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continued on the back inside cover

Cover: Mugger Crocodile basking on the banks of Savitri River at Mahad in Maharashtra, India. © Utkarsha M. Chavan.



Notes on the nesting and foraging behaviours of the Common Coot *Fulica atra* in the wetlands of Viluppuram District, Tamil Nadu, India

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Abstract: The nesting and foraging behaviours of the Common Coot *Fulica atra* were studied in the wetlands of Viluppuram District, Tamil Nadu during the breeding season. A total of 4,054 individuals of Common Coot including 467 juveniles and 1,327 nests were enumerated. Of the 1,327 nests, 1,191 were built on *Ipomoea carnea* vegetation and 136 on open water. The birds used twigs of *Ipomoea carnea* and various parts of eight other plant species as nest material. The nests were elliptical in shape, with flattened upper surfaces containing nest cup and a ramp-like structure each. 49.96 % of nests were found within 50 m distance from the edge of wetlands. A total of 16 plant species were identified as food sources including five algal species, such as *Aphanothece stagnina*, *Spirogyra irregularis*, *Chara flaccida*, *C. vulgaris*, and *C. zeylanica*. The Common Coots maintained strict territory during the breeding season and no other water birds were observed in the vicinity of their nesting and foraging sites. Even after completion of the breeding season, sporadic nesting was observed by a few pairs till June 2022.

Keywords: Chick behaviour, foraging plants, nest cup, nest materials, open nests, reproduction.

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INTRODUCTION

The Eurasian Coot or Common Coot *Fulica atra* (Linnaeus, 1758) (Aves: Gruiformes: Rallidae) is a sexually monomorphic, monogamous, gregarious, aggressive, and territorial bird. The Common Coot occurs as an extant species (resident) in India, Sri Lanka, Nepal, Bangladesh, Pakistan, Afghanistan, Bhutan, China, France, Germany, Egypt, Saudi Arabia, and the United Kingdom (BirdLife International 2019). The Common Coot has four subspecies, namely *Fulica atra atra* of India, southeastern Asia, Philippines, Europe, and northern Africa to Japan; *Fulica atra lugubris* of Java, Bali, northeastern New Guinea; *Fulica atra novaeguineae* of Central New Guinea and, *Fulica atra australis* of Australia and New Zealand (Gill et al. 2020). The IUCN Red List of Threatened Species has classified the species as 'Least Concern' (BirdLife International 2019).

The reproductive biology of the Common Coot was studied in North-east Algeria (Samraoui & Samraoui 2007) and in Heilongjiang Province of China (Zhang et al. 2018). Common Coots have been reported breeding in Gujarat (Himmatsinhji et al. 1991; Patel et al. 1998), Maharashtra (Khacher 1978), Andhra Pradesh (Nadarajan et al. 1993), and Tamil Nadu (Balachandran 1994; Santharam 1996). No other literature is available on the nesting and foraging behaviours of the Common Coot in Tamil Nadu. In order, to fill the gap, the present study was carried out.

In this study, I documented the number of birds and nests, and the roosting and foraging habits of the Common Coot in the wetlands of Viluppuram District in Tamil Nadu. This study aimed to investigate the number of individuals of the Common Coot inhabiting the wetlands during the breeding season, the source of their nesting materials and food, and the total number of nests. Additionally, roosting and foraging behaviours and interactions with other bird species were addressed.

MATERIALS AND METHODS

Study area

The present study was carried out at 30 sites in the wetland areas covering 29 villages in the Viluppuram District (12.0579°N & 79.5603°E), of Tamil Nadu (Table 1). Except for the Veedur reservoir other wetlands are seasonal and found dry during the summer months of June–August. These wetlands get filled in the Northeast monsoon during October–December every year. The vegetation at the study sites mainly consisted of herbs

like *Ipomoea carnea*, reeds/grass *Typha angustifolia*, and *Chrysopogon zizanioides*, and trees such as *Vachellia nilotica* and *Prosopis juliflora*. Agriculture is the primary occupation in the district. The major crops of the area are Paddy *Oryza sativa*, Jowar *Sorghum bicolor*, Pearl Millet *Pennisetum glaucum*, Finger Millet *Eleusine coracana*, Foxtail Millet *Setaria italica*, Sugarcane *Saccharum officinarum*, and Pulses, such as Black gram *Vigna mungo*, Green gram *Vigna radiata*, and Pigeon pea *Cajanus cajan*. Temperature ranges 36–20 °C. The average annual rainfall is 1,060 mm (Viluppuram 2021).

