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Bird's threat: Perception of Shrimp farmers in Coastal areas of Villupuram and Cuddalore district, Tamil Nadu, India

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Abstract

A questionnaire survey and field investigation in the shrimp farms were conducted in the coastal regions of Villupuram and Cuddalore district in the East Coast of South India from October to November 2012. A total of 16 farms were interrogated to identify and quantify the number of birds considered to be a threat to shrimp farming. Tiger shrimps (Penaeus monodon) and Vannamei (Penaeus vannamei) were the two widely cultivated species in this region. A total of 19 species of birds were observed, that includes, cormorants, coots, egrets, kingfishers and kites. Among the different size class of birds 58%, 32%, and 10% were small, medium and large birds, respectively. In foraging mode of birds 78% were active foragers caused highest damage in the farm. Scavenging birds and mud probers constituted 11% each of the total bird species. Farmers were more concerned about the disease transmission by mechanical or fecal contamination rather than predation. Based on the present findings management measures were suggested.

Keywords: Birds threat, shrimp farming, disease transmission, foraging.

Introduction

Indian aquaculture has demonstrated 6.5% growth over the last two decades, the production of shrimps in brackish water forms the major areas of activity[1].Utilizing moderate levels of inputs, especially organic-based fertilizers and feed aquaculture is well practiced in India. India utilized only about 13% of a total potential brackish water resource of 1.2 million hectares (ha) with over 8000 km of coastline. In Tamil Nadu the estimated brackish water area is 560 sq.km[2].Wetlands play a number of roles in the environment, principally water purification, flood control, and shoreline stability[3]. Wetlands are also considered to be the most biologically diverse of all ecosystems, serving as home to a wide range of plant and animal life.The Convention on Wetlands of International Importance, especially as Waterfowl Habitat, or Ramsar Convention, is an international treaty designed to address global concerns regarding wetland loss and degradation[4].

In addition to the ecological value, the costal wet land areas are also having high economic and social benefits. One among the benefit is through aquaculture which provide high potential for shrimp farming. The shrimps regarded as pinkish gold of sea have very high demand in the market due to its unique taste and nutritive value. In India the vast stretches of backwaters and lagoons provide an apt place for brackish water shrimp farming. Farmed shrimp production increased from 40,000 tonnes in 1991–1992 to 1, 15,000 tonnes in 2002–2003. Currently about 91 percent of the shrimp farmers in India own less than 2 ha, 6 percent between 2 to 5 ha and the remaining 3 percent have an area of greater than 5 ha may be due to the traditional systems of shrimp farming[1].

Brackishwater aquaculture in India is restricted to shrimp farming utilizing semi-intensive culture practices mainly with giant tiger prawn at stocking densities of 0.1–0.3 million/ha. With the provision of a high protein diet, water exchange, aeration and improved health management, production levels of 4–6 tonnes/ha have been demonstrated in a production period of 4–5 months. However, the presence of white spot syndrome during 1994–1995 drastically reduced prawn farming activity in the late 1990s.

Bird predation remains one of the important threats to the farmers[5]. The studies in the food preference in heronry conducted (on going) revealed that bird species such as cormorants, heron, egrets, etc mainly feed on shrimps and are being fed to raise their young ones. Thus, the present survey is conducted in the east coast region in order to identify the bird species which are involved in predation and to assess loss in the farms due to birds.

Material and Methods

A questionnaire survey among the farmers and field investigation in the farms were conducted to identify and quantify birds. The survey was conducted in the coastal regions of Villupuram and Cuddaloredistrict in the East Coast of South India from Oct to Nov 2012. A total distance of 104 km area was covered and 16 farms were interrogated and the observations were also made on the farms to identify and quantify the number of birds in each species (figure-1). Tiger shrimps (*Penaeus monodon*) and *Vannamei* (*Penaeus vannamei*) are the two widely cultivated species in this region.

