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SOME OBSERVATIONS ON THE CAPTURE AND TRANSPORT OF
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TOCANTINS RIVER, PARA STATE, BRAZIL

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Mapara, Hypophthalmus edentatus, is a filter feeding catfish common to the Amazon and Para Rivers and their tributaries. Mapara appears to feed almost exclusively on plankton organisms suspended in the water. The fish forms large, constantly swimming schools which are normally located in the bottom waters during the day but migrate towards the surface at night possibly in response to diminishing light intensities and/or vertical migration of zooplankton. Little is known about spawning habits of mapara but it is common knowledge among the fishermen that mature mapara migrate up tributary streams to spawn during the rainy season (March and April) when the rivers are rising. Mapara is acknowledged to be a fast grower but no scientific data are available on the growth rates of this fish. Santos^{*} (1962) stated that the maximum length appears to be about 45 to 50 cm. in total length with a maximum weight of about one kilogram.

*Santos, Eurico, 1962. Peixes Da Agua Doce. 2nd Edition, F. Briguiet and Co., Rio De Janeiro, Brazil. 278 p.

Commercial Fisheries

The center of the mapara fishery appears to be located at Cameta, Para State, on the Tocantins River. The fish are highly prized by the local people for their fine flavor and flesh so it is pursued year around by the Brazilian fishermen. Mapara is captured using various methods but the most successful method is use of a large block net which is fished like a purse seine. These block net operations usually take place at night when the fish are located close to the surface of the water. The schools of Mapara are located in an unusual and unique way. Men in small canoes called "taleiros" use long, flexible poles (talas) of about 4 to 5 meters to sound for the schools of fish. The poles are continually thrust down into the water until the vibrations of the fish hitting the poles are felt by the men in the boat. So numerous and tightly schooled are the mapara that there is no mistaking the constant vibrations imparted to the pole by the striking fish when a school is encountered. During the day, besides the above method, schools of mapara are located by watching for diving sea gulls and large concentrations of feeding porpoises. So numerous are the porpoises in this area, because of the large concentrations of mapara, that gill nets can not be used because they are torn to pieces by the aquatic mammals.

When a school of mapara is located the rest of the fishermen, which have been quietly waiting nearby in their boats, are signaled and the school is quickly encircled with the large seine. While the fishermen are searching and surrounding a school of mapara, great care is taken to make as little noise as possible as the fish are easily frightened away from the nets. Fishermen often fail to surround a school of mapara because the fish are frightened by a passing motor

boat or an attacking school of porpoises. Once a school of mapara has been successfully encircled, a few selected fishermen dive to the bottom of the net to close off the bottom so that the net can be gathered in and fish loaded into waiting boats. It is interesting to note that the trapped mapara do not dive to escape under the nets but remain near the water surface.

Each net is about 20 meters long and 15 meters deep and is supplied with plastic floats and lead so that the net will extend downward from the surface of the water. The net is made of cotton thread with a stretch mesh of 3 cm. Normally, ten to twenty of these nets are sewed together to form a seine of 200 to 300 meters in length. As the nets are about 15 meters in depth, it is not uncommon for the fishermen that dive to close the bottom of the net to have serious ear infections and even loss of hearing.

During the day, cast-nets and snagging with hook and line are also used to catch mapara. It is quite a picture to see forty or fifty small boats concentrated over a school of mapara with the occupants trying to snag the fish below, while large schools of porpoises frolic among the boats scaring both fish and fishermen.