Methods

With the help of two field assistants, the survey was conducted in the wetlands of Veedur Reservoir and wetlands of other areas in the district between 0545 and 1800 h, during the breeding season from the third week of December 2021 to the fourth week of March 2022. The number of birds was counted by following the total count method (Bibby et al. 2000) when the birds were foraging. Bird census was carried out over three monthly sessions during the second week of every month for three months and the bird population size was arrived at as the average of each session's total count. Chicks at various developmental stages were counted during March 2022. Variables such as nesting sites, sources of nest materials, and food sources, such as algae and angiosperm plants foraged by the birds were identified. The distance between the nests and the edges of water bodies was measured using measurement tape after the breeding season. The distance between the nests and edges of the water body was grouped into intervals 0–50, 51–100, 101–150, and 151–200 m. The exterior length and width of the nests as well as the length, width, depth of nest cups, and the height of nests above the water level were measured using a measuring tape after the nests (20) were abandoned by the birds. The count of adult, and juvenile birds, their roosting and foraging activities, and interactions with other water bird species within the wetland were observed using binoculars from a safe distance (ca. 30 m). All the guidelines and protocols of nesting studies, as prescribed by Barve et al. (2020) were followed scrupulously. No eggs, chicks, and adult birds were handled during the study. The locations of nesting sites were determined using Garmin Etrex 20x GPS device. Photographs and videos were taken using Nikon P1000 digital camera. The collected data were tabulated, analyzed and shown as a graphical representation.

RESULTS

A total of 3,587 adult individuals, 467 chicks, and 1,327 active nests of the Common Coot were enumerated in 30 water bodies. Out of 1,327 nests, 89.75% of nests ($n = 1,191$) were found constructed in the thick vegetation of *Ipomoea carnea* (Figure 2d,e) and 10.25% of nests ($n = 136$) were found constructed in open water (Figure 2a–c). At the end of the breeding season, a total of 467 chicks were enumerated (Table 1).

Nest construction

Nine plant species belonging to seven genera and seven families were utilized by the Common Coot as nesting materials. Of the nine plant species, eight were dicotyledons and one monocotyledon. The birds utilized various plant parts such as twigs, petioles, leaves, inflorescence, and even entire plants as nesting material. During nest construction, Common coots used live and dead twigs of *I. carnea*, formed base-like structures for nests and added dry twigs brought from nearby places. The nests are elliptical with a flattened upper surface containing the nest cup. The major part of the nest consisted of twigs of *I. carnea*. Open nests were built on leaves of *Nymphaea* spp. or *Aponogeton natans* using the twigs of *I. carnea* along with various parts of other plant species (Table 2). Moreover, they added leaves and inflorescence of grass *C. zizanoides* in the inner surface of the nest cup as egg lining. Even during incubation, many nests contained partly eaten fruits of species of genera *Nelumbo* and *Nymphaea* (Image 1,3b).

Abandoned nests ($n = 20$) after the breeding season revealed that the nests were found 12–18 cm height above the water level. The entire length of the nests including nest cups was in the range of 64.7 ± 21.79 cm and the width was in the range of 46.95 ± 17.56 cm. The length of the elliptical-shaped nest cup was in the range of 21.3 ± 3.29 cm and the width of the nest cup was 9.85 ± 2.52 cm. The depth of the nest cup was in the range of 7.45 ± 2.63 cm.

Distance between the edges of water bodies and the locations of nests (both open nests and nests on vegetation) revealed that a maximum of 49.96 % of nests ($n = 663$) occurred within 50 m distance from the edges and 1.88% of nests ($n = 25$) between 151 and 200 m distance from edges of water bodies. The percentage of nests that occurred at various distance interval ranges is given in Figure 2. The clutch size ranged 3–8 eggs.

The study revealed that the adult birds continued to expand their nests even after the chicks had grown by adding plant materials and used the nests as roosting

sites. It was observed that chicks also brought plant materials and added them to the nests. The size of the nest cup was relatively small when compared to the overall upper surface area of the nest. Apart from the nest cup, each nest contained a peculiar ramp-like structure on the margin. Whenever residents entered the water to harvest lotus/lilies or for fishing, young chicks jumped into the water, swam, temporarily hid in the nearby *I. carnea* vegetation and later returned to the nests by climbing through the ramps (Image 2j,k). Even partly grown-up chicks used the ramps to climb into their nests. The present study revealed that the breeding of the Common Coot concluded during the fourth week of March 2022. Sporadic nesting (11 nests in May and eight nests in June), however, was observed till the second week of June 2022.

