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**समुद्री मात्स्यिकी सूचना सेवा :** समुद्री मात्स्यिकी पर आधारित अनुसंधान परिणामों को आयोजकों, मत्स्य उद्योगों और मत्स्य पालकों के बीच प्रसार करना और तकनोलजी का प्रयोगशाला से श्रमशाला तक हस्तांतरित करना इस तकनीकी और विस्तार अंकावली का लक्ष्य है।

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### Front cover photo :

The fisherflok help in removing the gilled 'choodai' (lesser sardine) from the net brought to the landing centre at Mandapam after fishing.

### मुख आवरण फोटो :

मंडपम के अवतारण केंद्र में पकड़े गये लेस्सर सारडीन-‘चूडाई’ को गिल नेट से निकालनेवाले मछुए लोग ।

### Back cover photo :

Silver bellies - a rich demersal fish resource in the Palk Bay.

### पृष्ठ आवरण फोटो :

मुल्लन (सिल्वर बेल्लीस)-पाक खाड़ी की एक धनी तलमज्जी मत्स्य संपदा ।

# A CASE STUDY OF INFESTATION OF ACANTHASTER PLANCI IN ANDAMAN WATERS

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## Introduction

*Acanthaster planci*, a star fish popularly called the "Crown of Thorns" has become a subject for more than one thousand articles since its first description in 1743. The starfish feeds on coral polyps and often plague of them are observed on many parts of the Indo - Pacific reefs causing mortality to vast areas of reef corals and their subsequent degradation. The starfish has a more or less circular body with 9 to 21 radiating arms bearing sharp and lengthy spines capable of displaying rotary movement. Larger specimens may reach to a greater diameter of 40 cm. The species exhibits a wide range of colour patterns in nature, the common being violet with purplish or blue streaks on the middle of the arms or rusty brown or may be blue. Spines are greenish blue with reddish tips. *A. planci* is widely distributed in the Indo - Pacific from the east coast of East Africa, Red Sea, and then eastward as far as Hawaii. From the central Indian Ocean it is known from the Maldives, the Lakshadweep, the Sri Lanka and the east coast of India.

## Record of *A. planci* from Andaman and Nicobar Waters

The species is previously recorded from several localities from Andaman and Nicobar area such as Neil, Havelock, Sir Hugh Ross, Narcodem, Hut Bay, Chidiatop and Nancowry. However, aggregations of the star fish endangering reef corals were never noticed till late eighties. Changsong (1987, *Bull. Mar. Sci.* 41) reported on infestation in Andaman Sea and some divers including Mr. Tomy a tropical marine fish expert, observed 'hundreds' of "Crown of Thorns" along New Wandoor coast in southern Andamans. Subsequently, officials of the Andaman and Nicobar Forest Department and Fisheries have noticed fairly good number of them in the Marine National Park area at Wandoor in southern Andamans. Because of the presence of the starfishes, especially in the Marine National Park area, it was imperative to make a critical assessment of the situation of infestation and a team of scientists from CMFRI was given a mandate to investigate the problem in April - May, 1989.

## The survey

The present survey was chiefly carried out within the National Marine Park at Wandoor which has an extent of 281.5 sq km enclosing 14 small and large uninhabited islands. Intensive study was carried out around the following islands: Grub, Chester, Tarmugili, Red Skin, Malay, Alexandra and Twin Islands. Among these Jollybous is a tourist spot and others are rarely visited by people. In addition to these islands, localities in and around Port Blair such as North Bay, Sisostris Bay, Ross Island, Viper Island, Burmanallah and Chidiatop were also subjected to reconnaissance survey to spot *Acanthaster* if any on reefs.

A glass bottom dinghy with O.B.M. was used to locate the occurrence of the star fishes on coral thickets and on sighting, skindivers went down to count the individuals. The area was approximately estimated with a marked rope wherever significant concentration was observed. In other cases a twenty minutes count by slow swimming by divers was made. The survey was made mostly in shallow areas upto a depth of 4 m. In the last week of April, 1989 the French ship "Calyposo" was anchored in the Marine National Park and the scientists of Calyposo and officials of the Indian Navy made some deep diving to look for *Acanthaster* along Wandoor coast and around Grub Island. Samples were collected with the help of iron spears having backwardly directed hooks.

## Observations

*Acanthaster planci* was observed at Grub Island, Chester Island, Alexandra Island, Red Skin Island and Twin Islands\*. Eventhough there has been an earlier report of the occurrence of the star fish in fair numbers at New Wandoor, it could not be located during the present survey.

The reefs of Andaman surveyed are dominated by either *Acropora* spp. or massive *Porites* in different parts. Wherever *Acropora* is dominant *Porites* is scarce and vice versa. The common species of *Acropora* observed were *A. humilis*, *A. pacifica*, *A. florida*, *A. assim-*

\* See map in MFIS No. 105, Article No. 2 by G. Gopakumar et al.

*A. palifera*, *A. nobilis* and *A. formosa* along with *Seriatopora* spp. and *Pocillopora* spp. Starfish was more common on *Acropora* thickets than *Porites* community. The maximum concentration of *Acanthaster* was observed in Grub Island, nearly 50 m away from shore, in shallow waters. Survey by 'Calypso' scientists at a depth of 7 m showed that there occurred few starfishes in deeper zones. In an approximate area of 500 sq m we could count 62 specimens, averaging 124 for 1000 sq m. But it was a localised breeding aggregation and skin divers counted 20 to 30 specimens in 20 minutes of slow swimming.

In other places the number varied from 20 to 40 in 1000 sq m wherever there was fairly good concentration. In many localities, stary and isolated specimens were observed. The survey was conducted during day time and no efforts were made to examine the underside and crevices of *Acropora* thickets. Fairly rich concentration of *Acanthaster* was also noticed at Twin Islands. The coral growth at this place was between 5 to 7 m deep and at the western side of the larger island 85 specimens were accounted in a thirty minute search covering approximately 2500 sq m.

All the specimens collected were adults. Small and young ones were not seen for the reasons mentioned above during April - May, 1989 when the survey was carried out. The number of arms varied from 14 to 19 and R. varied from 125 to 155 mm. Majority of the specimens were violet in colour with light purplish blue streaks on the middle of the arm. A few were rusty brown. In some reef environs there was large - scale damage to corals as in Red Skin, New Wandoor and Chester Islands. In New Wandoor, opposite to the helipad, vast areas of corals were found to be dead and buried by silt. On many occasions, grazing marks on corals were observed but we could not locate great



Fig. 1. *Acanthaster planci*, the Crown of Thorns.



Fig. 2. White patches on *Acropora* sp. due to predation by *Acanthaster planci*.

patches of white corals indicating predation even at places like Grub Island where good concentration of *Acanthaster* was noticed. According to Serano (Cous-teau Foundation, Paris, 1989) *Acanthaster* was present in almost all reefs he surveyed in Andamans but the star fish population was normal. The mass mortality of corals observed at sites in the National Marine Park cannot be attributed to predation by *Acanthaster*. At New Wandoor siltation seems to be the prime factor that kills corals in the nearshore area. In deeper waters also mass mortality to corals was observed which might be due to many natural causes. Predation by *Acanthaster* might have played some role in the death of corals but this is not of an alarming state at present.

#### Outbreaks of *Acanthaster planci* and control measures

Instances of outbreaks of *Acanthaster planci* and consequent destruction to reefs have been reported from several places in the Indo - Pacific during the last 30 years. Several theories have been proposed as possible cause for the sudden plague of this starfish such as



Fig. 3. *Acanthaster planci* being removed from the reef with the help of an iron spear by a skin diver.

overfishing, environmental pollution, removal of predators of *Acanthaster* from reef environs, terrestrial run off due to human interference such as deforestation intensive agricultural operation etc. But none of these seem to be a perfectly satisfactory explanation. As far as south Andaman is concerned especially near the Wandoor coast soil erosion and terrestrial run off seem to be of high order due to removal of sand from the nearshore area causing mortality to corals. However, in far off islands like Twins where fairly rich concentration of *Acanthaster* was noticed; terrestrial run off cannot be identified as a possible reason for the starfish outbreak. It is true that the exploitation of molluscs from the Andaman reefs have assumed alarming proportion in the recent past. However, the predator prey relationship is not assessed. Suggested control measures in literature include manual removal, toxic fencing, electrical barriers, chemical control such as application of formalin on the reefs and biological control using gastropods like *Charonia* that feeds on the star fish. However, control of *Acanthaster* becomes virtually impossible when popula-

tion reaches millions and in such cases natural death due to starvation when coral poplyps become unavailable is the ultimate fate resulting in vast destruction to reefs.

The present situation in Andamans seems to be not of any alarming proportion. The survey revealed only certain localised areas with any significant number of starfishes. However, complasence may lead to catastrophic effects, since a single adult individual can produce as many as 20 million eggs in a spawning season. If conditions are favourable, hundreds of thousands of them can settle on the reefs. Breeding aggregations were noticed at Grub Island during the present survey. The existing population from the shallow waters could easily be removed manually by using spears. However, it is imperative that constant watch should be kept on the reefs in and around Andaman and Nicobar Islands for possible outbreaks. It is also necessary that local people should be educated on the problem and should be encouraged to report on sighting of *Acanthaster* to the administration so that control measures could be effected.