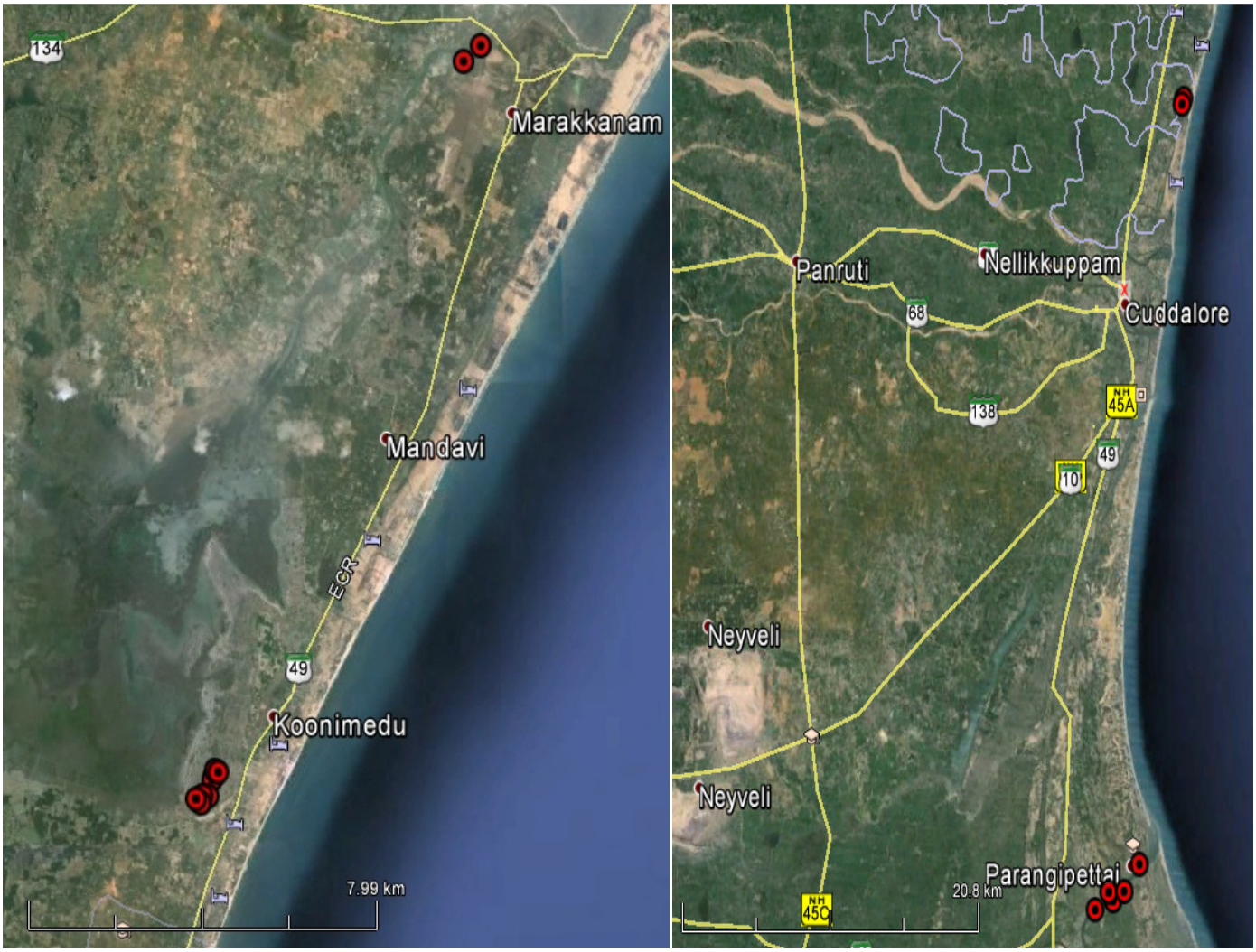

Figure-1
Map showing the location of the shrimp farms in Villupuram and Cuddalore District of Tamil Nadu

The bird species were categorized based on species, size, food consumption quantity and mode of foraging. The association of bird size class and abundance was tested using Chi-square test. Because a small bird with high abundance will cause more damage than a large bird with low abundance. In addition to that large birds can be easily spotted and chased away than a small one. Similarly a scavenging bird will have less impact than active predacious bird.