Foraging

In the present study, 16 plant species belonging to nine families foraged by the Common Coot were observed. Out of the 16 species, five were algae (thallophytes), a solitary grass species *C. dactylon* (monocotyledon) and the remaining 10 species were dicotyledons. The Common Coots swallowed entire colonies of blue-green alga *Aphanothece stagnina* and thalli of macro green algae *Spirogyra irregularis* and *Chara* spp. The birds usually dive into the water and cut off fruits of *Nelumbo nucifera* and *Nymphaea* spp. along with peduncles submerged in water, take them and placed them in the nests, pluck seeds using beaks, and feed their chicks. Adults were also observed consuming such seeds. Apart from hydrophytes, adult birds were found foraging on terrestrial plants, such as *C. dactylon* and *Phylla nodiflora* on the banks of water bodies. A list of plant species and their parts consumed by the birds is given in Table 3. In three instances, the adults collected small insects on the leaves of *Nymphaea* spp. and placed them in front of young chicks in the nests and the chicks swallowed the prey. Eight abandoned nests contained empty shells of snails.

Chicks

A total of 467 chicks at various developmental stages were enumerated at the end of the breeding period. Eighty-nine adults were found moving with a single chick each, 81 adults had two chicks each, 41 adults had three chicks each, eight adults had four chicks each, and the remaining 61 chicks were found wandering independently without any adult/parent birds probably because the parents had abandoned them or the parent birds might have been killed by predators (Image 2f,g).

Table 1. Details of nesting sites, number of birds, nests, distance from water body edges, and chicks of Common Coot counted in the study area.

	Name of the village/ study sites	GPS coordinates	Lake/ pond	Number of adult birds counted	Number of active nests counted	Open nests	Nests found in bushes	Number of nests located from edges of water bodies				Total number of chicks counted
								0–50 m	51–100 m	101–150 m	151–200 m	
1	Veedur	12.073201°N–79.620535°E	Reservoir	45	16	10	6	0	2	3	11	12
2	Veedur	12.072787°N–79.621395°E	Lake	320	62	28	34	14	27	7	14	72
3	Vallam	12.253836°N–79.512884°E	Lake	130	41	3	38	35	6	0	0	11
4	Alagramam	12.174401°N–79.577836°E	Lake	600	230	20	210	30	110	90	0	60
5	Keezhedayalam	12.170917°N–79.628823°E	Lake	170	78	4	74	32	12	34	0	22
6	Thenkalavai	12.178328°N–79.642219°E	Lake	18	6	0	6	2	2	2	0	8
7	Annamputhur	12.173768°N–79.674404°E	Lake	169	56	0	56	27	9	20	0	12
8	Omandur	12.170285°N–79.684428°E	Lake	8	2	0	2	0	1	1	0	0
9	Urani	12.154740°N–79.907088°E	Lake	260	110	10	100	70	40	0	0	43
10	Munoor	12.188669°N–79.813499°E	Lake	68	17	0	17	13	4	0	0	7
11	Thenkolapakam	12.122414°N–79.633937°E	Lake	10	4	0	4	3	1	0	0	6
12	Ponnampoondi	12.050018°N–79.622626°E	Lake	320	130	20	110	70	60	0	0	23
13	Eraiyr	12.064028°N–79.649245°E	Lake	210	65	0	65	35	20	10	0	17
14	Ambuzhukai	12.053135°N–79.652319°E	Lake	215	110	25	85	60	50	0	0	34
15	Pomboor	12.039517°N–79.601541°E	Lake	2	1	0	1	0	1	0	0	0
16	Siruvai	12.085022°N–79.605374°E	Lake	12	3	0	3	2	1	0	0	6
17	Kooteripet	12.152769°N–79.602806°E	Lake	12	4	0	4	2	1	1	0	0
18	Kodima	12.168730°N–79.596345°E	Lake	22	9	0	9	6	3	0	0	0
19	Kenipet	12.172076°N–79.606865°E	Lake	27	11	0	11	8	3	0	0	9
20	Thenpasiyar	12.188961°N–79.613161°E	Lake	70	29	4	25	23	6	0	0	0
21	Jakkampettai	12.188895°N–79.610063°E	Lake	32	13	0	13	9	4	0	0	8
22	Karnavoor	12.195530°N–79.651071°E	Lake	278	112	12	100	59	53	0	0	34
23	Deevanur	12.259598°N–79.557778°E	Lake	73	29	0	29	21	8	0	0	12
24	Mannampoondi	12.292093°N–79.557769°E	Lake	43	16	0	16	12	4	0	0	5
25	P.S. Palayam	11.962182°N–79.634326°E	Lake	10	4	0	4	3	1	0	0	0
26	Sorathur	12.206139°N–79.458818°E	Lake	36	16	0	16	9	7	0	0	0
27	Kanniyam	12.087708°N–79.635536°E	Lake	14	6	0	6	4	2	0	0	0
28	Kallakulathur	12.128919°N–79.649977°E	Lake	212	76	0	76	55	17	4	0	45
29	Vengai	12.164787°N–79.659901°E	Lake	22	7	0	7	4	3	0	0	0
30	Kazhuveli	12.150835°N–79.905336°E	Lake	179	64	0	64	55	9	0	0	21
Total				3587	1327	136	1191	663	467	172	25	467