# A SOCIO - ECONOMIC ANALYSIS OF PRAWN FARMING IN ORISSA STATE

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## Introduction

Based on the experimental success of prawn culture in confined water ponds in Chilka lake periphery, Government of Orissa formulated a massive prawn farming project to rehabilitate about 3,000 poorest families in the coastal rural area. The programme was initially introduced in 1982 - ' 83 and the actual pond excavation work was started in 1983 - ' 84 in Puri and Ganjam districts. According to this scheme, the selected beneficiaries whose annual income is not more than Rs. 12,000/- would be provided each with a pond of 0.2 ha of water area for prawn culture. The state government provides 100 per cent subsidy for the construction of the pond and also incurs the input costs for the first crop.

The state government has set up the Brackish-water Fisheries Development Agency which is fully responsible for the development of brackish water fisheries in the state. This agency provides technical assistance to the farmers right from the selection of site till harvesting as well as marketing of prawns through the entire duration of culture. The agency also provides inputs including seed, extends extension services and

imparts training to prospective farmers.

All the ponds provided to the Economic Rehabilitation of the Rural Poor (ERRP) beneficiaries in Ganjam and Puri districts have been designed for confined water management. The constructed pond is given on lease for 10 years which will be further extended.

As a part of the base line study of prawn farming programme under ERRP projects, C.M.F.R. Institute has conducted a comprehensive socio- economic survey of the beneficiaries of ERRP programme in seven clusters, 5 in Puri and 2 in Ganjam districts. About 70 per cent of the total beneficiaries of the cultured ponds are covered under this survey and the results are summarised below.

## Size of family

The size of the family ranges from 5.5 in Haripur cluster to 8.2 in Kusubanti. The average size of family of all beneficiaries worked out to 6.7. Of this, workers or earning members are only 1.7 per family. The average size of the family in Panaspada is 7.7 and per

family 2 are earning members. At Kusubenti, Mudiratha and Khandualpur, each family is having 2 earning members, whereas at Jadupur Gopakuda and Haripur on an average there is only one worker in a family. The proportion of workers to non-workers in a family is almost 1:4. Children below the age of 14 accounted for 45 per cent of the population (Table 1).

### Literacy

Percentage of literacy ranges from 21.0 per cent in Mudiratha (Puri dist.) to 71.3 per cent in Haripur. The average literacy level of the beneficiaries is comparatively higher than that of Orissa state. This may indicate that such benefits are mostly utilised by the literates in the rural areas. However, among the children below the age of 14, only 17 per cent are school going. But the percentage of school going children in different clusters show wide variation ranging from 7.6 per cent in Jodupur (Puri dist.) to 61.5 per cent in Haripur (Ganjam dist.). The literacy level of the population is also highest at Haripur which is having the smallest family size.

### Occupational pattern

In all the clusters in Puri, before the introduction of the culture programme, majority of the beneficiar-

ies were engaged in agriculture operations as wage earners whereas in Ganjam district, for most of them, fishing in Chilka lake was the major occupation. Even after taking up the prawn culture, during off - season they go for their traditional occupation. Among all the beneficiaries covered under the survey a few of them are having occupation other than agriculture labour or fishing, which include 5 fish traders in Ganjam district, one barber, 2 petty shop owners and two workers in ice factories. Since fishing and agricultural operations are seasonal and most of the beneficiaries are only wage earners without having any means of production, their average annual income ranged from Rs.1,000 to 1,200.

The percentage of workers to total population ranged from 16.4 for Gopakunda in Ganjam district to 30.4 for Madiratha in Puri district. Whereas the percentage of working population to the total adults in different clusters ranged from 31 to 51. Percentage of working population is maximum at Mudiratha where literacy is at the lowest level. At Haripur cluster where literacy is at the highest level of about 70 per cent, the working population constituted only 38 per cent of the total adult members. The literate adults including those who are studying in colleges may be reluctant to work as agricultural labourers or to engage in fishing. Most of the adults especially those who are illiterate do engage in any of these activities.

TABLE 1. Clusterwise socio-economic parameters

Name of the cluster	Puri district					Ganjam district	
	Panaspada	Jadupur	Kusubenti	Mudiratha	Khandualpur	Haripur	Gopakuda
No. of beneficiary families surveyed	31	20	47	27	134	29	33
Population	239	142	384	181	822	160	214
Males	65	37	100	56	229	41	53
Females	61	39	103	51	230	41	63
Children	113	66	181	74	363	78	98
No. of workers	63	32	94	55	230	31	35
No. of literates	64	35	113	38	279	114	101
No. of school going children	28	5	51	16	45	48	30
Percentage of workers to total population	26.4	22.5	24.5	30.4	28.0	29.0	16.4
Percentage of workers to total number of adults	50	42	46.3	51.4	50	37.8	30.2
Percentage of literacy	26.8	24.6	29.4	21.0	34.0	71.3	47.0
Percentage of school going children to total children	25	7.6	28.2	21.6	12.4	61.5	30.6
Size of family	7.7	7.1	8.2	6.7	6	5.5	6.5
Main occupation	A. L	A. L	A. L	A. L	A. L	F	F
Type of house	T. H	T. H	T. H	T. H	T. H	T. H	T. H

A. L : Agricultural labour, F : Fishing, T. H : Tatched hut.



After the introduction of ERRP programme all the adults in the families including women, not otherwise employed, and all children who do not go to school are participating in the activities of prawn farming. Women and children are mostly engaged in feed preparation. Because of this, some of the parents, especially those who are not literate are not interested in sending their children to the school.

### Social problems

Before introducing any new developmental programmes in rural sector its socio-economic impact should be critically studied. The prawn farming programme in Chilka periphery with its vast potential paves the way for a structural change in the social set up of the economically backward communities of this area. Most of the people who are now engaged in prawn farming were earlier occupied either in fishing or paddy cultivation for their livelihood. Majority of them are not having either own land for paddy cultivation or own fishing equipments.

With the introduction of prawn farming by Orissa government through Economic Rehabilitation of Rural Poor programme in 1983, a number of agricultural labourers get opportunity to enter into prawn farming in their own ponds provided by Orissa Government on a long term lease basis. For a landless labourer, opportunity to put all his efforts for his own enterprise will help to increase his labour productivity to a large extent. As it has been already seen from the field study, these new entrepreneurs face managerial problems because of lack of experience and conventional approach to prawn farming as a business. Prawn culture being a new industry or an old one being transformed by the application of new technology, many technical, institutional, economic and social problems as well as opportunities will arise.

Since most of the ponds are constructed in remote areas where there are no adequate transport and communication facilities, despite a good demand for prawns especially *P.monodon*, disposal of prawn is not an easy task for the farmers. The price they get at the farm level do not have any linkage to the price of the processed product.

Since most of the clusters under ERRP project are located in remote villages of Chilka periphery, communication facilities have to be further developed. Only government or any public agency can invest such overhead capital.

During the culture period the farmers have to stay at the cluster where their ponds are located. They

construct small huts on the embankment of the pond and stay there with their family. The children usually engage in feed preparation as well as feeding also. This has created problem of dislocation of the family because most of these farmers belong to distant villages. Moreover, school going children have to abandon their studies which will naturally increase the number of drop outs from the school.

### Economics of prawn farming

To study the economics of prawn farming, cost and earning data have been obtained from 9 centres in Puri and 6 clusters of fish ponds in Ganjam district. Detailed information on clusterwise average cost and earnings in prawn farming per pond per crop is given in Table 2 for Puri district in Table 3 for Ganjam district.

### Cost of production

Under ERRP programme, inputs such as seed, feed and fertiliser have been provided free of cost to the prawn farmers for the first crop. However, the cost of seed per pond per crop worked out to the range of Rs. 278 at Khandualpur to Rs.477 at Nairi and Gobapadar in Puri dist. This variation in the cost of seed in different clusters is mainly because of the variation in the size of stock and the distance to the collection point. The average cost per 1000 seeds worked out to about Rs.200. The average cost of feed per pond ranged from Rs.146 at Jadupur cluster to Rs.442 at Janikuda. The items used as feed and fertiliser are mostly groundnut oil cake, SSP, Urea, raw cow dung and lime. These are the only operational inputs used other than labour. No hired labour was engaged in any pond. The entire farming activities have been carried out by family labour. On the basis of the survey conducted in Puri and Ganjam districts the total labour requirement for raising one crop has been estimated to about 120 mandays. With an opportunity cost of Rs. 10 per manday, the labour cost per pond per crop worked out to Rs. 1,200/-.

In Puri district the total operational costs per pond (of 0.2 ha) per crop ranged from Rs. 518 at Jadupur to Rs. 860 at Janikuda. If the imputed value of family labour is also included this range will be from Rs. 1,718 to Rs. 2,060.

The average stock size per pond of 0.2 ha in Puri district worked out to 2,311 and Ganjam district 2,831. However, the average cost of seed per pond in Puri district came about Rs. 374 as against Rs. 301 in Ganjam district. The seed cost in Ganjam district was lower than that in Puri district because of less transportation cost.

