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STUDIES ON ACTIVITY PATTERN OF FORAGING BEHAVIOUR BY GREATER FLAMINGO ACROSS DIFFERENT SEASONS IN POINT CALIMERE WILDLIFE SANCTUARY, TAMILNADU, SOUTHERN INDIA.

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Abstract

To investigate the foraging ecology of Greater Flamingo in the swamp by documenting their food items, method of foraging, food preferences and prey characteristics influencing their use by the Flamingos. Totally 47 species of waterbirds were recorded among them the feeding method of flamingos is characteristic and peculiar. The seasonal variation on the time spent on probing, beak out, vigilance, walking and aggressiveness showed significant variations. No difference was observed between adult and sub adult in any of the behaviours. The percent time spent on probing, beak out and vigilance showed significant difference in relation to the type of feeding method adapted by the individual Greater Flamingoes. The percent time spent on beak out and fight showed significant variations among the flock sizes. The percent time spent on beak out and preening feather showed significant difference between habitats. The percent time spent on probing, beak out and vigilance, preening feather, preening neck and fight showed significant difference among different seasons.

Keywords; water birds, Greater Flamingo, probing, preening feather, flock sizes

1. INTRODUCTION

The east coast of India, especially the Tamilnadu region, is of major significance for waterbirds because many extensive wetlands are found here (Thiyagesan and Nagarajan, 1995). These wetlands are especially important as wintering areas for water birds. Also, an appreciable number of bird species migrate annually from breeding sites in arctic Siberia via India to wintering grounds in Australia (Sampath and Krishinamurthy, 1989; 1990, Thiyagesan and Nagarajan, 1997) and these areas are critical for the continuance of migration and, ultimately, for the survival of many shorebirds (Myers, 1983). The wetlands of Point Calimere Wildlife and Birds Sanctuary are among the best feeding grounds for migratory waterbirds in the world (Balachandran, 2006). From time immemorial, flamingos are the regular visitors of Point Calimere Wildlife and Bird Sanctuary, South India and they use this sanctuary as their main wintering ground in India (Baruah, 2005). Long term studies indicated that the population of waterbirds is declining around the globe and the decline in India is rapid especially at places like Point Calimere Bird sanctuary (e.g. Nagarajan and Thiyagesan 2006; Balachandran, 2006; 2007). But of late, population of flamingos in this sanctuary which usually fluctuated narrowly around 20000 individuals declined drastically to 3351 in 1986 and mere 350 in 1995 in this sanctuary (e.g. Nagarajan and Thiyagesan, 2006) indicating, perhaps a deterioration in the habitat quality in this area. Hence in this study we assess the population of Greater Flamingos and other water birds across the years between 2004 and 2006.

2. MATERIALS AND METHODS

2.1.STUDY AREA

Point Calimere Wildlife & Bird Sanctuary is located along the Palk Strait in three districts of Tamil Nadu: Nagapattinam, Tiruvarur and Thanjavur (Fig.2.1). It lies in between 79.399 E & 79.884 E longitudes and 10.276 N & 10.826 N latitudes, covering an area of 38,500 hectares from Point Calimere in the east to Adirampattinam in the west. The Point Calimere Wildlife and Birds Sanctuary which was declared as a Ramsar Site on 19th August 2002 has three divisions: The Point Calimere forest, the Great Vedaranyam Swamp (GVS), which include the mangrove forest at Muthupet and the mangroves of Talaignayar Reserve Forest (TRF),

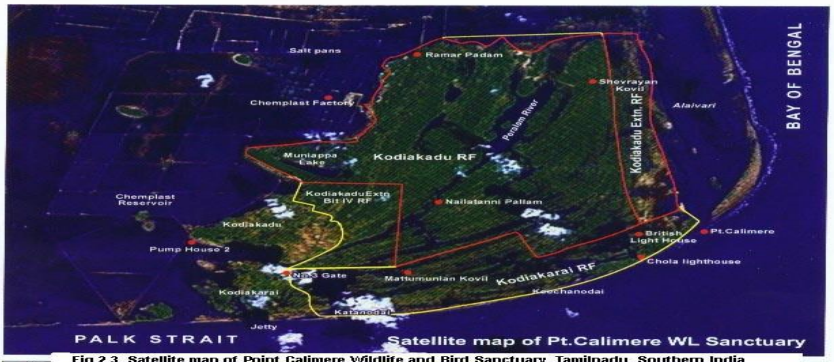


Fig.2.3. Satellite map of Point Calimere Wildlife and Bird Sanctuary, Tamilnadu, Southern India