Results and Discussion

In the present study 19 species of birds were observed in the farm, the details of the bird species, size class, foraging mode and abundance are given in the table-1. The majority of the birds include egrets, kingfishers, cormorants, coots and kites. Among the different size class of the birds the highest percentage (58%) of them were small birds (11 species) when compared to medium (32%) and large size (10%) class. The most abundant species were cormorants, coots, crows and Ibis.

A comparison made between the size class and abundance of bird species that indicated that the large and medium size class birds were more abundant than small size birds. But it was not significant among the size class and abundance category ($\chi^2=0.66;\ df=4;p>0.05$; table-2). Though the number of bird species of large sized were less but they caused considerable damage to the farm.

Foraging mode: There were six different kinds of foraging modes observed among the different bird species (table-1). They can be categorized into three major groups, *viz.* active foragers, mud probers and scavengers. The majority of the birds were active foragers (78%) that include aerial foragers, divers, sit and wait predators and tactile foragers. These active foragers caused most damages in the farm. Scavenging birds and mud probers were constituted 11% each of the total bird species.

Table-1
Details of bird species identified in the shrimp farms in Villupuram and Cuddalore District of Tamil Nadu

Major category	Size of bird	Foraging mode	Name	Abundance category
Cormorants	Small	Divers	Little Cormorant (*Phalacrocorax niger)*	High
	Medium	Divers	Large Cormorant (*Phalacrocorax carbo)*	Medium
Coots	Medium	Divers	Eurasian Coots (*Fulica atra)*	High
Egrets	Small	Sit and wait predator	Little Egret (*Egretta garzetta)*	Medium
	Medium	Sit and wait predator	Intermediate Egret (*Mesophoyx intermedia)*	Low
	Small	Sit and wait predator	Cattle Egret (*Bubulcus ibis)*	Medium
Herons	Small	Sit and wait predator	Pond Heron (*Ardeola grayii)*	Low
Kites	Medium	Aerial	BrahminyKite (*Haliastur indus)*	Medium
	Medium	Aerial	Black kite (*Milvus migrans)*	Medium
Crows	Small	Scavengers	Common Crow (*Corvus splendens)*	High
	Small	Scavengers	Jungle Crow (*Corvus macrorhynchos)*	High
Ibis	Medium	Tactile	Oriental White Ibis (*Threskiornis melanocephalus)*	High
Stork	Large	Tactile	Painted Stork (*Mycteria leucocephala)*	Medium
	Large	Tactile	Woolly Necked Stork (*Ciconia episcopus)*	Medium
Others waders	Small	Tactile probing	Sandpipers sp.	Medium
	Small	Tactile probing	Plovers sp.	Medium
Kingfisher	Smal	Sit and wait predator	White Breasted Kingfisher (*Halcyon smyrnensisfusca*)	Low
	Small	Sit and wait predator	Pied Kingfisher (*Cerylerudis travancoreensis)*	Low
	Small	Sit and wait predator	Small Blue Kingfisher (*Alcedoatthis*)	Low

Table-2
Size class of the birds and their abundance in the shrimp farms in the Villupuram and Cuddalore districts of Tamil Nadu

Size of the bird	Abundance category (%)			χ^2 Test
	High	Medium	low	
Large+medium birds	25	62.5	12.5	χ^2=0.66; df=4;p>0.05
Small birds	27.3	36.4	36.4	

Disease transmission a major threat to shrimp farming: The study revealed that most of the farmers are not concerned about the bird predation in their farms but they are more concern about the spread of disease from one farm to another *via* birds. Tiger shrimps and V*annamei sp* are the two widely cultivated species in this region. While more farmers prefer Vannamei due to its disease resistant character even though WSSV (White Spot Syndrome Virus) *is reported in* Vannamei sp in India[6]. The main diseases in concern are WSSV and Taura Syndrome Virus (TSV). Birds are being an important route of transmission of the virus[7].