TABLE 2. Clusterwise average costs and earnings in prawn farming per crop per pond of 0.2 ha during 1983 - '84 and 1984 - '85 in Puri district, Orissa state

Name of the cluster	Year of crop	Duration of crop (in days)	No. stocked	Cost of seed (Rs)	Cost of feed and fertiliser (Rs)	Total costs (Rs)	No. Harvested	Survival rate (%)	Quantity* harvested (kg)	Gross** revenue (Rs)	Farm surplus (Rs)
1. Khandualpur	1983-1984	97	1632	278	353	631	1223	75	28 (26)	1996 (71)	1365
2. Khandualpur	1984-1985	134	2362	343	248	591	1122	48	29 (27)	1963 (68)	1372
3. Kusubenti	"	112	2154	277	326	603	1305	61	39 (24)	2686 (69)	2083
4. Mudirath	1983-1984	88	1742	346	384	730	1454	84	36 (26)	2655 (74)	1925
5. Janikuda	"	80	2092	418	442	860	1737	83	52 (28)	3851 (74)	2991
6. Gobapadar	"	125	2500	477	339	816	1353	54	33 (29)	2880 (69)	1464
7. Nairi	"	126	2500	477	339	816	1414	57	32 (31)	2055 (64)	1239
8. Jadupur	1984-1985	58	1868	372	146	518	1000	54	31 (25)	2174 (70)	1656
9. Gorapur	1983-1984	160	2000	400	361	761	1735	87	42 (31)	2699 (64)	1938
10. Panaspada	"	130	1706	279	270	549	1415	83	36 (27)	2404 (66)	1855

1. \*Figures in brackets indicate break-even production.

2. \*\*Figures in brackets indicate value realised per kg of prawn.

3. No hired labour was engaged in any pond.

4. Opportunity cost of family labour is not included in the total costs.

5. For the calculation of break-even production, imputed value of family labour has also been taken into account.

TABLE 3. Cluster - wise average costs and earnings in prawn farming per crop per pond of 0.2 ha during 1983-'84 and 1984-'85 in Ganjam district

Name of the cluster	Year of crop	Duration of crop (in days)	No. stocked	Cost of seed (Rs)	Cost of feed and fertiliser (Rs)	Total costs (Rs)	No. Harvested	Survival rate (%)	Quantity* harvested (kg)	Gross** revenue (Rs)	Farm surplus (Rs)
1. Binchanappalli	1983-1984	90-105	2542	305	406	711	1031	41	17 (36)	905 (53)	194
2. Binchanappalli	1984-1985	120-140	2250	243	347	590	710	32	18 (25)	1289 (71)	699
3. Gopakuda	1983-1984	96-104	2606	367	515	882	1168	45	25 (33)	1578 (63)	696
4. Gopakuda	1984-1985	N. A.	2586	342	453	795	1149	44	29 (29)	1969 (68)	1174
5. Sonapur-Khariapada	1983-1984	113-123	3000	270	404	674	817	27	20 (36)	1032 (52)	358
6. Sonapur-Khariapada	1984-1985	N. A.	3460	346	161	507	2256	65	37 (59)	1070 (29)	563
7. Sonapur-Bhagamara	1983-1984	103-113	3000	270	404	674	964	32	21 (41)	967 (46)	293
8. Sonapur-Bhagamara	1984-1985	N. A.	4400	440	178	618	1855	42	32 (51)	1138 (36)	520
9. Katuru-Baghanara	1984-1985	N. A.	3000	300	223	523	2100	70	25.5 (27)	1630 (64)	1107
10. Haripur	1984-1985	N. A.	4300	430	486	916	1963	46	44 (34)	2749 (52)	1824

1. \*Figures in brackets indicate break-even production.

2. \*\*Figures in brackets indicate value realised per kg of prawn.

3. No hired labour was engaged in any pond.

4. Opportunity cost of family labour is not included in the total costs.

5. For the calculation of break-even production, imputed value of family labour has also been taken into account.

The average cost incurred on feed and fertiliser for one crop worked to Rs. 321 in Puri and 325 in Ganjam district. The total operational costs per pond (0.2 ha) excluding labour charges worked out to Rs. 695 in Puri and Rs. 626 in Ganjam districts.

Regarding fixed costs, the average initial investment for the construction of a pond including land value came about Rs. 7,000/-. Annual cost on equipments like traps and sheds came about Rs. 200 per pond.

#### Unit cost

Detailed cluster wise information on the expenditure to produce one kg of prawn is given in Table 4. The clusterwise break up of average cost of inputs

required to produce one kg of prawn and its value realised is given in Table 3. It is seen that in Puri district the value realised per kg of prawn is higher than cost for all clusters, whereas in Ganjam district it is lower for all clusters except Hairpur. To estimate the total cost per kg of prawn imputed, value of the family labour, also has been taken into consideration which contributes the major portion of the total cost.

The cost of production per kg of prawn is maximum in Binchanapally cluster (Ganjam district) and minimum in Janicuda cluster (Puri district). The higher level of unit cost in Ganjam district is mainly because of low level of productivity as compared to Puri district. So also the price realised in Ganjam district in case of many clusters is much lower than those in Puri district.

TABLE 4. Clusterwise average levels of inputs used to produce one kg of prawns

Name of cluster	Seed used (Nos)	Value (Rs)	Feed & fertiliser's (Rs)	Labour* value (Rs)	Total operational cost (Rs)	Value realised per kg (Rs)
<b>Puri District</b>						
1. Khandalpur 1983-1984	58	10.00	12.50	43.00	65.5	71.00
2. Khandalpur 1984-1985	81	12.00	8.69	42.00	62.69	68.00
3. Mudiratha	48	9.66	10.67	33.00	53.33	74.00
4. Kusubenti 1984-1985	56	7.16	8.43	31.00	46.49	69.00
5. Janicuda	40	7.89	8.50	23.00	39.39	74.00
6. Gabapada	75	14.28	10.15	36.00	60.43	69.00
7. Nairi	80	12.70	13.28	38.00	63.98	64.00
8. Jadupur	61	12.23	3.75	39.00	54.98	70.00
9. Corapur	55	11.00	9.15	24.00	54.15	64.00
10. Panaspada	50	8.00	5.69	34.00	47.69	66.00
<b>Ganjam District</b>						
1. Binchinappalli 1983-1984	150	18.00	24.00	71.00	113.00	53.00
2. Binchinappalli 1984-1985	125	13.50	19.00	67.00	99.50	71.00
3. Gopukuda 1983-1984	104	14.50	20.50	48.00	83.00	63.00
4. Gopukuda 1984-1985	89	12.00	15.50	41.00	68.50	68.00
5. Khariapada 1983-1984	150	13.50	20.00	60.00	93.50	52.00
6. Khariapada 1984-1985	94	9.00	4.50	32.00	45.50	29.00
7. Baghamara (Sonapur) 1983-1984	143	13.00	19.00	57.00	89.00	46.00
8. Baghamara (Sonapur) 1984-1985	138	13.75	5.50	38.00	61.25	36.00
9. Katum 1984-1985	118	12.00	9.00	47.00	68.00	64.00
10. Haripur 1984-1985	97	10.00	11.00	27.00	48.00	62.00

\* Imputed value of family labour required to produce one kg of prawn at the rate of Rs 10/- per labour day.

## Production trend

The average quantity of prawns produced in a pond of 0.2 ha in different clusters in Puri district raising one crop in 1983 - '84 and 1984 - '85 varied from 28 kg in Khandualpur cluster to 52 kg in Janikuda. Stocking rate also was lowest at Khandualpur (1,632 for 0.2 ha pond) whereas at Janikuda it was 2,072 and the maximum of 2,500 was at Gobapada and Nairi. The survival rate ranged from 54% in Gobapada and Jadupur to 87% in Gorapur.

In Ganjam district average production per pond ranged from 17 kg in Binchanapalli to 44 kg in Haripur cluster. Stocking rate varied from 2,542 in Binchanapalli to 4,400 in Baghamara (Sonapur). However, survival rate with the minimum of 41% at Binchanapalli and maximum 46% at Haripur do not show much variation.

The average production per crop per pond worked out at 36 kg in Puri district and 27 kg in Ganjam district. The low level of average production in Ganjam district can be attributed to the floods in certain clusters and poor management.

Since the prawn farming is still at an experimental stage and the production data given in the Table - 1 are pertaining to 1st or 2nd crop raised under ERRP, the level of production can be definitely improved by efficient utilisation of available inputs and better pond management. In Ganjam district without taking family labour into account average net income for one crop per pond for different clusters ranged from Rs. 194 in Binchanapalli (1983 - '84 crop) to Rs. 2,740 in Haripur cluster. However, the imputed value of family labour also is included in the cost of prawn production, in Ganjam district only. Haripur cluster (1984 - '85 crop) recorded a net profit over the operational costs. In Table 1 and 2 break-even production levels are given in brackets under column which indicate that in Ganjam district except in Haripur cluster production levels should be considerably increased if the prawn farming is to be carried out with the hired labour. However, in Puri district average production levels in all the clusters and more than the corresponding break-even production levels. In the calculation of break-even output imputed value of family labour also have been taken into account.