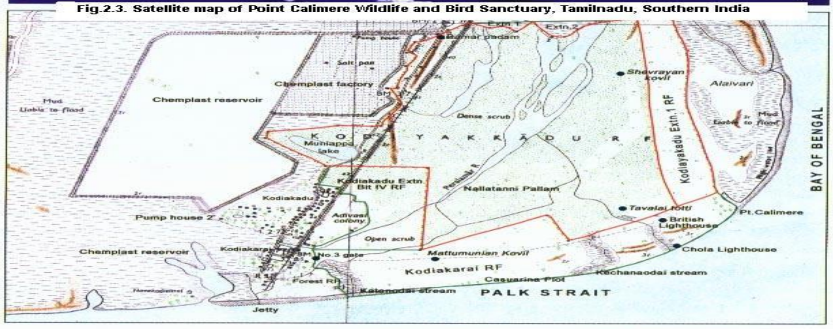


Fig. 2.4 Survey of India map of Pt.Calimere WL Sanctuary

2.1. Study Period and Seasons

Data were collected in Four seasons namely Post-monsoon (January-March), Summer (April-July), Pre-monsoon (August and September) and Monsoon (October-December) of three successive years were classified to analyze the data.

2.2. Flock Size

The Greater Flamingos were used to forage or utilize the habitats as groups and the size ranged from 2-340 individuals. The group size could influence the foraging and other behavioural activities of the Grater Flamingos. Hence, during the behavioural observations the numbers of individuals in each group was counted to estimate the flock size. The flock size was classified as small (<50nos) numbers, medium (50-100nos) numbers and large (>100nos) numbers.

2.3. Focal Animal Sequential Sampling

The time spent on various states of foraging behaviour and associated behaviors are affected by many factors such as flock size, age of the individual, time of the day, foraging method, foraging area and physicochemical factors of the substratum. Therefore in each small flock one actively foraging bird was selected randomly for observation and the major behavioral and foraging activities were recorded for 10 minutes continuously (Altmann, 1974). Then another individual was selected and observed for 10 minutes. All the individuals of the flock got equal chance to be included in the sampling observation. If the focal individual stopped feeding more than 2 minutes or moved out of site then the observation was abandoned and was not included in the analysis.

2.3.1. Behavioural categories

The foraging behaviour of Greater Flamingo (*Phoenicopteres ruber*) was classified as follows and based on reconnaissance *ad libitum* sampling made on actively foraging flamingos (Altmann, 1974).

2.3.1.1. Probing: The birds probe the mud to capture the prey.
2.3.1.2. Beak release: During foraging the birds release the beak from water column.
2.3.1.3. Walking: During foraging the flamingos move from one place to another place using their legs.
2.3.1.4. Vigilance: State of high alertness where the target is identifiable and characterized by sudden head or body movement.
2.3.1.5. Preening beak: The act of bird cleans their beak by using its leg.
2.3.1.6. Preening feather: The act of bird cleans their feather by using its leg.
2.3.1.7. Preening neck: The act of bird cleans their neck by using its leg.
2.3.1.8. Fight: Brief physical aggressive attack made by one individual of flamingo on other individual of flamingo.
2.3.1.9. Aggressiveness: Focal bird fights vigorously with other individuals
2.3.1.10. Number of Probing: Number of separate probings made by Greater Flamingo for filtering the prey within 10min was counted.

3. RESULTS AND DISCUSSION

3.1. Seasonal Variation

The percent times spent on different behaviours by actively foraging Greater Flamingos in different seasons across the years of study period are shown in figure 2.2.

3.2. Seasonal Variations in 2004

3.2.1. Monsoon

During 2004, Greater Flamingo spent maximum time for probing (91.9%) and minimum time for preening neck (0.1%) in monsoon season in time block 6-10. In the subsequent time block also the probing activity was highest with a value of 92.4% and lowest for preening neck with a value of (0.01%). In 15-18 time block, Greater Flamingo spent maximum time on probing (94.2%) and minimum time for fighting (0.01) (Fig. 2.2.).

