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A Handbook on the Japanese Sea Cucumber - Its Biology, Propagation and Utilisation (K.Y. Arakawa, 1990)

translated by M. Izumi, South Pacific Commission, Noumea, New Caledonia

In the last issue of the Beche-de-mer Information Bulletin *(No 3, November 1991) a summary of the general biology of* Stichopus japonicus, *experiments on seed collection and culture of larvae and juveniles, as described in the above publication, was given. The Appendix is summarised below.*

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4. Appendix

4.1 Propagation

4.1.1 Resource preservation and management

Prohibition of sea cucumber fishing in certain seasons or areas under local fishing regulations is very effective in terms of resource management, as well as protecting areas for juvenile release and seedlings.

4.1.1.1 Prohibited fishing area

An example of the effectiveness of prohibited fishing areas comes from Oura Bay, Saga Prefecture in Kyushu. Stones were scattered over the sea-bottom in an area of 700 m^2 and 1,700 juveniles were released. Fishing was prohibited for two years in an area of 1,500 m^2 which included the area of release. At the end of the prohibition period, 90 fishing boats made a total catch of 1,600 kg, approximately 30 times higher than previous catches.

In another example, in Migayi Prefecture in 1938 (also in an area where stones had been scattered over the sea-bed), fishing of adult sea cucumber was prohibited for three years in an area of 1,938 m^2. After the prohibition was lifted, catches increased by 2.5 to 3.7 times.

4.1.1.2 Prohibited fishing season

Most local regulations provide for prohibited fishing seasons between March and November, since there is a spawning season from March to July and a season of high water temperatures from August to September. The local prohibited fishing seasons are shown in Figure 1.

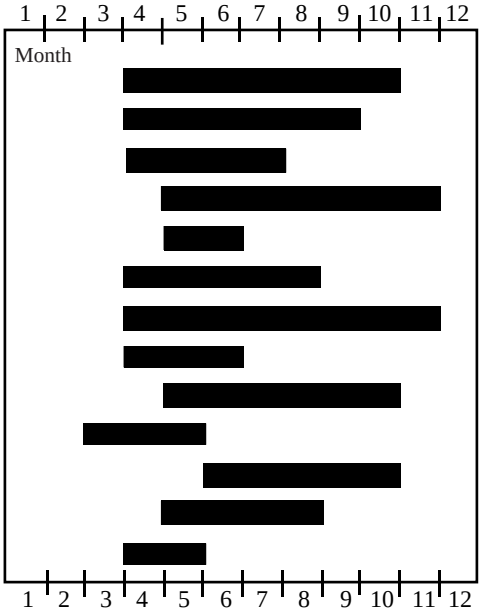


Figure 1. Prohibited fishing seasons in Japan, from: Muranushi, A. et al. (1965). *Sea cucumber: 60 species of aquaculture in the shallow water.* Ohnishi Press, Tokyo, pp. 297-303. (The map does not appear in the original version, but has been added to assist readers in locating the different prefectures)

PREFECTURES

Miyagi(4), Kanagawa(8), Hyogo(13), Hiroshima(15), Yamaguchi(17), Oita(25), Kagawa(18), Okayama(14)

Fukuoka(21), Saga(22), Nagasaki(23), Kumamoto(24)

Iwate(3), Wakayama(11)

Fukui(7), Tokushima(19)

Hokkaido(1)

Aomori(2)

Aichi(9)

Niigata(5)

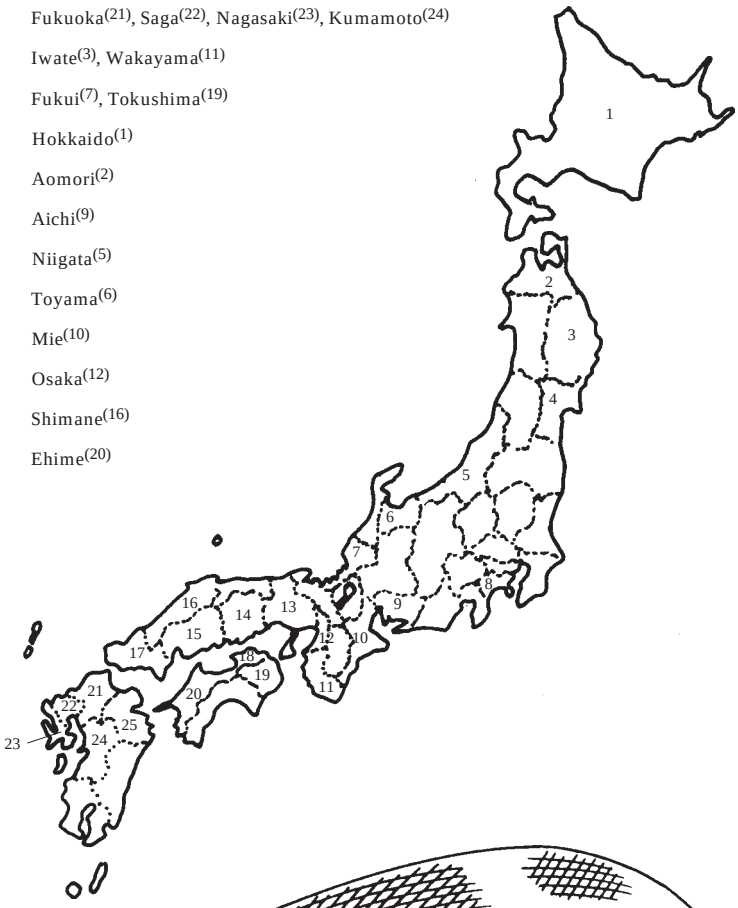
Toyama(6)