Marketing

Because of its excellent flesh and few bones, mapara is much in demand by the local people. Much of the mapara is sold locally for 1.5 to 2.0 cruzeiros* per kilo (25 to 35 cents) for whole small fish and 3.5 to 4.0 cruzeiros per kilo (60 to 70 cents) for undressed large fish. At this time of year, September, the majority of the fish being caught and sold in Cameta were small fish (17 to 23 cm.) and it appeared that these fish were easily sold locally. The authors observed only

* 1 cruzeiros = 17.5 cents

large mapara (30 to 40 cm.) for sale in the fish markets in Belem and these fish were selling for 3.5 cruzeiros per kilogram. Prices of fish vary seasonally depending upon their abundance. Fish that cannot be sold locally are iced in the holds of larger boats and transported to Belem and other distant markets for sale. Mapara are also salted and dried for export to cities throughout Brazil.

As one seining operation may include as many as forty or fifty fishermen, a unique system of paying the fishermen has been devised. The chief of the operation, usually the man with the large boat and most of the nets, takes fifty percent of all fish caught and the remaining portion is divided equally among the other fishermen.

Capture and Transport of Live Mapara

Because of the lack of knowledge concerning the life history of mapara and its transport for extended periods of time, the first attempt by the authors to transport live mapara back to Fortaleza ended in failure. However, while we were unable to introduce mapara to the fishculture research station at Pentecoste, Ceara, the information and experience gained will be of great help in the future. The following recounts our experience in capturing mapara and our attempt to transport them back to Fortaleza.

The authors and a Brazilian technician, David Ferreira de Souza, familiar with the Cameta area, arrived in Cameta, Para on the morning of September 27, 1972, after an all night boat ride from Belem. Arrangements were made with local fishermen to catch a small number of live mapara that same night to see if they would live in plastic bags with oxygen for a period of time sufficient to

allow transport of fish back to Fortaleza. When told why we wanted live mapara, local fishermen informed us that mapara was one of the most fragile fish in this area and that the fish died within minutes after removal from the water. A one and a half hour ride in a small motorized boat carried us to the fishing grounds where a number of live mapara were captured by the seining operation described earlier. The fish ranged in size from 17 cm. to 23 cm. (19g to 54g) Table 1. The fish were quickly transported from the fishermen's nets to large plastic bags of about 40 liter capacity. Plastic bags containing 1, 2, 5, 8, 10, 15, and 20 mapara along with approximately 10 to 15 liters of water were filled with pure oxygen, sealed and transported back to Cameta. Upon our return to Cameta, a few individual fish were placed in small plastic bags of about 10 liter capacity to determine if individual mapara could survive in small bags. This preliminary test indicated that mapara could be transported in sealed plastic bags containing pure oxygen for at least short periods of time if small numbers of fish are put in each bag. Bags with 8, 10, 15, and 20 fish showed mortalities by the time we reached Cameta, approximately two hours after being placed in the sealed bags. The tests confirmed that 1 and 2 mapara of the 17 to 23 cm. size range placed in large or small plastic bags were able to survive for twelve hours and several fish in small individual bags survived for 24 hours with one change of water and oxygen.

From this preliminary test, the decision was made to transport the mapara in small, plastic bags, one fish to each bag. This would allow the maximum number of fish to be carried in the transport facilities available.

The final transport of fish was carried out on September 28 and 29. About

8:30 PM, 120 mapara were taken from fishermen's nets using pails partially filled with water and placed into twelve, 40-liter plastic bags. Ten fish were placed into each bag containing approximately 15 liters of water and the remaining space filled with oxygen. Upon arrival back at Cameta at 10:00 PM, 96 of the original 120 fish were still living. The fish were then changed to individual plastic bags. Into each bag, approximately 10 liters capacity, was placed 1.5 liters of fresh river water, one mapara, and oxygen before being sealed with rubber bands. The transfer took approximately 3 hours and by 1:00 AM, 96 sacks containing one fish apiece were ready for transport. The next morning the fish were placed in cardboard transport boxes, 6 plastic sacks to the box. Each box weighed approximately 10 kilograms. Of the 96 fish alive the night before, 84 were still alive at 6:30 AM when they were flown by small plane from Cameta to the Belem airport. Upon arrival at the Belem airport, the fish were examined and sacks containing dead fish were removed. Sixty-six fish still alive but showing obvious signs of stress, were placed aboard a commercial flight leaving for Fortaleza at 9:30 AM. At 12:00 noon, the fish were received in Fortaleza by DPAN personnel and taken to the Convenio laboratory in Fortaleza. Of the 66 fish that left Belem, 25 were still alive at 12:30 PM but all but 3 mapara had died 2 hours later. The three remaining fish were dead 3 hours later. From the time of capture until their release in Fortaleza, those mapara that were still alive had been in a confined environment for 16 hours and had been in plastic sacks without a change of water or oxygen for approximately 12 hours. Of the original 120 fish, 54 were dead within approximately 6 hours after confinement.