3.2.2. Post-monsoon

During 2004, the Greater Flamingo was not observed in post-monsoon season and hence no data was collected.

3.2.3. Summer

In summer season in the time block 6-10, Greater Flamingo activity was highest for probing (88.2%) and lowest for preening neck (0.1%). In time block 10-15 Greater Flamingo spent maximum time for probing (88.6%) and minimum time for both preening neck and fighting activity (0.3% of each behaviour). In the subsequent time block 15-18 probing activity was highest with a value of 87.6% and lowest for preening neck activity with a value of 0.2% (Fig. 2.2.).

3.2.4. Pre-monsoon

Greater Flamingo observed to spend maximum time for probing (88.2%) and minimum time for both preening beak and preening neck activity (0.2% of each behaviour) in the time block 6-10. In the subsequent time block probing activity was highest (88.9%) and lowest both in preening neck and fighting activities (0.2% of each behaviour). In the 15-18 time block Greater Flamingo spent maximum time for probing with a value of 87.9% and minimum time for both preening neck and fighting activities (0.1% of each behaviour) (Fig. 2.2.).

3.3.1. Seasonal Variations in 2005

3.3.3.1. Monsoon

During 2005, in monsoon season Greater Flamingo spent maximum time for probing with a value of 86.6% in time the block 6-10 and minimum time for aggressive with a value of 0.1%. In the subsequent time block probing activity was highest (87.3%) and lowest for aggressive activity (0.1%). In 15-18 time blocks, probing activity was maximum (87.1%) and minimum in aggressive activity (0.04%) (Fig. 2.2.).

3.3.3.2. Post-monsoon

Greater Flamingo observed to spend maximum time for probing (90.8%) and minimum time for both preening beak and preening neck activity (0.1% of each behaviour) in the time block 6-10. Greater Flamingo probing activity was highest (91.5%) and lowest in (0.1% of each behaviour) for preening beak, preening neck and fighting activities in the time block 10-15. In the subsequent time block probing activity was highest with a value of 92.0% and lowest for preening neck with a value of 0.03% (Fig. 2.2.).

3.3.3.3. Summer

During 2005, the Greater Flamingo was not observed in summer season and hence no data was collected.

3.3.3.4. Pre-monsoon

In 6-10 time blocks probing activity was maximum (92.0%) and minimum for preening beak, fighting and aggressive activities (0.1% of each behaviour). Greater Flamingo probing activity was highest (91.5%) and lowest in (0.1% of each behaviour) for preening beak, preening neck and fighting activities in the time block 10-15. In 15-18 time blocks probing activity was maximum (91.6%) and minimum for fighting activity (0.01%) (Fig. 2.2.)

3.4.1. Seasonal Variations in 2006

3.4.1.1. Monsoon

During 2006, Greater Flamingo observed to spend maximum time for probing (81.5%) and minimum time for aggressive (0.1%) in the time block 6-10. Greater Flamingo probing activity was highest (83.2%) and both for fighting and aggressive activities were lowest (0.1% of each behaviour) in the time block 10-15. In 15-18 time blocks probing activity was maximum (81.6%) and minimum in fighting activity (0.1%) (Fig. 2.2.).

3.4.1.2. Post-monsoon

In 6-10 time block probing activity was maximum (85.6%) and minimum for aggressive activity (0.03%). Greater Flamingo probing activity was highest with a value of 85.4% and lowest with a value of 0.1% of each behaviour for preening neck, fighting and aggressive activities in the time block 10-15. In time block 15-18 probing activity was maximum (86.5%) and minimum for aggressive activities (0.01%) (Fig. 2.2.).

3.4.1.3. Summer

Greater Flamingo observed to spend maximum time for probing (82.4%) and minimum time for preening neck (0.01%) in the time block 6-10. In the subsequent time block probing activity was highest with a value of 82.4% and lowest for preening neck with a value of 0.01%. In time block 15-18 probing activity was maximum (82.8%) and minimum both for walking and fighting activities (0.1% of each behaviour) (Fig. 2.2.).

