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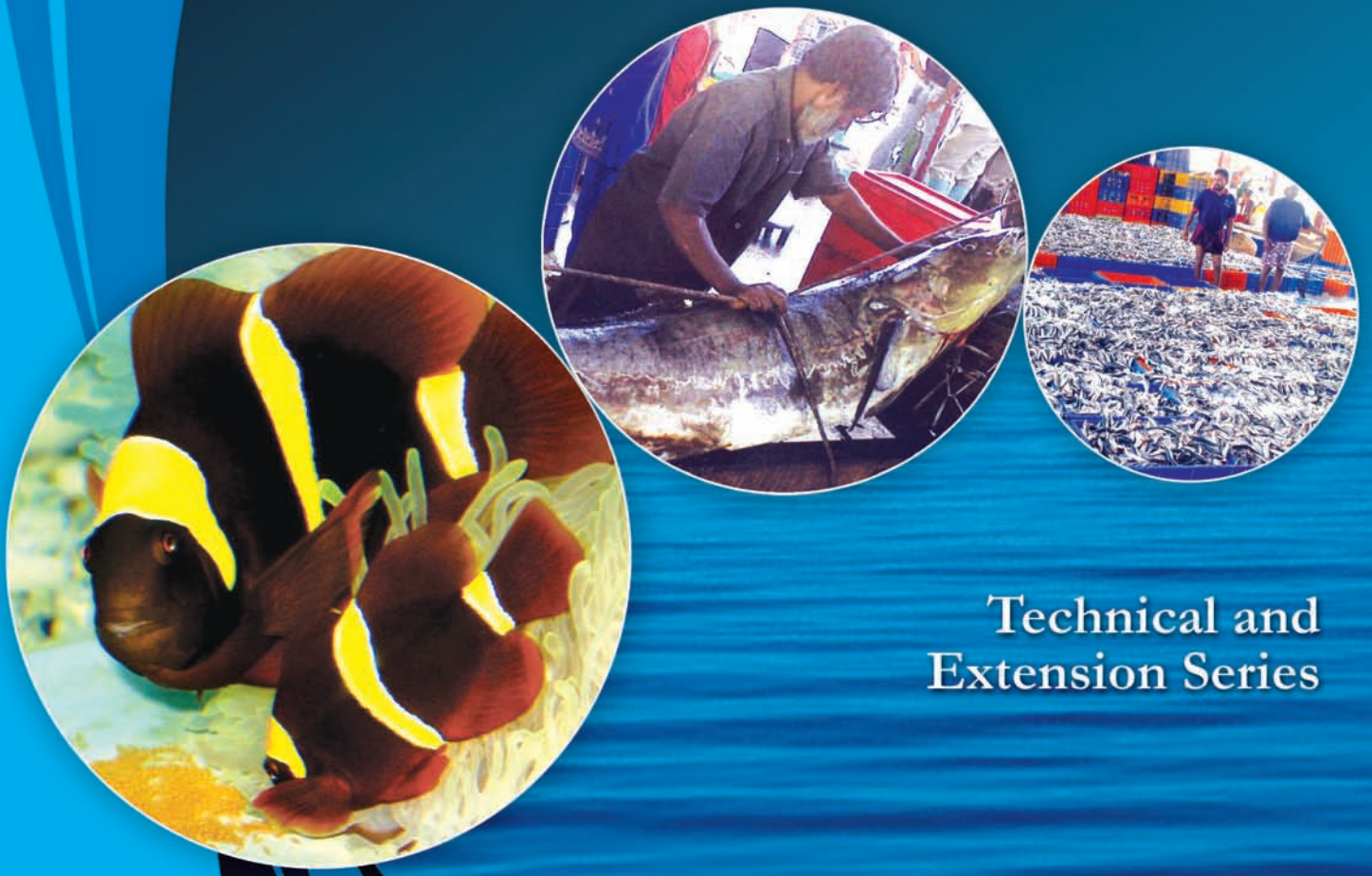

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Mussel resources of Andaman Islands

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A variety of molluscan resources such as edible oysters, pearl oysters, clams, mussels and gastropods are distributed along the coastal area of Andaman and Nicobar islands. Among the bivalves, the distribution of green mussel *Perna viridis* was earlier known only from a small creek at Sippighat (Mahadevan, 1983). However, there is no detailed information on the extent of distribution, density of

population, the total biomass, magnitude of fishery and environmental parameters of natural beds of Andamans so far. The present report describes the ecological aspects of natural beds, the area of distribution, density of population and total biomass which could be realized from different localities. Information on the status of fishery was also collected.