## Marketing problems

From Table 1 and 2 it is seen that the price realised is very low in some clusters especially in Ganjam district. It is mainly because of the defective marketing system and lack of infrastructure facilities.

Many clusters do not have proper road facilities. Since the harvesting is done by traps and continue for 10 to 15 days the quantity harvested daily at each cluster will be not sufficient for truck loads. Moreover most of the clusters are not accessible for trucks. Hence the agents of the processing units collect the prawn from the farmer by cycle loads. The fish farmers do not have sufficient knowledge of price structure. In Ganjam district price factor is the major one which affects the revenue of the farmers. By improving the marketing efficiency, the average revenue per crop could be raised by 25 to 60 per cent.

## Farm income

Gross income received for one crop from a pond of 0.2 ha in different clusters in Ganjam district ranged from Rs. 905 (Binchanapalli) to Rs. 2,740 (Haripur cluster). The low level of gross revenue in Binchanapalli and Sonapur cluster could be attributed to the low level of production mainly due to the damage to the crop by flood and lower level of value realised per kg of prawn. Whereas in Puri district the average gross revenue ranged from Rs. 1,963 (Khandualpur cluster) to Rs. 3,851 (Janikuda). Average gross income per crop per pond in Puri district worked out to Rs. 2,530 and Ganjam district Rs. 1,432.

Average net income of a pond from one crop in different cluster of Puri district ranged from Rs. 1,239 (Nairi) to Rs. 2,991 (Janikuda) and in Ganjam district from Rs. 194 (Binchanapalli) to Rs. 1,824 (Haripur). The average net income for the district as a whole per crop per pond worked out Rs. 1,834 in Puri district and Rs. 743 in Ganjam district. The net income or the farm surplus is defined as the gross revenue minus the operational costs. All farm activities were carried out by family members. The imputed value of the family labour is not included in the total costs for the computation of farm surplus.

## Returns to labour

Since ERRP project is mainly meant for the rehabilitation of the poorest people, beneficiaries are mostly landless agricultural labourers or fishermen who are only wage earners. For both these activities, monsoon is lean season; prawn farming, which is mainly carried out in monsoon season, provides employment to the beneficiaries during this time. All the farm activities are carried out by the family labour and no hired labour is engaged for any work. In the economic analysis of such projects for which initial investment is comparatively low, returns to labour carry much more meaning than returns to capital.

The following table gives the clusterwise returns to labour in Puri and Ganjam districts. In Puri district for all clusters returns to labour per man day is more than the opportunity cost of Rs.10 per man day. However, in Ganjam district except in Haripur cluster, returns to labour is less than the opportunity cost. This is because of the lower productivity of ponds in Ganjam district together with the low level of prices received by the prawn farmers. The cost of feed per 1000 seeds stocked worked out at Rs.170 in Puri district and Rs.115 in Ganjam district. Other than the lower feed intensity, poor pond management also has contributed to the low productivity in Ganjam district. It was observed that, in Ganjam district, many clusters were not having proper protection embankments and crops were damaged in many ponds.

*Returns to labour (in ERRP ponds) (Rs./Man - day)*

*Puri Dist. (1983-'84)*

Name of the cluster :

Khandualpur	11.38
Mudirath	16.04
Janikuda	24.94
Cobapada	12.20
Nairi	10.33
Gorapur	16.15
Panaspada	15.46
(1984-'85)	
Kusubanti	17.35
Khandualpur	11.43
Jadupur	13.80

*Ganjam Dist. (1983 - '84)*

Binchinppalli	1.62
Gopakuda	5.80
Khariapada	2.98
Baghamara (Sonapur)	2.44
(1984-'85)	
Binchinappalli	5.66
Gopakuda	9.78
Khariapada	4.69
Baghamara (Sonapur)	4.33
Bahamara (Katuru)	9.23
Haripur	15.20

**Policy implications**

1. At the present level of average production of 25 kg of *P. monodon* for one crop in 0.2 ha pond in Ganjam district, the net farm surplus is calculated without taking into account the opportunity cost of family labour. The labour requirement for all farm activities in one pond (0.2 ha) to raise one crop is worked out at 120 man days and with an opportunity cost of Rs.10 per man day, the total labour cost would come to Rs.1,200. However, the average income realised in Ganjam district is much lower than what can be expected in a normal situation. It can be considerably increased by avoiding floods during monsoon, by

better pond management and improving the marketing facilities. The average price realised per kg of prawn in Ganjam district was only Rs. 53 as against Rs. 70 in Puri district. The situation in Puri is better not only because of higher price level but also the high average production (36 kg) with a net farm income of Rs.1,885. A close observation of cost and revenue structure, management and environmental aspects indicated that the production as well as net farm income can be increased by increasing stock size, efficient feeding, improved marketing infrastructure and proper pond management.

The prawn farming in 0.2 ha ponds serves the purpose of providing employment to the beneficiaries who work mostly either as agricultural labourers or as wage earners in fishery sector with scant availability of employment opportunities. If the prawn farming is to be brought under an industrial footing, the 0.2 ha ponds are not at all sufficient. However, as a scheme for rehabilitation of rural poor this pond size is sufficient to provide a subsistence level of income to the poorest of the poor who are so far deprived of any sort of ownership of means of production.

2. According to the survey conducted by the Department of Fisheries, Government of Orissa since 1979 - '80, the extent of suitable brackish water area that can be brought under productive coastal aquaculture projects is estimated to be about 203,000 ha including dense mangrove forests. To bring atleast 10,000 ha under prawn farming in the near future the seed requirement, at an average rate of 20,000/ ha, for two possible crop in a year worked out at 400 million seeds

The State Fisheries Department initiated a seed survey in 1979 - '80 and continued upto 1982 - '83. The survey revealed that the seed potential of important species of cultivable prawn mainly *P. indicus* and *P. monodon* is 130 million and another survey conducted in 1983 - '85 revealed that the availability of juveniles of these species in different estuaries and Chilka lake would be around 36 million. If a judicious method of collection of seed is adopted without affecting the capture prawn fishery of the lake, stocking materials for about 1,000 ha prawn farms in Chilka area can be collected from the lake.

These surveys indicate that the seed requirement for developing the potential area for prawn farming in Orissa state cannot be met with the collection from the wild. In this connection the immediate requirement is an assured supply of seed to farmers at the appropriate time for a reasonable price. The present practice of collecting the seeds from the wild cannot be continued indefinitely. The shortage of seed has already been felt

in certain areas of Puri district. Hence it is highly essential to establish hatcheries so that the collection from the Chilka lake area, which will in due course affect capture fishery of prawns, can also be avoided.

3. Another major problem, the prawn farmers are facing, is the lack of efficient feeds. At present the farmers mainly use ground nut oil cake, snail etc. as feed. The farmers themselves prepare feed and feeding intensity is decided on their own discretion. In the near future this will pose serious problem to them. Steps have to be taken to produce efficient feed and make it available to farmers at reasonable price.

4. It was observed during the survey that in some of the clusters, some ponds have been washed away and crops have been very seriously damaged due to flood. One of the reasons for the low level of productivity in Ganjam district is the absence of proper embankment to protect the farms from flood. The construction of protection embankment requires huge capital which can be done only through public investment.

5. Before undertaking major investments in prawn farming by distributing land to small farmers, issues of land tenure and water rights must be solved. The issue at hand, when land or water is leased out to private individuals is the price and duration of contracts. In the case of ERRP programme beneficiaries do not have to pay lease amount. The duration is 10 years which will be extended further. Since the government is planning to bring more area under prawn farming it is better to lease out land area on long term basis so that farmers also can have long term planning for proper maintenance of ponds.

6. Majority of the farmers interviewed, were of the opinion that the ponds are to be deepened. The depth of the ERRP pond is 2.5 metres. The water level for the 2nd crop which is harvested in March is much lower and not at all sufficient for the proper level of growth of the animal.

7. Most of the clusters do not have proper marketing infrastructure and hence the price realised per kg of prawn both at Ganjam (Rs.53) and Puri (Rs.70) was much lower than the prevailing market price of about Rs.80. The formation of a marketing co-operative society of the prawn farmers will help them to solve the marketing problems and get reasonable price for their product.

8. It was observed that inefficiency in management was responsible to certain extent, for low level of production in many clusters. Fish farming is a business and it requires business methods for efficiency in its management. Recent development in the field of techniques and methods of aquaculture and the increasing trend in fish prices have further pin-pointed the importance of the role of management in fish farming. For the efficient management of the farm, information on new technology, modern practices and prevailing price trends are to be made available to fish farmers. For sound farm planning, farmers further need information on cultivable species, proper size of the pond, availability of seeds, economic as well as technical efficiency of artificial feed production techniques, cost structure etc.