3.4.1.4. Pre-monsoon

During 2006, the Greater Flamingo was not observed in pre-monsoon season and hence no data was collected. Variations in species composition may be associated with the arrival of seasonal migratory species, together with the presence of species dwelling in the area (Filipello and Lopez de Casenave 1993). Water bird communities experience seasonal and annual fluctuations in abundance and species composition, on a local (DuBowy, 1988; Bethke, 1991; Lopez de Casenave and Filipello, 1995), as well as on a regional scale (Bethke and Nudds, 1995). Seasonal or annual variations are highly dependent on events like precipitation and general hydrological budget and characteristics of the area. Multi-species aggregation of shorebirds with high population densities feeding in coastal beaches, mudflats, and marshes are commonly found during the migratory period.

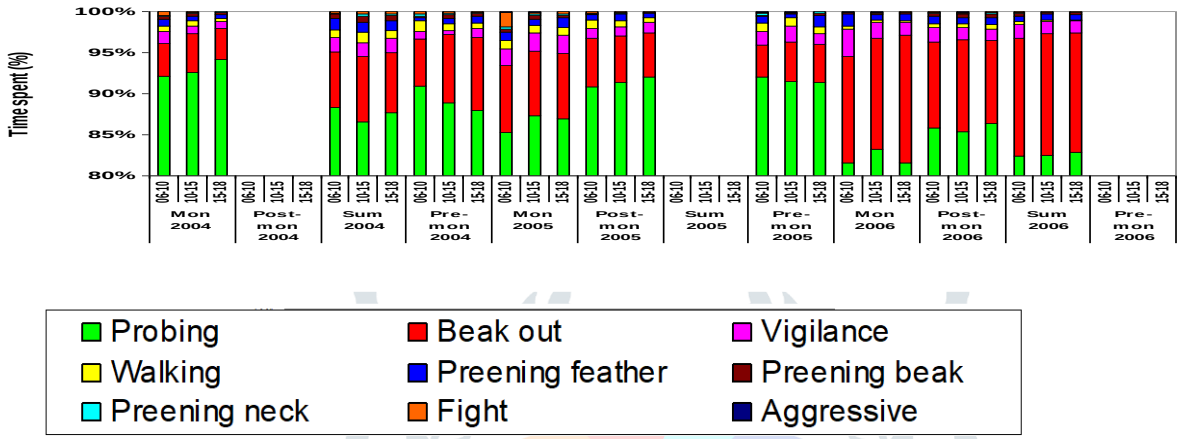
The distribution of shorebirds among habitats has been linked to a variety of factors, including: habitat preferences of species, seasonal abundance, long term population trends, use of habitats and movement between habitats (Connors *et al*., 1981; Myer *et al*., 1984; Burger *et al*., 1997). Differences in habitat use by different species have been widely observed in both macrohabitats and microhabitats (Brush, 1995; Long and Ralph, 2001). Each shorebird species differentially exploits a given type of habitat (Hayes and Fox, 1991), although they often use all the habitats (Burger *et al*., 1997b). Prey composition and distribution among habitats and competition for different prey items may have a direct influence on the habitat use of shorebirds (Davis and Smith, 2001) and therefore shorebird species form guilds which show high similarities of diets (Skagen and Oman, 1996). Hence it is aimed to assess the intra and inter specific associations between the various water bird species and the Greater Flamingo in the swamp.Furthermore, Sumathi *et al.* (2008) found that the Flamingos feed on plankton rich areas of swamp in Point Calimere Wildlife and Bird Sanctuary, Southern India. Flamingos (Phoenicopteridae) are highly specialized filter feeders with their beak well adapted to feed on very small particles, compared to other birds of similar size (Mascitti and Kravetz, 2002).

Greater Flamingo (*Phoenicopterus ruber roseus*) is larger and feeds mainly on invertebrates such as brine flies (*Ephydra*), shrimps *(Artemia*), molluscs *(Cerithium*), chironomids, polychaetes and amphipods which they obtain from mud by

ooze feeding (Ali,1981). Birds that feed on aquatic habitats use a variety of foraging techniques from diving (cormorants, shags and pelicans) to mud probing (plovers and sandpipers). Shorebirds detect prey by visual and tactile sensory mechanisms, exhibiting a wide range of feeding styles such as pecking, probing, stabbing, sweeping, ploughing (Ntiamoa-Baidu *et al*., 1998). Often individuals of single species uses a wide variety of foraging techniques depend upon the prey they consume (Hulscher, 1996, Edwards *et al*., 2007). Selection and adaptation of a particular foraging technique depend upon the prey characteristics and environmental factors (Edwards *et al*., 2007).