A survey was conducted during April 2001 to study the distribution pattern and magnitude of mussel population in Andaman islands. The work was carried out during the low tide by examining inter and sub-tidal area of mussel beds, trekking on foot and by skin diving up to a depth of 5 m. A station was fixed in inter-tidal area, a quadrate of 0.25 m^2 (50 x 50 cm) was placed and all the mussels present inside the quadrate was removed, washed and counted. From each station three samples were collected. The specimens were collected in separate plastic bags and taken to the laboratory for further analysis. Linear measurements and weight of the mussels were taken individually. After removing the shell, sex and stage of gonadal maturity were also recorded. The meat weight was taken to represent the percentage edibility.

Ecology of mussel beds

Sippighat is a narrow tidal creek near Port Blair. The creek bifurcates into two behind newly constructed Naval office: the east 'Sippighat creek' and the 'Bimbleton creek'. During rainy months, runoff water from the surrounding elevated ground would find its way into the creek at many points. But the tidal amplitude is very well pronounced to almost 2 m height in Sippighat to neutralize, to a great extent the effect of fresh water influx and dilution. The width of the creek varies from 30 to 120 m. The bund of the creek is strengthened with granite stones with fully grown mangrove trees on either side. Bottom of the creek was loose muddy. Mussels were found attached to concrete structures of culvert, sluice gate and rocky substratum in Sippighat and on concrete structures, stones and hard muddy substratum in other areas.

The bridge with concrete culvert, sluice gate and the hard concrete bottom beneath the bridge provide a good substratum for the settlement of mussels. Adjacent to the sluice, piers have been erected to hold the freshwater pipeline and the hard substratum below this has got settlement of mussels in patches. Mussels were also found partly buried in the mud near the sluice gate and under the submerged side of the bridge.

Beyond the sluice gate on either side, the bottom was loose and slushy due to heavy deposition of silt and mussels were absent. The mussels settled on the bottom of the culvert where the tidal movement was fast, were found to be clean and brightly coloured whereas mussels settled away from the water current had heavy silt deposit. The tidal water flows with rich nutrients and plankton during high tide and slowly recedes during the low tide through the sluice gates. The water level in the mussel bed was about 20 cm or sometimes exposed during low tide and during high tide reached to 1.5 to 2 m.

Ecology of mussels in Mithaghari, Hathitope, Kadakkachan sluice, Minnie Bay and Rangat were different from the Sippighat creek. The mussels settled on the piers just below the jetty in Minnie Bay and on the hard rocky substratum or on the hard muddy bottom in Mithaghari jetty. Mussels were found in the sub-tidal region. The seawater is oceanic in character and changes in hydrological parameters during the monsoon were also negligible in these areas. Mussels were found in thin population, along with pearl oysters *Pinctada margaritifera* and *Pteria penguin*. Mussels observed in the natural habitat have shown hard and thick shells with heavy settlement of fouling organisms. The important fouling organisms which are sedentary in nature are barnacles, bryozoans, serpulids, sponges, corals, ascidians, hydroids and the transit forms are polychaetes, crabs, fishes, carideans *etc*. The turbidity was comparatively less in this area when compared to Sippighat.