## A FISHERY FOR FIDLER SHRIMP *METAPENAEOPSIS STRIDULANS* ALCOCK OFF MAHARASHTRA COAST \*

*Metapenaeopsis stridulans* belongs to the tough shelled varieties of shrimps known as 'Dugdu' in Marathi. This species has been known to occur in small numbers during post - monsoon months in 'Dol' net catches. Later it appears regularly in trawl catches at Sassoon Dock during premonsoon months (March - June), contributing to a regular fishery. As the species occurred in every month during the years 1988 and '89 the trend in catch has been studied on its landings along with some biological parameters.

The fishery is mainly by trawl net at Sassoon Dock. The details of catch along with units operated

are given in Table 1.

The landings as seen from the table show an increase from January to June and decrease afterwards. During some months like October and November, 1988, substantial increase in catches was noticed. This fluctuation is to be expected since the entry of this species into the fishery is relatively new. The decline in catches is attributable to the fact that during post - monsoon months, trawlers operate in shallower waters where larger sized penaeids are available in plenty due to their influx during this period. The average catch per boat in both the years was found to reach 27 kg / unit.

The size range in the fishery was 50 - 98 mm though the species has been reported to attain 100 mm. Maturing and mature females were found to be present during March and April, indicating spawning just prior to the monsoon. The size at first maturity was 59 mm for male and 65 mm for female.

The growth study indicated a rate of 5 mm increment per month for both sexes which is comparable to the growth rate of other penaeids like *Solenocera crassicornis*. This growth rate is for adults only as juveniles were not captured by the trawlers.

Another species of *Metapenaeopsis* present as strays was *M. hilarula*. The catches were sold in the local market and also bought by exporters for export. The price/kg amounted to Rs.10. This tough-shelled prawn was not easily spoiled when compared to other species caught along with it like *Salenocera choprai* and *Parapenaeus longipes*.

Judging from the present rate of exploitation, it can be predicted that the fishery is likely to sustain at the present trend for some more years.

TABLE 1. Catch particulars in kg of *M. stridulans* (Units shown in parenthesis) Place : S. Dock, Gear : Trawl

Month	Year 1988	Year 1989
January	8,667 (1,833)	5,507 (2,287)
February	64,987 (1,618)	8,064 (1,680)
March	97,672 (1,605)	45,901 (1,802)
April	77,005 (1,733)	77,661 (1,795)
May	79,046 (1,977)	12,2810 (3,291)
June	63,213 (1,687)	64,802 (1,705)
July	46,989 (2,006)	48,256 (1,590)
August	59,649 (2,586)	33,379 (1,050)
September	21,149 (1,838)	22,924 (1,444)
October	50,037 (1,732)	15,087 (2,152)
November	83,398 (2,565)	6,684 (964)
December	33,934 (2,446)	-
Total with C. P. U.	6,85,755 (26.77)	4,50,775 (24.09)

\* Reported by : M. Aravindakshan, Bombay Research Centre of CMFRI, Bombay.



## ON A LARGE DEVIL RAY *MANTA BIROSTRIS* LANDED AT TUTICORIN \*

On 3-5-1990, two numbers of Devil ray measuring 2.17 and 2.11m in total length and 5.54 and 5.25 m in breadth respectively were caught from the inshore waters of Tuticorin at a depth of 50 m by gill net operated from Tuticorin type of boat. It was identified as *Manta birostris* locally known as ' *Kombu thirukai*'. While the former was a female weighing 1,200 kg (Fig. 1). The latter was a male weighing 1,150 kg. Both the specimens were auctioned for Rs. 400/- at the landing centre. The morphometric measurements taken are presented in Table 1.

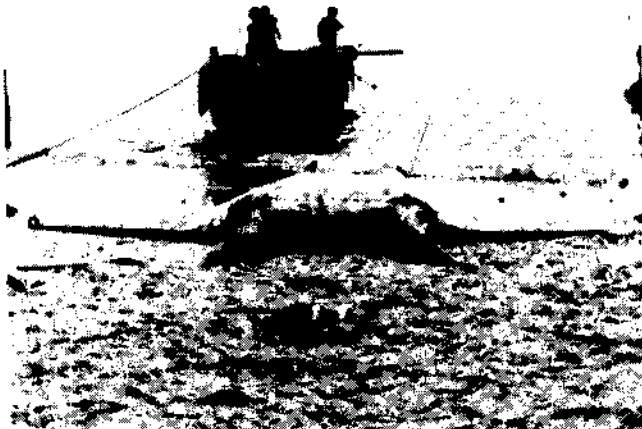


Fig. 1. The Devil ray *Manta birostris*. Ventral view of the specimen (anterior).

TABLE 1. *Morphometric measurements of Manta birostris (Walbaum)*

Particulars	Female (mm)	Male (mm)
Disc horizontal length (width)	5540	5250
Disc vertical length (length of body)	2170	2110
Inter orbital distance	1380	1320
Breadth of cephalic horn	310	295
Length of cephalic horn	690	670
Diameter of eye	110	98
Diameter of eye ball	25	24
Length of mouth	890	780
Length of tail	1270	1160
Length of pelvic fin	350	320
Width of first gill slit	560	520
Width of second gill slit	560	520
Width of third gill slit	540	495
Width of fourth gill slit	470	430
Width of fifth gill slit	390	350

\* Reported by S. Rajapackiyam, T. S. Balasubramanian and G. Arumugam, Tuticorin Research Centre of CMFRI, Tuticorin.

# आन्दमान समुद्र में ऐकेन्थास्टर प्लान्सी के पर्याक्रमण पर एक वस्तुस्थिति अध्ययन

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सी एम एफ आर आइ कौचिन - 682 031

## प्रस्तावना

“क्राउन ऑफ थॉन” नाम से मशहूर ऐकेन्थास्टर प्लान्सी एक तारामीन है। सन् 1743 में इसके सम्बन्ध में पहला विवरण आया। इसके बाद यह हज़ारों लेखों का प्रतिपाद्य विषय रहा है। इसका मुख्य आहार प्रवाल पॉलिप है। इन्डो-पसफिक प्रवाल भित्तियों के कई भाग इसके पर्याक्रमण के कारण क्षयग्रस्त दीख पड़ता है। तारामीन लगभग वृत्ताकार का होता है। इसके शरीर के चारों ओर तीखा और लंबी काँटे वाले 9 से 21 हाथ होते हैं। बड़े नमूने 40 से.मी व्यास तक बढ़ते हैं। ये कई रंग के होते हैं। लेकिन अधिकांश बैंगिनी रंग के होते हैं और हाथ के मध्य भाग में नील लोहित या नीले रंग या भूरे रंग की रेखाये होती हैं। काँटे लाल अग्रभाग से युक्त हरित नील रंग के होते हैं। इन्डो-पसफिक में पूर्वी अफ्रिका के पूर्वी तट, लाल सागर और हवाय तक के पूर्व भाग में ए. प्लान्सी खास मात्रा में पाया जाता है। हिन्द महासागर में, मालदीव्स, लक्षद्वीप, श्रीलंका और भारत के पूर्वी तटों में इसकी उपस्थिति मालूम हुई है।

## आन्दमान-निकोबार समुद्र में ए. प्लान्सी

आन्दमान-निकोबार के कई स्थानों में ए. प्लान्सी की उपस्थिति पहले ही अभिलेखित की है। लेकिन बीसवीं शताब्दी के नवौं दशक तक तारामीन का समुच्चय प्रवाल भित्तियों का नाश करते हुये नहीं देखा था। चांगसोंग ने पहली बार आन्दमान समुद्र में इनके पर्याक्रमण के बारे में रिपोर्ट की। श्री टोमी, एक समुद्री मछली विशेषज्ञ और अन्य कुछ पनडुब्बों ने दक्षिण आन्दमान में सैकड़ों “क्राउन ऑफ थॉनस” के बारे में रिपोर्ट की। बाद में आन्दमान निकोबार वन विभाग और मातित्यकी के कर्मचारियों ने न्यू वान्डूर तट एवं मरीन नेशनल पार्क के पास तारामीन को अधिक मात्रा में देखा। मरीन नेशनल पार्क में तारामीनों की उपस्थिति, उसके पर्याक्रमण सम्बन्धी स्थिति के निर्धारण करने की अनिवार्यता पर जोर डाला। परिणामस्वरूप सी एम एफ आर आइ के वैज्ञानिकों के एक दल को अप्रैल-मई 1989 में इस पर अन्वेषण करने के लिए नियुक्त किया गया।

## सर्वेक्षण

वर्तमान सर्वेक्षण मुख्यतः वान्डूर के नेशनल मरीन पार्क के 281.5 वर्ग कि.मी. क्षेत्र में, जिसमें 14 छोटे और बड़े द्वीप शामिल हैं, किया गया। ग्रब, चेस्टर, तारमुगिल, रेड स्किन, मल्य, जॉलिवस, अलक्सान्ड्रा और व्दिन द्वीपों में विशेष अध्ययन किया। इन में जॉलिवस एक पर्यटन केन्द्र है। इन द्वीपों के अतिरिक्त पोर्ट ब्लेयर के उत्तर उपसागर, सिसोस्ट्रिस उपसागर, रोस द्वीप, वैपर द्वीप, वर्मानल्ला और चिडियाटोप आदि प्रदेश और इसके चारों ओर के स्थानों को भी सर्वेक्षण के लिए चुन लिया।