Hence this research focus to find out the foraging techniques adapted and changes in the probing by Flamingoes in the swamps of Point Calimere Wildlife and Bird Sanctuary. Knowledge of daily activity patterns is essential for the construction of time energy budgets and evaluating foraging and survival strategies of animals in seasonal environments (Risenhoover, 1986). So, time allocation of Greater Flamingo while foraging in the swamp during different seasons is analyzed in the present research. To analyse the habitat utilization and time activity pattern of use of different areas of the swamp, in order to understand their patterns of use of different areas of the swamp in different seasons. To investigate the foraging ecology of Greater Flamingo in the swamp by documenting their food items, method of foraging, food preferences and prey characteristics influencing their use by the Flamingos.

Fig. 2.2: Per cent time spent by Greater Flamingo on various activities in different time blocks across different seasons[a] of study period in the swamp of Point Calimere Wildlife and Bird Sanctuary, Tamilnadu, Southern India. Note that the 'X' axis starts from 80%.



[a]Mon = Monsoon ; Post-mon = Post-monsoon; Sum = Summer; Pre-mon = Pre-monsoon

4. CONCLUSION AND RECOMMENDATION

The knowledge on the biology or behaviours of these birds provides useful information that could inform conservation particularly in urban areas where birds are increasingly being threatened by human persecution. Further, this particular study highlights some useful information that could be used for planning bird utilization programs particularly through birdwatching and avitourism. Further, the results strongly supported the hypotheses stated earlier in the introduction. The resulted are useful as baseline and provide opportunities for broader assessment of other bird species in order to build strong knowledge on many species. Future studies should look into the how the bird behaviours are related to bird persecution in different areas of the swamp.

REFERENCES

Ali, 1981. *Ecological reconnaissance of Vedaranyam Swamp*, Thanjavur Dist., Tamilnadu. Annual Report. Bombay Natural History Society, Bombay.

Altman, J.1974. Observation study of behaviour sampling methods. *Behaviour*. 49 (34): 227-265.

Balachandran, S. 2007. Decline of coastal birds along the south-east coast of India. *Zool. Surv. India National Symposium on Conservation and valuation of Marine Biodiversity*: 41-51

Balachandran, **S.** and Dasfidar, D.G. 2006. *Restoration of Point Calimere (The Great Vedaranyam Swamp), A designated Ramsar site for the Benefit of Fisheries and Migrant water birds.* Progress report, Bombay Natural History Society, Bombay.

Baruah, A.D. 2005. Point Calimere Wildlife and Bird Sanctuary. Tamilnadu Forest Department, Publication, Nagapattinam .

Bethke, R.W. 1991. Seasonality and interspecific competition in waterfowl guilds: a comment. *Ecology*: 72-1115- 1158.

Bethke, R.W., and Nudds, T.D. 1995. Effects of climate change and land use on duck abundance in Canadian prairie-parklands. *Ecol. Appl* 5: 588–600.

Burger, J., Howe, M.A., Hahn, D.C., Chase, J. 1997a. Effects of tide cycles on habitat selection and habitat partitioning by migrating shorebirds. *Auk*. 94: 743–758.

Burger, J., Niles, L., Clark, K.E. 1997b. Importance of beach, mudflat and marsh habitats to migrant shorebirds on Delaware Bay. *Biol Conserv*. 79: 283–292.Caziani, S.M. and Derlindati, E. 2000. Abundance and Habitat of High Andes Flamingos in Northwestern Argentina. *Waterbirds*. (Special publication 1) 23: 121-133.

Brush, T. 1995. Habitat use by wintering shorebirds along the lower Laguna-Madre of South Texas. *Tex. J. Sci*. 47:179–190.