Sippighat mussel bed

An account on the natural mussel bed area, density of population, size range, mean weight, sex ratio, percentage edibility and total biomass for different stations are given in Table 1. Mussels were thick in population in the form of mat underneath the bridge. The total area of the mussel bed was 250 m^2. The population of mussels per one square meter was 158. The size ranged between 35 and 118 mm with mean size of 72.3 mm and the average weight was 35.1 g. The total biomass of mussel population in

Table 1. Distribution of green mussel *Perna viridis* in Andaman Islands

Station	Area of bed (m^2)	Average number of mussels / m^2	Size range (mm)	Mean size (mm)	Mean weight (g)	Sex ratio M : F	Percentage edibility	Total biomass (kg)
Sippighat creek	250	158.0	35-118	72.3	35.1	69:31	30.2	1386.5
Bimbleton creek	200	61.3	47-136	96.7	76.3	65:35	29.9	935.4
Kalapathar	300	47.3	62-132	98.2	80.1	63:37	30.8	1139.0
Garachathra sluicegate	300	76.2	74-121	81.3	48.7	50:50	37.7	1113.3
Mitha gari	150	64.0	85-188	122.4	181.6	54:46	20.1	1743.4
Hathitope	200	84.0	87-130	111.7	131.9	70:30	29.7	2215.9
Kadakkachan sluice	200	48.0	79-109	97.1	78.6	67:33	25.6	754.6
Minnie Bay	80	17.8	99-201	149.1	272.9	54:46	24.4	3886.1
Rangat	300	73.0	71-116	78.2	47.8	60:40	25.2	1046.8
Total	1980							14221

this area was estimated as 1386.5 kg. The percentage edibility was 30.2 %. The sex ratio showed that females were dominant (31:69) in the population.

Bimbleton creek

The road bridge with sluice gate in the Bimbleton creek recorded moderate settlement of mussels. Among the four gates, two were closed with sand and gravel to prevent the flow of water. Mussels were thickly populated in all the concrete structures and underneath the sluice gate.

Mussels were sparsely distributed in the hard muddy bottom and on the granite stones. The total mussel bed area was approximately 200 m^2 and the density of population was 61.3 m^2. The size ranged between 47 and 136 mm with a mean size of 96.7 mm and weight 76.3 g. The total biomass which could be realized from this bed was 935.4 kg. The percentage edibility was 29.9 %. Females outnumbered males (35:65) in the population.

Kalapathar

This station was characterized by the presence of a black rocky area (Kalapathar) at about half a kilometer from the Bimbleton creek or just behind the newly built Naval office. It was informed that there was a rich mussel ground and people with dinghies used to go and fish several baskets of mussels to meet the local market. At present the top of the rock is devoid of mussels, but the submerged area of peripheral region harbour mussels for 3 m width. The population of mussels observed in small patches at the rate of 47.4 mussels per m^2. The size of the mussels ranged between 62 and 132 mm. The mean size and weight were 98.2 mm and 80.1 g respectively. The total biomass which could be realized from this bed was 1,139 kg in a total area of 300 m^2. Females were found to be dominant in the population (37:63) and the condition index was 30.8%.

Garacharma sluice gate

It is a bridge with one way sluice gate situated at a distance of 2 km behind Garacharma Basti. The sluice has four gates and the bottom had concrete structure harbouring mussels. The depth of water during low tide was 50 cm and the turbidity was high. On either side of the creek, fringing mangrove vegetation was present. The density of mussel population was thick underneath the bridge and with moderately small patches in outer area of the sluice. The average number of mussels per square meter in this area was 76.2 and the sizes were between 74 and 121 mm with an average weight of 48.7 g. The total biomass from 300 m^2 mussel bed could be realized at 1,113.3 kg and meat weight obtained was 37.7 %. The sex-ratio was observed in equal proportions.

Mithagari

Mithagari jetty is L shaped which is used for public navigational purpose to go to nearby islands. There are 20 vertical pillars and three longitudinal horizontal concrete beams lying just below the platform and above the water surface during the low tide. All these concrete structures have got good settlement of edible oysters *Saccostrea cucullata*, *Crassostrea rivularis* and pearl oysters *Pteria penguin* and

Pinctada margaritifera. The mussels were thickly populated and settled in clusters along with the oysters. The water depth was 2 to 5 m. The bottom was muddy with granite stones which were scattered on either side of the jetty. The mussels were found attached to the granite structures and sometimes partly buried in the hard muddy bottom. The mussels fished for market were comparatively larger in size and all the mussels were thickly deposited by the fouling organisms. The density of population per square meter was 64 and the mean weight was 181.6 g. The total mussel biomass could be realized to 1743.4 kg in 150 m^2 area of bed.

