years).

Dive characteristics are shown in Table 2. For male Cachido-Ama, total time in water was 201 ± 10 min per day, total number of dives per day was 109 ± 29 , and average single dive time was 37.0 ± 0.4 sec. Shiraki, et al. (1986) reported that in Tsushima island male Cachido-Amas, who are called Katsugi there, had total time in water of 276 ± 8 min per day and total number of dives per day of 175 ± 8 , indicating much longer work time and greater number of dives than Cachido-Ama shown in Table 2. The average single dive time, however, did not significantly different between the two groups of Cachido-Ama, i.e., 38.6 ± 3.3 vs. 37.0 ± 0.4 sec in Katsugi vs. Cachido-Ama, respectively in the present study.

Differences in diving characteristics between Cachido- and Funado-Amas as seen in Table 2 are that the Cachido had significantly greater total number of dives, 109 ± 29 vs. 23 ± 1 , and longer total diving time, 63 ± 12 vs. 26 ± 2 min, than the Funado. The smaller number of dives for the Funado is probably due to the fact that Funado had to spend time warming themselves by the on-boat stoves at intervals since they dove with near-naked. Data showing lowered chest skin temperature (Hong et al, 1991) and total number of dives per day by Funado wearing wet suits at Hekura island in Ishikawa prefecture (unpublished data taken in August, 1993) is comparable to the number seen in Katsugi-Ama at Tsushima island. This observation indicated that wet suits can prevent divers from excessive body heat loss and allow them to dive for a continuously longer period of time than near-naked divers.

Average dive depth and average deepest dive depth were 6.9 ± 0.1 m and 12.9 ± 1.8 m for

Table 1. Age and Physical Characteristics of Cachido and Funado-Ama Divers

		Cachido-Ama 1989 n=4	Funado-Ama 1990 n=9
Age	(Years old)	46.6±4.4	52.3±1.9
Height	(cm)	165.0±3.4	163.0±3.8
Weight	(kg)	61.6±4.9	67.1±3.5
Diving Career	(years)	19.0±2.3	25.4±2.4

n is the number of divers. Values are mean±S.E..

Table 2. Dive Characteristics of Cachido-and Funado-Ama Divers

	Cachido-Ama 1989 n=4	Funado-Ama 1990 n=9
Total time in water (min/day)	201±10	305±5
Total diving time (min/day)	63±12	26±2
Total surface time (min/day)	138±8	279±6*
Total number of dives per day	109±29	23±1
Average depth of dive (m)	6.9±0.1	9.7±0.5
Average deepest dive (m)	12.9±1.8	11.9±1.9
Average single dive time (sec)	37.0±0.4	68.5±4.3
Average longest dive time (sec)	51.7±4.1	79.8±12.2
Descent speed (m/sec)	0.72±0.005	0.97±0.07
Ascent speed (m/sec)	0.77±0.007	0.72±0.03
Descent time (sec)	9.8	10.0
Ascent time (sec)	8.9	13.5
Bottom time per dive (sec)	18.3	45.0

n is the number of divers. Values are mean S.E.. *: on boat

Cachido, and 9.7±0.5m and 11.9±1.9m for Funado-Ama, respectively. Average single dive time and average longest dive time were 37.0±0.4 sec and 51.7±4.1 sec in Cachido, and 68.5±4.3 sec and 79.8±12.2 sec in Funado-Ama. These observation indicated that Funado-Amas dove deeper and longer than Cachido-Amas. Descent speed was greater in Funado-Amas who dove with an aid of weight than Cachido-Amas, while ascent speed was the same for both Ama groups. The bottom time per dive for Funado-Amas of 45.0 sec was much longer than 18.3 sec for Cachido-Amas, which suggested that Funado-Ama had a greater advantage to catch fish and shellfish than the Cachido-Ama did.

Summary

Diving fishers were employed at 764 (35.95%) of 2135 coastal fisheries cooperative associations around Japan. There were 12,264 male and 3,037 female specialized diving fishers,

and their age distribution was concentrated in forties (30.1 %). It was indicated that female diver's population has become aged and was faced with a severe lack of successors in comparison with the male diver's population.

63.6% of specialized diving fishers were breath-hold divers called Ama who were divided into Cachido- and Funado-Ama. Diving characteristics in Cachido- and Funado-Ama divers were investigated using a data logger that recorded diving depth, the R-R interval of the heart rate, water temperature, and skin temperature every second.

Average single dive time and average dive depth were 37.0 ± 0.4 sec and 6.9 ± 0.1 m in male Cachido-Amas, and 68.5 ± 4.3 sec and 9.7 ± 0.5 m in male Funado-Amas, respectively. As a result, the Funado-Amas could dive deeper and longer than Cachido-Amas. Since bottom time in single dive was 45.0 sec and 18.3 sec in Funado- and Cachido-Amas, respectively. It suggests that the Funado-Amas had a greater advantage to catch fish and shellfish at the bottom of the sea than the Cachido-Amas did.

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