According to the farmers, birds mechanically transmit the infected prawns from one area to other which can cause the outbreak of disease. Studies also reported that birds which are seen foraging over ponds, carry infected shrimp to nearby ponds and dislodge them there which may be uninfected[8]. Birds, especially predatory or scavenging birds such as terns (Sternidae) or gulls (Laridae), mechanically transmit infection between ponds by releasing captured, moribund or dead prawns[7,9]. In addition to mechanical transmission, fecal contamination of birds can also transmit many diseases[10].

Furthermorethe shrimp stage (developmental stage) at which infection occurs determine the amount of loss, if the infection occurs within 30 days old shrimps it can cause 100% loss, and if it is within 60 days it lead to 70% loss. Thus the day in which the infection occurs has crucial role in the loss.

Many mitigating measures (table-3) were employed to control birds entering into farms. Majority of the farmers used less expensive methods like tying polythene bags (24%), crackers (21%) and floating of thermocol pieces (15%) in water to scare away birds. Burning crackers to scare away birds were also used when flocks of birds visit the field. Manual guarding (15%) was alsoseen. Tying threads (6%) across farms with 12 cm apart was found effective. Some farms were fully protected from birds using nets (12%) which are more costly and cannot be affordable to all farmers. Side fencing (3%) from dogs, crabs and birds were also noted in some farms. In two farms where aerators (3%) were fixed was found to have less birds because motor sound and flushing of water.

Other threats: In addition to the disease transmission other problems such as maintaining pH of water, meeting biological oxygen demand, water quality, bacterial amount, water depth *etc*. Furthermore other problems include guarding the farms from robbers and threats due to disease transmission through stray dogs.

The present study revealed only the list of bird species and their abundance, more information required on which bird caused more damage, in terms of predation or mode transmission for suggesting target species to control.The disease transmission affect the yield and sometimes leads to complete loss. A good understanding of disease, extent of damage and control measures was studied in detail in the shrimp farms but there is less information on the mode of transmission of disease via birds and its ecology.

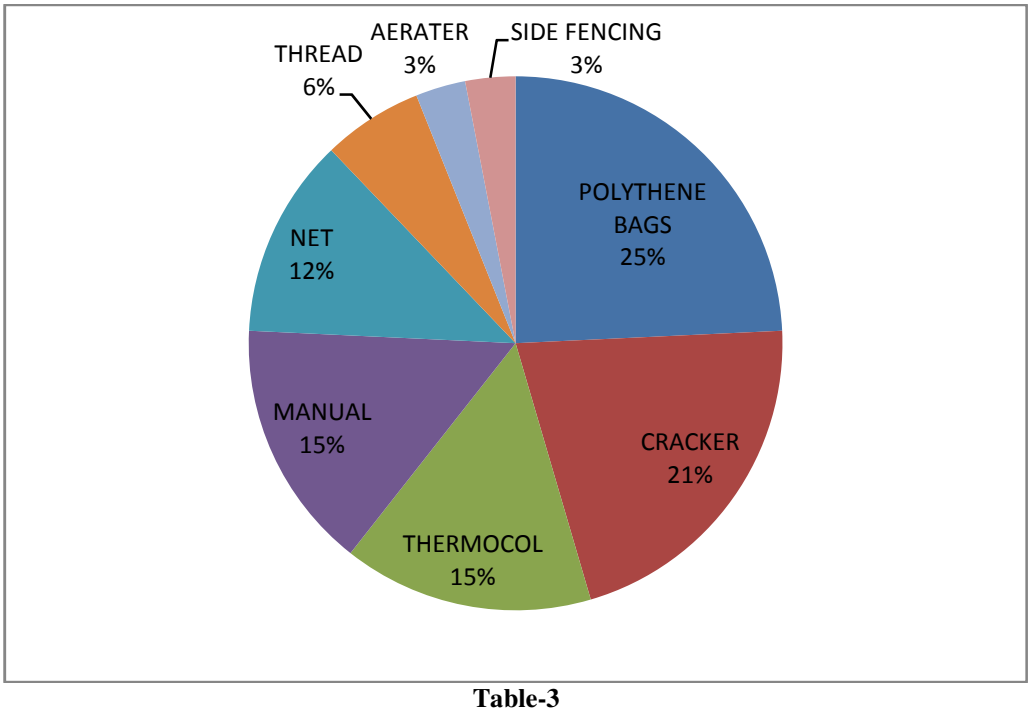

Table-3
Mitigation measures taken by shrimp farmers against bird menace in the shrimp farms in the Villupuram and Cuddalore districts of Tamil Nadu