Image 1. Nest types of Common Coot in the study area. a—An individual Common Coot searching nest site | b & c—Open type nests, and | d—Nest built on *Ipomoea carnea* vegetation. © M. Pandian.

Interactions with other birds and threats

Common Coots maintained strict nesting territory during the breeding season and no other water birds were observed in the vicinity of their nesting and foraging sites. Other water bird species, such as Little Egret *Egretta garzetta*, Lesser Duck *Aythya affinis*, Indian Spot-billed Duck *Anas poecilorhyncha*, Pheasant-tailed jacana *Hydrophasianus chirurgus*, Little Grebe *Tachybaptus ruficollis* and Lesser Whistling Duck *Dendrocygna javanica* were found foraging in the water bodies where nests of the Common Coot occurred. Individual Common Coots used to chase/attack when other bird species come in the vicinity of their nesting and foraging sites. Other bird species stop their activities like swimming, foraging, preening, or perching on aquatic plants, and become alert and ready to escape whenever a Common Coot moves nearby. In four instances, individuals of Pheasant-tailed Jacana used abandoned nests of Common Coot as a day roost. Fishing by locals caused disturbance to the foraging of adults and chicks. No killing of adult birds/ nest predation, however, was observed (Image 4).

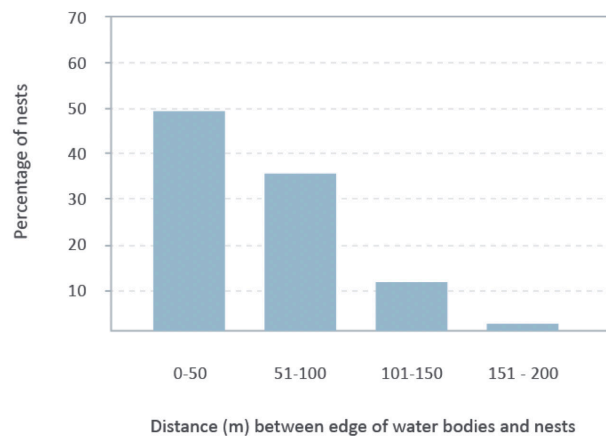
DISCUSSION

Nest construction

In southern Algeria, 63.2% of nests of Common Coot were associated with *Phragmites australis* probably to reduce predation risk from the air (Samraoui & Samraoui 2007). Emergent vegetation is important for habitat selection by Coots, presumably because it provides nesting habitats and protection against aerial predators (Nieoczym & Kloskowski 2018). In the present study, 89.75% of nests were built in emergent vegetation *I. carnea* probably to avoid aerial predators as stated by Samraoui & Samraoui (2007) and Nieoczym & Kloskowski (2018). Most of the nests of Common Coot were associated with *T. angustifolia* in Algerian Sahara (El-Yamine et al. 2018). Though *T. angustifolia* reeds occurred abundantly in the present study area, the birds did not build nests on these reeds, whereas they preferred *I. carnea* vegetation. The study also revealed that 50% of the nests occurred within 0–50 m and another 35.19% of nests occurred within 51–100 m

Table 2. List of plant species used as nest materials by the Common Coot in the study area. d—Nest built on *Ipomoea carnea* vegetation.