सर्वेक्षण के लिए ओ बी एम घटित डिंगी का इस्तेमाल किया जिसका अधोभाग काँच का होता है। प्रवालों में तारामीन को देखते ही पनडुब्बे गहराई में डूब कर मछलियों को गिन लिया। जहाँ तारामीन अधिक मात्रा में दिखाई उस क्षेत्र को अंकित रस्ती से प्राक्कलित किया। सर्वेक्षण साधारणतया 4 मी तक की गहराई के उथला जल में किया गया। अप्रैल 1989 के अन्तिम हफ्ते में “कालिपोसो” नामक फ्रेंच जहाज़ ने मरीन नेशनल पार्क में लंगर किया और इसके वैज्ञानिकों और भारतीय नौ सेना के कर्मचारियों ने अधिक गहराई में डूब करके वान्डूर तट एवं ग्रब द्वीप में ऐकेन्थास्टर के लिए अन्वेषण किया। इन्होंने भालों के सहारे कुछ नमूनों का संग्रहण किया।

## निरीक्षण

निरीक्षणों से व्यक्त हुआ कि ग्रब द्वीप, चेस्टर द्वीप, अलक्सान्ड्रा द्वीप, रेड स्किन द्वीप और व्दिन द्वीप में ऐकेन्थास्टर की उपस्थिति है। वर्तमान सर्वेक्षण में न्यूवान्डूर में तारामीन नहीं दीख पडा। सर्वेक्षण किये गये आन्दमान के प्रवाल भित्तियों में ऐक्रोपोरा एस पी पी या पोरिट्स मुख्य थे। जहाँ ऐक्रोपोरा अधिक थे वहाँ पोरिट्स कम थे। तारामीन पोरिट्स से अधिक ऐक्रोपोरा में दिखायी पडी। ऐकेन्थास्टर की अधिकतम उपस्थिति ग्रब द्वीप में तट से 50 मी. दूर पर उथला जल में दिखाई पडी। “कालिपोसो” वैज्ञानिकों द्वारा चलाये गये सर्वेक्षण ने व्यक्त किया कि 7 मी से अधिक की गहराई में तारामीन बहुत कम

है। लगभग 500 वर्गमी क्षेत्र में 62 नमूनों को देखा गया।

अन्य स्थानों में 1000 वर्ग कि मी क्षेत्र में इसकी संख्या 20-40 के बीच रही। सर्वेक्षण सिर्फ दिन में और एक्रोपोरा भित्तियों के बाह्य प्रतलों में ही किया था। टिवन द्वीप में भी ऐकेन्थास्टर को अधिक मात्रा में देखा गया। यहाँ प्रवालों को 5 से 7 मी के बीच की गहराई में देखा गया। यहाँ के 2500 वर्ग कि मी क्षेत्र में करीब 85 ऐकेन्थास्टर देखे गये।

सभी संग्रहित नमूने वयस्क थे। हाथों की संख्या में 14 से 19 तक की और व्यास में 125 से 155 मि. मि तक की विविधता देखी। रेड स्किन, न्यू वान्डूर और चेस्टर द्वीपों में प्रवालों की भारी क्षति दिखायी पड़ी। कई बार प्रवालों में चरने का चिह्न दीख पडा लेकिन ग्रब द्वीपों में जहाँ ऐकेन्थास्टर अधिक मात्रा में उपस्थित था श्वेत प्रवालों में इनके चरने का कोई चिह्न नहीं दीख पडा। सेरानो के अनुसार (कोस्ट्यू फाउण्डेशन पारिस, 1989) आन्दमान में सारे के सारे रीफों में ऐकेन्थास्टर मौजूद था। लेकिन तारामीन की संख्या सामान्य स्थिति में थी। नैशनल मरीन पार्क के विविध स्थानों में प्रवालों के मृत्युदर का कारण ऐकेन्थास्टर नहीं कहा जा सकता। न्यू वान्डूर में निकट तट क्षेत्रों में प्रवालों को मारने वाला मुख्य धटक सिल्टेशन लगता है। गहरे जलों में भी प्रवालों की बढ़ती मृत्युदर किसी अन्य प्राकृतिक कारणों से हो सकता है। एक हद तक प्रवालों की मृत्युदर का एक गौण कारण ऐकेन्थास्टर की परभक्षिता हो सकता है, लेकिन सर्वेक्षणों के अनुसार अब यह खतरनाक नहीं।

### ऐकेन्थास्टर फ्लान्सी-आधिक्य और नियंत्रण तरीके

पिछले तीस वर्षों से इन्डो-पसफिक के कई भागों से ऐकेन्थास्टर फ्लान्सी का आधिक्य और इससे प्रवालों की क्षति के बारे में कई रिपोर्ट मिली हैं। ऐकेन्थास्टर के इस प्रादुर्भाव

केलिए कई कारण बताये जाते हैं लेकिन कोई भी कारण सन्तोषजनक व्याख्या देने में पर्याप्त नहीं है। आन्दमान में, मुख्यतः वान्डूर तट के निकट मिट्टी निकालने के कारण मृदा अपरदन हुआ है जो प्रवालों के नाश का कारण बन गया है। लेकिन टिवन जैसे द्वीपों में जहाँ ऐकेन्थास्टर अधिक मात्रा में उपस्थित है, यह मृदा अपरदन ऐकेन्थास्टर के प्रादुर्भाव का एक न्यायसंगत कारण नहीं मान सकता। यह सच है कि अन्धमान रीफों में मोलस्को का असंतुलित शोषण उन्हें सर्वनाश की ओर ले जा रहा है। लेकिन यहाँ से इनके परभक्षिता-भक्ष्य संबन्ध के बारे में कोई सूचना नहीं मिली है। ऐकेन्थास्टर के नियंत्रण के लिए हस्तचयन, विष व विजली का घेरा, रासायनिकों और इन्हें खानेवाले जठरपादों के प्रयोग आदि मुझावे दिये हैं। लेकिन ऐकेन्थास्टर की भारी वृद्धि, इस प्रकार के नियंत्रणों को असंभव कर देती है। ऐसी स्थिति में प्रवाल भित्तियों के सर्वनाश से होने वाले अभाव में इनके भूखे मरना ही एकमात्र प्रतिविधि लगती है।

आन्दमान की वर्तमान स्थिति खतरनाक नहीं लगती है। क्योंकि सर्वेक्षण के अनुसार कुछ क्षेत्रों में ही अधिक मात्रा में तारामीनों की उपस्थिति देखी है। लेकिन एक वयस्क मछली एक ही बार 20 दश लक्ष अंडों का उत्पादन कर सकती है। हाल ही में ग्रब द्वीप में किये गये सर्वेक्षण के अवसर पर तारामीन के प्रजनन में वृद्धि दिखायी पड़ी थी। उधला जल से इन्हें शूलों की सहायता से हाथों से निकालना आसान है। फिर भी आन्दमान और निकोबार द्वीपों के चारों ओर तीक्ष्ण निगरानी की आवश्यकता है। स्थानीय लोगों को इस समस्या को समझाकर ऐकेन्थास्टर को देखने पर प्रशासन को रिपोर्ट करने के लिए उत्सुक बनाना भी इसके नियंत्रण के लिये आवश्यक है।

वर्तमान पता \* सी एम एफ आर आइ का टूटिकोरिन अनुसंधान केंद्र

\*\* सी. एम एफ आर आइ का विषिजम अनुसंधान केंद्र

## उडीसा की झींगा कृषि पर एक समाज-आर्थिक विश्लेषण

के.के.पी. पणिकर

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### प्रस्तावना

चिल्का झील में झींगा कृषि की परीक्षात्मक विजय के आधार पर उडीसा सरकार ने एक विशाल झींगा कृषि परियोजना बनायी और इस सिलसिले में 3000 गरीब कुटुम्बों को तटीय देहाती क्षेत्र में पुनर्निवास कराया। इस कार्यक्रम की प्रारंभिक

शुरुआत 1982-83 में हुई। लेकिन इसका वास्तविक काम 1983-84 में पुरी और गन्जम जिलों में शुरू हुआ। इस योजना के अनुसार 1200 रुपये से कम वार्षिक आय वाले चुने हुए हितग्राहियों को 0.2 हैक्टर जल क्षेत्र झींगा कृषि के लिए दिया जायेगा।

तालाब के निर्माण के लिए राज्य सरकार 100 प्रतिशत सहायक अनुदान और पहला फसल के खर्च भी देती है। राज्य सरकार के अधीन कार्यरत नुनखरा-जल मात्स्यिकी विकास अभिकरण कृषकों को कृषि भूमि के स्थान निर्धारण से लेकर झींगों के विपणन तक की कार्यों में आवश्यक तकनीकी सहायता देती है। इसके अतिरिक्त कृषकों को बीज, विस्तार सेवायें और प्रशिक्षण भी देते हैं।