To control the bird damage there are different avian deterrent techniques have been used, they are auditory, visual, physical and lethal methods[5,11]. The mechanical protection of farm with net has been widely used to prevent bird menace but it is more expensive. In addition to that less expensive methods like tying polythene bags and floating thermocol pieces in water, burning crackers are common mitigating methods adopted by farmers to scare away birds. Furthermore, the efficacy of different methods such as bird scares, noise makers, distress calls, pyrotechnic devices like Electronic noise Makers, scarecrows, predator models, mirrors and reflectors can be tested in the field. At the same time farmers should be provided awareness about bird conservation.

Conclusion

The following management measures were suggested for better farming. Shrimp farming should be limited with proper protection measure near the natural water sources or mangrove area. The change in the land use from agriculture, natural non forest areas, grass land and wet lands into farming area should be regulated. Water drained from farms into natural water sources should be prevented. The measures suggested in the Coastal Regulation Zone Act (CZR) should be strictly followed. Thus Sustainable development of farming practices with focus in environmental protection should be encouraged.

References

1. Annon 2013, National Aquaculture Sector Overview 2005-2013, India, National Aquaculture Sector Overview Fact Sheets, In: Ayyappan, S (*ed.*) *FAO Fisheries and Aquaculture Department* [online], Updated 1 June 2005 **(2013)**

2. Annon, Fisheries statistics, Director of Marine product Export development Authority, Chennai **(2010)**

3. Odum E.P. and Barrett G.W., *Fundamentals of ecology*, Thomson Brooks/ Cole **(2005)**

4. Prasad S.N., Ramachandra T.V., Ahalya N., Sengupta T., Kumar A., Tiwari A.K., Vijayan V.S. and Vijayan L., Conservation of wetlands of India- A review, *Tropical ecology* , **43(1)**, 173-186 **(2002)**

5. Dekker W. and Leeuw J.J.D., Bird–fisheries interactions: the complexity of managing a system of predators and preys, 3-14, In: Cowx, I.G. (*ed.*) *Interactions between Fish and Birds: Implications for Management,* Hull International Fisheries Institute, University of Hull, UK **(2003)**

6. Balakrishnan G., Peyail S., Kumaran R., Theivasigamani A., Kotiya A.S., Jitesh J.B. and Srinivasan N., First report on White Spot Syndrome Virus (WSSV) infection in white leg shrimp *Litopenaeus vannamei* (Crustacea, Penaeidae) under semi intensive culture condition in India, *AACL Bioflux,* **4(3),** 301-305 **(2011)**

7. Garza J.R., Hasson K.W., Poulos B.T., Redman R.M., White B.L. and Lightner D.V., Demonstration of infectious Taura Syndrome virus in the feces of sea gulls collected during an epizootic in Texas, *Journal of Aquatic Animal Health,* **9**, 156-159 **(1997)**

8. Lotz J.M., Viruses, biosecurity and specific pathogen-free stocks in shrimp aquaculture, *World journal of Microbiology and Biotechnology,* **13(4),** 405-413 **(1997)**

9. Fegan D.F. and Clifford H., Health management for viral diseases in shrimp farms, 168-198, *In:* Browdy C.L. and Jory, D.E. (*eds*), The New Wave, Proceedings of the Special Session on Sustainable Shrimp Culture. Aquaculture, The World Aquaculture Society, Baton Rouge, Louisiana, USA, 168–198 **(2001)**

10. Andreadis T.G., Transmission, 159-176, *In*: Fuxa, J.R. and Tanada, Y. (*eds.*) Epizootiology of Insect diseases, John Wiley and Sons, New York **(1987)**

11. Littauer G., Avian Predators Frightening Techniques for Reducing Bird Damage at Aquaculture Facilities, SRAC Publication No. 401, **(1990)**