Connors, P.G., Myers, J.P., Connors, S.W., and Pitelka, F.A. 1981. Interhabitat movements by sanderlings in relation to foraging profitability and the tidal cycle. *Auk.* 98, 49-64.

DuBowy, P.J. 1988. Water fowl communities and seasonal environments: temporal variability in interspecific competition. *Ecology*. 69: 1439-1453.

Davis, C.A., Smith, L.M. 2001. Foraging strategies and niche dynamics of coexisting shorebirds at stopover sites in the southern Great Plains. *Auk*. 118: 484–495.

Edwards, R., Rossiter, L and Nagarajan, R. 2007. Foraging strategies Oystercatchers (*Haematopus ostralegus*) on rocky shores: influence of tide, substrate and kleptoparasitism. *J. Sci. Trans. Environ. Technov.* 1: 29-35.

Filipello, A.M., Lopez de Casenave, J. (1993). Variacion estacional de la comunidad de aves acuaticas de la Reserva Constanera Sur. Rev,Mus Arg Cs Nat B Rivada via *Ecologia* 4:1-15.

Hayes, F.E., Fox, J.A. 1991. Seasonality, habitat use, and flock sizes of shorebirds at the Bahia-De-Asuncion, Paraguay. *Wilson. Bull*.103: 637–649.

Hulsher, J. B. 1996. Food and feeding behaviour. *In:* J.D. Goss-Custard (ed.) The Oystercatcher: from individuals to population: 7-29. Oxford University Press. Oxford.

Lopez de Casenvae. J. and Filipello, A.M. 1995. Las Aves acuaticas de la Reserva Costanera Sur: cambios estacionales en la composicion especifica y en la abundancia de poblaciones y gremios. Hornero 14: 9-14

Long, L.L., Ralph, C.J. 2001. Dynamics of habitat use by shorebirds in estuarine and agricultural habitats in northwestern California. *Wilson Bull* 113: 41–52.

Mascitti, V. and Kravetz, F.O. 2002. Bill morphology of South American flamingos. *Condor* 104:73-83.

Myers, J.P. 1983. Conservation of migrating shore birds: staging areas, geographic bottle necks, and regional movements. *American Birds* 37: 23–25.

Myers, J.P., Schick, C.T. and Hohenberger, C.J. (1984). Notes on the 1983 distribution of sanderlings along the United States Pacific coast. *Wader Study Group Bulletin* 40, 22-26.

Nagarajan, R. and Thiyagesan, K. 2006. The effects of coastal shrimp farming on birds in Indian mangrove forests and tidal flats. *Acta Zoologica Sinica* 52 (Supplement): 541–548.

Ntiamoa-Baidu, Y., Piersma, T., Wiersma, P., Poot, M., Battley, P., Gordon, C. 1998. Water depth selection, daily feeding routines and diets of waterbirds in coastal lagoons in Ghana. *Ibis*: *40*: 89–103.

Sampath, K. and Krishnamurthy, K. 1989. Birds of Pichavaram Mangroves and the adjoining coastal Environs. *J.Ecol.Sci.*6; 24-38.

Sampath, K. and Krishnamurthy, K. 1990. Birds fauna and limnology of the Koliveli tank, Tamilnadu. pp 47-48. *In* Proc. Seminar on wetland ecology and management, Bombay Natural History Society. Keoladeo National Park, Barathpur, 23-35, February 1990. 154p.

Skagen, S. K., Oman, H.D. 1996. Dietary flexibility of shorebirds in the western hemisphere. *Can. Field. Nat.* 110: 419– 444.

Sumathi,T., Nagarajan, R. and Thiyagesan, K.2008. Effect of water depth and salinity on the population of Greater Flamingo (*phoenicopterus ruber*) in Point Calimere wildlife and bird sanctuary, Tamilnadu, southern India. *J. Sci. Trans. Environ. Technov*. 2: 9-17.

Thiyagesan, K. and Nagarajan, R. 1995. Impacts of developmental projects on the wetlands in two coastal districts of Tamilnadu, southern India. *Asian Wetland News* 8: 8.

Thiyagesan, K. and Nagarajan, R. 1997. Effects of a cyclone on waterbird populations at the Pichavaram mangroves, Southern India. *Wader Study Group Bulletin* 80: 47–51.