Recommendations

1. Mapara are common in the Tocantins River near the city of Cameta. With the aid of local fishermen, live mapara were easily captured.
2. While not an extremely hardy fish, mapara can be confined and transported in plastic sacks with water and pure oxygen for short periods of time with careful handling. Fish in the 17 to 23 cm. group, while large, can be transported but should have a change of oxygen and water, if necessary, not more than six hours after the closing of the plastic bags. Mapara is an active fish and appears to use up oxygen supplies rapidly.
3. While mapara of 17 to 23 cm. can be transported, it is recommended that future attempts be made in May or July when smaller fish are available. Smaller fish should result in greater ease of handling, more space for movement within the plastic bags, and the transport of larger numbers of fish.
4. Mapara should be held out of water for as short a time as possible. All efforts should be made to transfer mapara in containers holding water as this fish appears to die quite rapidly when held out of water.
5. It appears that mapara has to swim continually in order to live and respire properly. When confined in plastic bags, mapara continually swam in a circle. When transporting mapara, sufficient room should be allowed so that the fish are able to swim freely. Smaller fish would allow greater freedom of movement when confined in plastic bags.
6. A major problem with the transport of mapara is the fouling of the water with fish waste products. This fish is a filter feeder and has a long

digestive tract. After 12 hours of confinement, the water in the bags was very dirty and examination of dead fish showed that the gills of these fish were clogged with waste material which prohibited a proper exchange of oxygen and CO₂. Besides inhibiting respiration, the waste products may produce toxic substances that cause a deterioration of water quality placing the mapara under stress. It is suggested that before being placed in containers for transport, that the mapara be held in tanks containing clean water for 24 hours so that waste materials in their digestive tracts can be eliminated. If some type of holding facilities can't be arranged in Cameta, it is suggested that the fish be transported to Belem and held for 24 hours in Belem before transporting to Fortaleza. In the event that adequate holding facilities are not available in Belem, arrangements should be made to change water and oxygen in Belem before the fish are transported to other places.

7. It is the opinion of the authors that future attempts should be made by DNOCS to transport mapara to Fortaleza for further study. If this fish adapts well to the Northeast and will spawn in the reservoirs or fishculture ponds in this area, it would mean a very substantial future increase in the available source of fish protein. A schooling, filter-feeding fish such as mapara could raise the fish production of reservoirs located in the Northeast of Brazil by a substantial amount, providing fishermen with a fish that is easily captured, and an added source of income. If successful in fishculture ponds, mapara would mean a very substantial increase in production when raised in association with other species of fish. This added production of fish would then be passed on to the people for consumption as low cost fish protein. Mapara holds the promise of

being an important addition to the fish fauna of the Northeast and every effort should be made to bring this fish to the area.

Table 1

Lengths and Weights of Mapara, Hypophthalmus edentatus, from the Tocantins River

	<u>Total Length</u> <u>mm.</u>	<u>Weight</u> <u>grams</u>
	195	26.5
	207	36.6
	223	53.9
	212	36.7
	196	28.9
	214	40.0
	205	36.3
	219	42.6
	191	27.1
	201	31.6
	180	20.8
	169	19.2
	215	45.6
	185	22.9
Average	208	33.5