Hathitope

The creek with rocky structures on either side of the bank and the jetty with pillars provide a suitable substratum for the settlement of mussels. Mussels were observed in patches on rocks and thickly populated on piers. The density of mussels per m^2 was 84 and the size was ranging between 87 and 130 mm with a mean size of 117.7 mm. The total biomass of mussels was arrived at 2215.9 kg in a 200 m^2 area of mussel bed. The sex-ratio in the population was 30:70 and females outnumbered males. The percentage edibility was 29.7 %.

Kadakkachan sluice

The concrete structures of the sluice gate in Kadakkachan area had moderate settlement of mussels. The maximum depth near the sluice gate was 1.5 m. The average number of mussels per m^2 was 48 and the size ranged between 79 mm and 109 mm with a mean weight of 78.6 g. The estimated biomass was 754.6 kg.

Minnie Bay

The bay is 0.8 km^2 roughly, deeply curved and surrounded by isolated patches of mangroves on all three sides. The eastern entrance and the western side harboured coral stones and shallow areas got exposed during low tide. The water was turbid. The maximum depth of water in the bay was 4 m. The NIOT has constructed overhead pipeline on concrete pillars to pump seawater to their shrimp farms. The submerged part of pillars were square in shape of 45 cm thickness. The pillars were lying between 2-4 m depth. All the 50 pillars were deposited with mussels. The mussels in Minnie Bay were larger in size and the age group may be 2 to 4 years. Their distribution was scattered with a minimum density of 10 and a maximum of 26 per m^2 with an average of 17.8 mussels on these pillars. The size ranged between 99 and 201 mm with a mean size and weight of 149.1 mm and 272.9 g respectively. The total biomass estimated was at 3.886.1 kg in 80 m^2 area. Females were dominant in the population (46:54).

Rangat

Mussels were found attached to submerged rocks in a small creek confluent with the sea. The bottom was slushy with rocks. The depth of water in the mussel bed was about one meter and it got exposed during the receding tide. The mussels were in dense patches at three places and in small patches on several rocks submerged in the creek. The mussel bed area was estimated as 300 m^2. The average number was 73 per m^2 with a mean size of 78.2 mm and weight of 47.8 g. A total biomass of 1046.8 kg was estimated in Rangat area. The percentage edibility was 25.2 %. Females were dominant in the population (40:60).

Fishery

The present survey has brought to light the occurrence of mussels in nine stations. The mussels and other bivalves are fished by the local people for consumption. But, there is no organized fishery for mussels anywhere in Andaman. Fishing for mussels is undertaken in Kalapathar area and Sipphighat. Now, the above area has less density of mussels to conduct a fishery. However, there is a good demand for mussels in hotels. Local people especially bengalis and biharis around Sippighat area also collect mussels and edible oysters regularly for their consumption. Mussels were picked up in Sippighat creek, Mithagari and Hathitope by local fisherman and sold for Rs. 80/- per kg meat.

Mussel culture feasibility in Andaman

The present short-term survey has shown that the mussel population in Andaman islands has got restricted distribution on rocks, bridges, sluice gates and boat jetties in all the places studied. Large scale culture of green mussel in and around Andaman is subjected to the availability of the seed. The occurrence of seed is limited and restricted to Sippighat, Mithagari, Hathitope and Minnie Bay areas.

It is interesting to note that, during the period of survey, the mussels of uniform size occurred in Sippighat and Bimbleton creeks which might have settled in the previous season of spawning. The above two potential areas may be regularly monitored to record the mass settlement of seeds at appropriate time. The freshly settled seeds from these localities could meet the seed requirements for future culture. The calm and deeper areas available in Sippighat, Bimbleton, Mithagari, Hathitope, North Bay and Minnie Bay are found suitable for undertaking large scale mussel culture.