गन्जाम और पुरी जिले के हितग्राहियों को दिये गये तालाब सीमाबद्ध जल प्रबन्ध के लिए डिज़ाइन किया गया है। तालाब निर्माण के बाद 10 वर्षों की अवधि के लिए पट्टे पर दिया जाता है जिसे और भी बढ़ा सकता है।

प्रस्तुत परियोजना के मूल दिशा अध्ययन के भाग में सी एम एफ आर आइ पुरी और गन्जाम जिले के हितग्राहियों का सर्वेक्षण किया। कुल हितग्राहियों के लगभग 70 प्रतिशत इस सर्वेक्षण का पात्र बना। सर्वेक्षण का परिणाम सारांश रूप में नीचे प्रस्तुत है।

#### कुटुम्ब परिमाण

हितग्राहियों के औसत कुटुम्ब परिमाण 6.7 दिखाया पडा। इन में प्रति कुटुम्ब का कमाऊ व्यक्ति 1.7 है। पनासपाडा के औसत कुटुम्ब परिमाण 7.7 और प्रति कमाऊ व्यक्ति दो हैं। कुसुबन्ति, मुदिराता और खान्द्वलपुर में केवल दो-दो कमाऊ सदस्य होते हैं। लेकिन जादपुर, गोपकुडा और हरिपुर के घरों में केवल एक व्यक्ति काम करता है। इस प्रकार एक कुटुम्ब में काम करने वाले और काम नहीं करने वाले का अनुपात 1:4 रहा। चौदह वर्ष की आयु के नीचे के बच्चे कुल जन संख्या का 45 % निकला।

#### साक्षरता

साक्षरता मुदिराता में 21.0 प्रतिशत और हरिपुर में 71.3% है। हितग्राहियों का साक्षरता स्तर उड़ीसा राज्य की अपेक्षा ऊँचा दीख पडा। चौदह साल की आयु के नीचे बच्चों में स्कूल जाने वाले केवल 17 प्रतिशत है। लेकिन विविध भागों में स्कूल जाने वाले बच्चों के प्रतिशत पर विविधता दिखायी पडी। हरिपुर में साक्षरता स्तर काफी ऊँचा है।

#### धंधा

पुरी में झींगा कृषि की प्रस्तुति के पहले लोग मजदूरी पर लगे रहते थे। गन्जाम जिले के लोगों का मुख्य धंधा मत्स्यन था। अब झींगा कृषि में लगे रहने पर भी प्रतिकूल मौसम में ये लोग अपने परंपरागत काम करते हैं। इसके अलावा नाई, दुकानदार आदि कुछ लोग भी हैं। मत्स्यन और कृषि मौसम पर आश्रित होने के कारण अधिकांश हितग्राहियाँ मजदूर होने के कारण उनके औसत वार्षिक आय केवल 1000-1200 रुपये के बीच में रहते हैं।

मुदिराता और गुपाकुडा में कर्मियों का प्रतिशत यथाक्रम 16.4 और 30.4 हैं। मुदिराता जैसे साक्षरता में पिछड़े रहने वाले स्थानों में कर्मियों का प्रतिशत काफी ऊँचा था तो साक्षरता में आगे रहने वाले हरिपुर जैसे स्थानों में कम।

प्रस्तुत परियोजना की प्रस्तुति के बाद स्त्रियों सहित वयस्क एवं स्कूल में न जानेवाले बच्चे झींगा कृषि के कार्यकलापों में भाग लेते हैं। स्त्रियाँ और बच्चे अधिकतम कृषि के लिए आवश्यक आहार की तैयारी करते हैं।

#### समाजिक समस्यायें

उड़ीसा सरकार द्वारा 1983 में ई आर आर पी कार्यक्रम के ज़रिये प्रस्तुत किये झींगा कृषि ने अनेक मजदूरों को अपने-अपने तालाबों में कृषि करने का अवसर प्रदान किया है। लेकिन परिचय की कमी और झींगा कृषि को एक व्यवसाय के रूप में चलाने की रीति आदि प्रबन्ध संबन्धी कुछ समस्यायें हैं।

अधिकांश तालाबों का निर्माण दूरी पर होने के कारण यातायात की समस्या है। इसका प्रभाव विपणन पर भी पडता है।

#### उत्पादन लागत

ई आर आर पी कार्यक्रम के अन्दर्गत पहली कृषि के लिए बीज, आहार, उर्वरक आदि मुफ्त दिया था। यद्यपि बीज का मूल्य प्रति तालाब प्रति फसल खान्द्वलपुर में 278 रुपये और नेयरी और गोबापाडर में 477 रुपये प्राक्कलित किया। औसत मूल्य प्रति 1000 बीज 200 रुपये निकला। प्रति तालाब आहार

का औसत मूल्य जादपुर में 146 रुपये और जानिकुंडा में 442 रुपये निकला । किसी भी तालाब में काम करने के लिए किराये पर मज़दूरों को नहीं लगाते थे ।

प्रति तालाब प्रति फसल कुल परिचालन व्यय जादपुर में 518 रुपये और जानिकुंडा में 860 रुपये दीख पडा ।

प्रति तालाब के औसत स्टॉक साइज पुरी जिले में 2311 और गन्जाम जिले में 2831 दीख पडा । परिवहन लागत के कारण गन्जाम जिले में बीज का मूल्य पुरी जिले की अपेक्षा कम थी । कुल प्रचालन व्यय पुरी में 695 रुपये और गन्जाम में 626 रुपये दीख पडा । एक तालाब के निर्माण के लिए प्रारंभिक निवेश स्थल के मूल्य को भी शामिल करते हुए 7000 रुपये तक आया ।

### उत्पादन उपनति

पुरी जिले के खान्दवालपुर क्लस्टर में झींगा उत्पादन की औसत मात्रा जानिकुंडा से कम था । संग्रहण दर भी खान्दवालपुर में कम दीख पडा । जानिकुंडा में संग्रहण दर 2072 और गोबापाडा और नेयरी में 2500 था । अतिजीविता दर गोबापाडा में 54% और जादपुर में 87% दीख पडा । गन्जाम जिले के हरिपुर क्लस्टर में उत्पादन अधिक दीख पडा ।

औसत उत्पादन प्रति तालाब पुरी जिले में 36 कि. ग्रा. और गन्जाम जिले में 27 कि. ग्रा था । गन्जाम जिले में उत्पादन दर की कमी का कारण बाढ़ एवं अपर्याप्त प्रबन्धन है ।

यद्यपि झींगा कृषि अब भी निरीक्षणात्मक अवस्था पर है तथापि यह व्यक्त हुआ है कि ई आर आर पी कार्यक्रम से प्राप्त निवेश का उचित उपयोग और ठीक प्रबन्धन से उत्पादन बढ़ा सकता है ।

### विपणन समस्यायें

गन्जाम जिले के कुछ क्लस्टरों में बहुत कम दाम मिला । इसका मुख्य कारण विकल विपणन रीति और अवसंरचना सुविधाओं की कमी है । अधिकांश क्लस्टरों में ठीक मार्ग सुविधायें नहीं हैं । साधारणतया संग्रहण ट्रैप के ज़रिए होता है और यह 10-15 दिन तक जारी रहता है । इस तरह संग्रहित फसल ट्रक में लाने के लिए पर्याप्त नहीं होता । इसलिए एजेन्ट्स

झींगों का संग्रहण साइकिल के ज़रिए करता है । यह ही नहीं मत्स्य कृषकों को भाव के बारे में पर्याप्त ज्ञान भी नहीं । विपणन दक्षता सुधारने पर औसत आमदनी 25% से 60% तक बढ़ने की संभावना है ।

### फार्म आय

गन्जाम जिले के विविध क्लस्टरों से 0.2 हेक्टेर तालाब से प्राप्त कुल आय 905 रुपये (बिन्चानम्पल्ली) से 2740 रुपये (हरिपुर) तक थी । पुरी जिले में औसत कुल आय 1963 रुपये (खन्डवलपुर) से 3851 रुपये (जानिकुंडा) तक थी । पुरी और गन्जाम जिले में प्रति फसल प्रति तालाब औसत कुल आय यथाक्रम 2530 रुपये और 1432 रुपये दीख पडी ।

पुरी जिले में एक तालाब की औसत नेट आय 1239 रुपये (नेयरी) से 2991 रुपये (जानुकुंडा) और गन्जाम जिले में 194 रुपये (बिन्चानम्पल्ली) से 1824 रुपये (हरिपुर) तक दीख पडी । पुरी जिले और गन्जाम जिले की औसत नेट आय यथाक्रम 1834 और 743 रुपये निकला ।

### श्रम का लाभ

ई आर आर पी परियोजना का मुख्य लक्ष्य गरीब लोगों का सुधार है । इसके लिए चुने गए अधिकांश हितग्राहियों भूमि रहित श्रमिक और मछुए होते हैं । इन दोनों वर्गों के लिए मनसून बहुत काम रहित और लाभहीन मौसम है । लेकिन झींगा कृषि मुख्यतः मनसून में चलाने के कारण इन लोगों को काम मिलता है ।