Mie(10)

Osaka(12)

Shimane(16)

Ehime(20)



4.1.2 Traditional fishing gear and methods

Fishing gear and methods including small bottom trawl nets for sandy bottoms, spears, hooks and scoop nets for reefs and diving gear have been developed with local originality, as shown in the table on page 7 and figures 2–4.

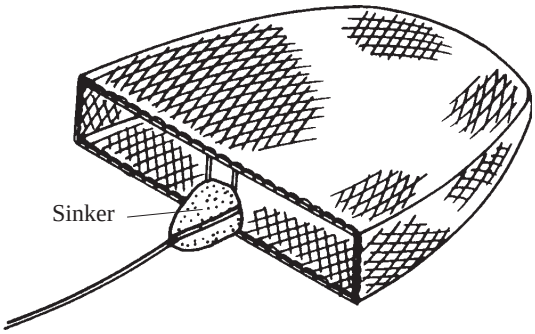


Figure 2. Beam trawl net

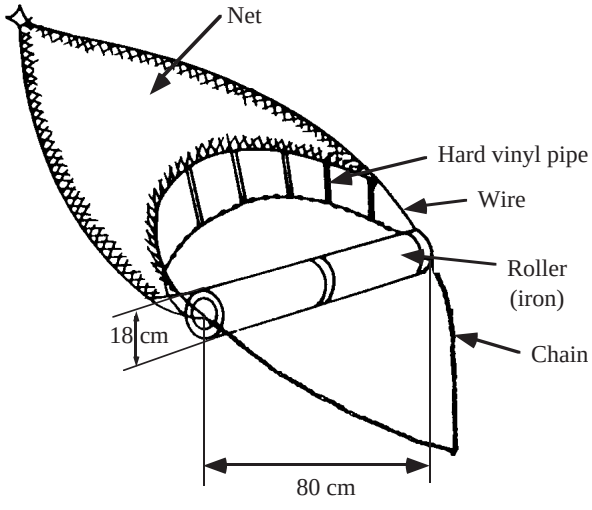


Figure 3. Roller-pulling net

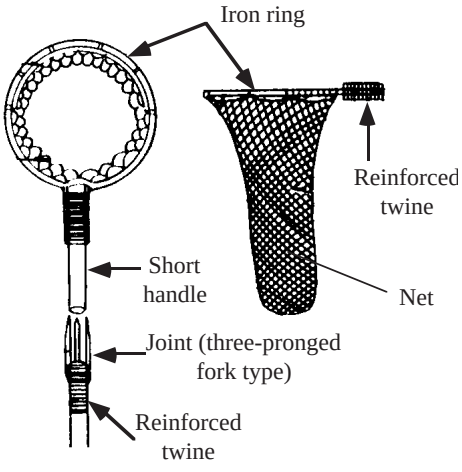


Figure 4. Scoop net

In many prefectures, there are local restrictions or prohibitions on certain types of fishing operations and fishing gear (see table below).

Prefectures	Gear
Kumamoto	Single type of beam trawl net (koketa-ami ichijyo-gata) (Figure 2)
Aichi	Parallel type of beam trawl net (koketa-ami nijyo-gata)
Aomori, Yamaguchi, Nagasaki, etc...	Bottom trawl net (sokobiki-ami)
Hokkaido, Miyagi, Aichi, Ishikawa, etc...	Beam trawl net (ketahiki-ami or keta-ami)
Hokkaido, Aomori	Japanese eight foot net (hassaku or hassaku-ami)
Aichi, Mie, Shimane, Saga, etc...	Trawl net (hiki-ami)
Okayama	Roller-pulling net (roller-kogi) (Figure 3)
Others	(uchise-ami, teguri-ami, funa-biki, mutsu-ami, etc...)

4.1.3 Regeneration experiments

In regeneration experiments at the Souya Fisheries Cooperative in Hokkaido, Japan, since 1984, approximately 2,000 pieces of 1,300 sea cucumbers' bodies cut in sections were released. The survival rate of tail and head parts was confirmed as about 60% and about 25% respectively after 3 months. On average, they recovered about 80% of their weight.