### नीति विवक्षा

1. गन्जाम जिले की औसत आय बहुत कम दिखाई पडी । ठीक तालाब प्रबन्धन और विपणन सुविधाओं के सुधार आदि से आय बढी सकती है । गन्जाम जिले में झींगा का भाव प्रति किग्रा. 53 रुपये था तो पुरी जिले में 70 रुपये था क्योंकि पुरी में भाव के साथ साथ औसत उत्पादन भी ऊँचा रहा । वहाँ की नेट आय 1885 रुपये दीख पडी । आय संरचना, दाम, आदि का सूक्ष्म निरीक्षण यह सूचित करता है कि स्टॉक साइज, अच्छा आहार, विपणन सुविधाओं का सुधार और उचित तालाब प्रबन्धन से उत्पादन और आय बढ़ा सकते हैं ।

2. उड़ीसा सरकार के मात्स्यकी विभाग द्वारा 1979-80 में चलाये सर्वेक्षण के अनुसार तटीय जलकृषि परियोजना में लाने के लिए 2,03,000 है. प्राक्कलित किया गया । इसमें कम से कम 10,000 है. को झींगा कृषि के लिए उपयुक्त करने के लिए प्रति है. में 20,000 बीज के औसत दर में, वर्ष में दो फसल के लिए 400 दशलक्ष बीज प्राक्कलित किया ।

राज्य मात्स्यकी विभाग ने 1979-80 में एक बीज सर्वेक्षण का आरंभ किया और 1982-83 तक यह जारी रखा । इसके अनुसार कृषि योग्य पी. इन्डिकस और पी. मोनडोन आदि प्रमुख जातियाँ 130 दशलक्ष प्राक्कलित किया । 1983-85 में चलाये गये सर्वेक्षण इन जातियों के किशोरों की उपलब्धि विविध ज्वारन्दमुखों और चिल्का झील में 36 दशलक्ष टन आकलित किया । यदि झील के कैप्चर मात्स्यकी को प्रभावित किये बिना बीज संग्रहण के लिए एक विवेक पूर्ण रीति स्वीकार करें तो करीब 1000 है. झींगा फार्म के लिए संग्रहण माल झील से संग्रहण कर सकता है ।

अभी तक के निरीक्षण यह स्थापित करते हैं कि उड़ीसा राज्य की झींगा कृषि के लिए पर्याप्त बीज इस प्रकार के संग्रहण से पूरा नहीं होगा । कृषकों को आवश्यक समय और मित भाव में बीज मिलना अत्यन्त आवश्यक है । अब पुरी जिले में बीज की कमी महसूस होने लगी है । इसलिए हैचरियों की स्थापना बहुत जरूरी है ।

3. उचित आहार का अभाव और एक मुख्य समस्या है । आजकल स्वयं आहार तैयार करके उनके इच्छानुसार खिलाता है । भविष्य में यह बहुत बड़ी समस्या का कारण बन जायेगी । इसलिए उचित आहार का उत्पादन और मित भाव

पर उसे कृषकों को मिलने के लिए आवश्यक कदम उठाना चाहिए।

4. कुछ क्लस्टर्स में बाढ़ के कारण फसल का नाश हुआ था । गन्जाम जिले के उत्पादन स्तर में पड़ गयी कमी इस कारण से थी । इसलिए फार्मों को बाढ़ से बचाने के लिए ठीक प्रकार के तट बंधन की आवश्यकता है । इसके लिए बहुत भारी मूलधन की आवश्यकता है । अतः जन-निवेश से ही यह कार्य सिद्ध होगा ।

5. ई आर आर पी परियोजना के अधीन हितग्राहियों को पट्टे का रकम देने की आवश्यकता नहीं । लेकिन पट्टे की अवधि 10 वर्ष है इसे और भी बढ़ाने का निर्णय सरकार की तरफ से होना चाहिये ।

6. ई आर आर पी तालाबों की गहराई 2.5 मी. है । इन्हें और भी बढ़ाना है ।

7. अधिकांश क्लस्टर्स में उचित विपणन सुविधा की कमी है । गन्जाम (53 रु) और पुरी (70 रु) में झींगा का भाव बहुत कम दीख पडा । विपणन सहकारी समिति के निर्माण से समस्या को सुधार सकता है ।

8. अधिकांश क्लस्टर्स में उत्पादन की कमी का मुख्य कारण प्रबन्धन की त्रुटि है । मत्स्य कृषि एक व्यापार है और इसके लिए कुशल प्रबन्धन की आवश्यकता है । कुशल प्रबन्धन के लिए नयी तकनीकी आधुनिक रीतियाँ और प्रचलित भाव के बारे में कृषकों को सूचना देनी चाहिए । इसके अलावा कृषि योग्य जाति, तालाब का साइज, बीज की प्राप्यता, कृत्रिम आहार आदि विषयों पर कृषकों को तकनीकी निर्देश देना आवश्यक है ।

## महाराष्ट्र तट में फिड्ल महाचिंगट मेटापेनिऑप्सिस स्ट्रिडुलान्स अलकोक की मात्स्यकी\*

मेटा पेनिऑप्सिस स्ट्रिडुलान्स मराठी में डुगडु नाम से जानने वाले महाचिंगटों के वर्ग का है जिसका कवच अत्यधिक मज़बूत होता है । यह जाति मानसूनोत्तर काल में डॉल नेट की पकड़ में छोटी संख्या में दिखायी पडती है । पूर्व-मानसून काल (मार्च-जून) में सासून डॉक में एक नियमित मात्स्यकी के रूप में यह प्रत्यक्ष होता है ।

इसकी पकड़ मुख्यतः ट्राल जाल से सासून डॉक में होती है । जनवरी से जून तक पकड़ में वृद्धि और इसके बाद कमी दीख पडी । सन् 1988 के अक्टूबर और नवंबर के महीनों में पकड़ में ज्यादा वृद्धि महसूस हुई । यह एक नई जाति के आगन्तुक होने के कारण उतार-चढ़ाव की प्रतीक्षा कर सकती है । इसका आकार रेंच 50-98 मिमी दीख पडा । प्रौढ

होनेवाली और प्रौढ स्त्री जाति मार्च और अप्रैल महीनों में उपस्थित थी। यह इसकी सूचना है कि अंडजनन मानसून के पूर्व होता है। पुरुष जाति के लिए पहली प्रौढावस्था का आकार 58 मिमी और स्त्रीजाति का 65 मिमी होता है।

वृद्धि का अध्ययन प्रति माह 5 मि मी वृद्धि दर सूचित करता है। यह वृद्धि दर केवल प्रौढों के लिए है क्योंकि ट्रालरों से किशोरों का संग्रहण नहीं किया था।

मेटापेनिऑप्सिस के और एक उपस्थित जाति एम. हिलारला थी। संग्रहण को स्थानीय बाज़ार में बेच दिया और

निर्यातकों ने भी खरीदा। प्रति कि. ग्रा भाव 10 रुपए तक आया। सोलेनोसिरा चोप्राइ और पारपेनिअस लॉगिपस के समान इन मज़बूत झींगों का नाश करना आसान नहीं है।

वर्तमान शोषण दर से ऐसा अनुमान कर सकता है कि और कुछ वर्षों के लिए भी इस जाति की वर्तमान स्थिति कायम रखेगी।

\* बंबई अनुसंधान केन्द्र, के एम. अरविन्दाक्षन द्वारा तैयार किया ब्योरा।

## टूटिकोरिन में स्थलित एक भीमाकार रे मैन्टा बाइरोस्ट्रिस के बारे में \*

टूटिकोरिन के 50 मी गहराई के उपतट जल से 3-5-1990 को गिल जाल के ज़रिए यथाक्रम 2.17 और 2.11 मी. कुल लंबाई के दो भीमाकार रे पकड़े गये। इसका स्थानीय नाम "कोम्बुतिरुक्के" है। इन में पहली स्त्री जाति और दूसरा पुरुष जाति के थे। दोनों का भार यथाक्रम 1200 और 1150 कि.

ग्रा. था। दोनों नमूनों को स्थलन केन्द्र में 400 रुपये में नीलाम कर दिया।

\* टूटिकोरिन अ. के. के एस. राजपाकियम, टी. एस. बालसुब्रह्मण्यन और जी. अरुमुगम द्वारा की गयी रिपोर्ट।



### GUIDE TO CONTRIBUTORS

The articles intended for publication in the MFIS should be based on actual research findings on long-term or short-term projects of the CMFRI and should be in a language comprehensible to the layman. Elaborate perspectives, material and methods, taxonomy, keys to species and genera, statistical methods and models, elaborate tables, references and such, being only useful to specialists, are to be avoided. Field keys that may be of help to fishermen or industry are acceptable. Self-speaking photographs may be profusely included, but histograms should be carefully selected for easy understanding to the non-technical eye. The write-up should not be in the format of a scientific paper. Unlike in journals, suggestions and advices based on tested research results intended for fishing industry, fishery managers and planners can be given in definitive terms. Whereas only cost benefit ratios and indices worked out based on observed costs and values are acceptable in a journal, the observed costs and values, inspite of their transitionality, are more appropriate for MFIS. Any article intended for MFIS should not exceed 15 pages typed in double space on foolscap paper.