4.1.3.1 Regeneration of body parts

It was reported that the regeneration rate of cut sea cucumber was 80 to 90% in about 100 breeding days. The result of the regeneration experiments is shown in the following table.

Cutting position	No. of sea cucumber	No. surviving after 5 days	7 days	24 days	32 days	Survival rate after 32 days
	12	7	7	6	6	50.0
	(12)	(6)	(6)	(4)	(1)	(8.3)
	12	12	11	9	8	66.7
	(12)	(12)	(10)	(4)	(2)	(16.7)
	12	9	9	5	5	41.7
	12	12	12	9	8	67.7
	12	5	5	2	0	0
	12	12	12	10	10	83.3

( ) = red-coloured *Stichopus japonicus* (Aka)

Cited from: Che, S. (1963). *Research on sea cucumber - behavior, biology and propagation of* Stichopus japonicus. Kaibun-do, Tokyo, 226 pages.

4.1.3.2 Regeneration of viscera

A fishing village in Aichi Prefecture, Japan, has a traditional method of removing sea cucumber viscera without killing them. The following process is required:

— Keep collected sea cucumber in a sea-cage for half a day so that they emit all faeces from their intestines;

— Divide sea cucumbers into lots of 10 and place each lot in tray;

— Remove intestines from one or two sea cucumbers, then squeeze the juice from the intestines;

— Put juice into each tray containing about 10 sea cucumbers;

— All sea cucumbers will discharge their intestines from their anus.

If a sea cucumber of more than marketable size has eviscerated its intestines, the fresh tegument and salted viscera are sold separately. Smaller sea cucumbers are returned to the sea to regenerate for a month, and the intestines only sold.

4.2 **Statistics**

4.2.1 Total catch of sea cucumber in Japan from 1978 to 1987

Year	Catch (tons)
1978	10,143
1979	9,381
1980	8,970
1981	8,098
1982	8,437
1983	8,295
1984	7,624
1985	7,862
1986	7,248
1987	7,133

Cited from: *Annual statistical report of fisheries and aquaculture production for 1987*, Department of Statistics and Information, Ministry of Agriculture, Forestry and Fisheries.

4.2.2 Sea cucumber catch in major prefectures in 1987

Prefecture	Catch (tons)
Hokkaido	1,723
Aomori	364
Mie	246
Ishikawa	711
Nagasaki	657
Hyogo	413
Hiroshima	442
Yamaguchi	717
Ehime	259
Oita	417

Cited from: *Annual statistical report of fisheries and aquaculture production for 1987*. Department of Statistics and Information, Ministry of Agriculture, Forestry and Fisheries

4.2.3 Deliveries and sales of fresh sea cucumber, Tokyo Central Wholesale Market (Tsukiji)

4.2.3.1 Total deliveries and sales of sea cucumber

Year	Deliveries (kg)	Unit price (yen/kg)	Total sales (yen)
1978	926,262	536	496,517,850
1979	799,309	647	517,531,164
1980	837,080	707	591,639,060
1981	810,328	709	574,328,277
1982	695,655	768	534,469,103
1983	713,724	817	583,455,585
1984	772,736	769	594,364,040
1985	726,067	751	545,390,865
1986	784,064	757	570,343,588
1987	704,951	753	531,095,020
1988	697,539	850	592,818,633

Cited from: *Annual report for 1988*, Tokyo Metropolitan Central Wholesale Market

4.2.3.2 Total deliveries and sales of salted entrails of sea cucumber

Year	Deliveries (kg)	Unit price (yen/kg)	Total sales (yen)
1978	12,905	6,694	86,384,030
1979	12,079	7,088	85,611,755
1980	9,789	9,050	88,593,050
1981	13,893	8,718	121,125,350
1982	11,893	7,839	93,224,380
1983	56,947	2,156	122,784,268
1984	9,296	6,999	65,064,400
1985	10,241	6,099	62,464,800
1986	9,851	6,435	63,395,405
1987	8,044	7,289	58,629,410
1988	9,750	11,952	116,529,805

Cited from: *Annual report for 1988*, Tokyo Metropolitan Central Wholesale Market

4.2.4 Trade statistics

4.2.4.1 Imports to Japan of frozen sea cucumber

Country	Weight (kg)	Amount (yen)
USA	20,458	32,806,000
Canada	17,120	20,115,000
Korea	10,078	19,988,000
Fiji	6,128	4,182,000
China	169	1,265,000
Total	47,656	78,356,000

Cited from: *Fisheries trade statistics for 1988*, Fisheries Agency of Japan

4.2.4.2 Imports to Japan of salted or dried sea cucumber

Country	Weight (kg)	Amount (yen)
Korea	18,210	93,925,000
Maldives	2,250	4,606,000
USA	1,803	3,402,000
China	315	1,811,000
Singapore	1,212	1,261,000
Total	23,790	105,005,000

Cited from: *Fisheries trade statistics for 1988*, Fisheries Agency of Japan