	Name of the plant	Family	Plant parts used as nest materials
1	<i>Ipomoea carnea</i> Jacq.	Convolvulaceae	Twigs
2	<i>Nymphaea pubescens</i> Willd.	Nymphaeaceae	Leaves and petiole
3	<i>Nymphaea nouchali</i> Burm.f.		Leaves and petiole
4	<i>Aponogeton natans</i> (L.) Engl. & K. Krasuse	Aponogetonaceae	Entire plant
5	<i>Polygonum hydropiper</i> (L.) Delabre	Polygonaceae	Twigs
6	<i>Polygonum barbatum</i> L.		Twigs
7	<i>Pentapetes phoenicea</i> L.	Malvaceae	Twigs
8.	<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrocharitaceae	Twigs
9	<i>Chrysopogon ziznoides</i> (L.) Roberty	Poaceae	Leaf blades and inflorescence.

**Figure 1.** Details of the percentage of nests found from the edges of water bodies.

distance from edges of water bodies. The construction of the highest number of nests near the banks is probably due to the shallow water containing emergent *I. carnea* vegetation, the availability of abundant nest material and food sources like algae and other hydrophytes. Studies over larger geographical areas, however, may throw light on the causes for the construction of more nests near the edges of water bodies.

Common Coots rarely raise two broods per season (Taylor 1998). The present study reveals that despite the conclusion of breeding during the fourth week of March 2022, sporadic nesting by a few pairs continued till the second week of June 2022. It was not possible to ascertain whether these were cases of late breeding or it was a second breeding in the year. Nests often

Table 3. List of plant species and their parts fed by the Common Coot in the study area.

	Name of the plant	Family	Plant parts used
1	<i>Aphanothece stagnina</i> (Spreng.) A. Braun	Cyanophyceae	Entire algal colony.
2	<i>Spirogyra irregularis</i> Ngeli ex Kutzing	Zygnemataceae	Entire algal colony.
3	<i>Chara flaccida</i> A. Braun	Charophyceae	Entire algal thallus.
4	<i>Chara vulgaris</i> (L.)		Entire algal thallus.
5	<i>Chara zeylanica</i> Klein ex Willd.		Entire algal thallus.
6	<i>Hydrilla verticillata</i> (L.f.) Royle	Hydrocharitaceae	Entire plant.
7	<i>Ottelia alismoides</i> (L.) Pers.		Stem, young buds, leaves, and flowers.
8	<i>Nechamandra alternifolia</i> (Roxb. ex Wight) Thwaites		Stem, Leaves, and flowers.
9	<i>Najas minor</i> All.		Entire plant
10	<i>Ceratophyllum demersum</i> (L.)	Ceratophyllaceae	Entire plant
11	<i>Lemna gibba</i> (L.)	Lemnaceae	Entire plant
12	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Leaves
13	<i>Nelumbo nucifera</i> Gaertn.	Nymphaeaceae	Stamen, pistil, and seeds
14	<i>Nymphaea pubescens</i> Willd.		Stamen, pistil, and seeds.
15	<i>Nymphaea nouchali</i> Burm.f.		Stamen, pistil, and seeds
16	<i>Phylla nodiflora</i> (L.) Greene	Verbenaceae	Leaves, tender stems, and inflorescence.

remain used by the family for roosting (Taylor 1998). In the study sites, adult Common Coots with their juveniles not only used their nests for roosting but also expanded the existing nests further by adding fresh nest materials. These observations corroborate the findings of Taylor (1998).

Foraging

The Common Coot is omnivorous, feeding on small prey, eggs of other birds, algae, vegetation, seeds and fruits (Martin et al. 1997). Sago pondweed *Stuckenia pectinata* in France and Germany (Allouche & Tamisier 1984; Hilt 2006) and Watermilfoil *Myriophyllum verticillatum* and horn-wort *Ceratophyllum demersum* in China are their main sources of food (Wang et al. 1990; Zhang & Ma 2011). Submerged vegetation is an important food source for Common Coot and it is positively related to its breeding success (Nieoczym & Kloskowski 2018). The Common Coots exhibit considerable plasticity in their foraging behaviours by foraging on a wide range of plants and animal materials,

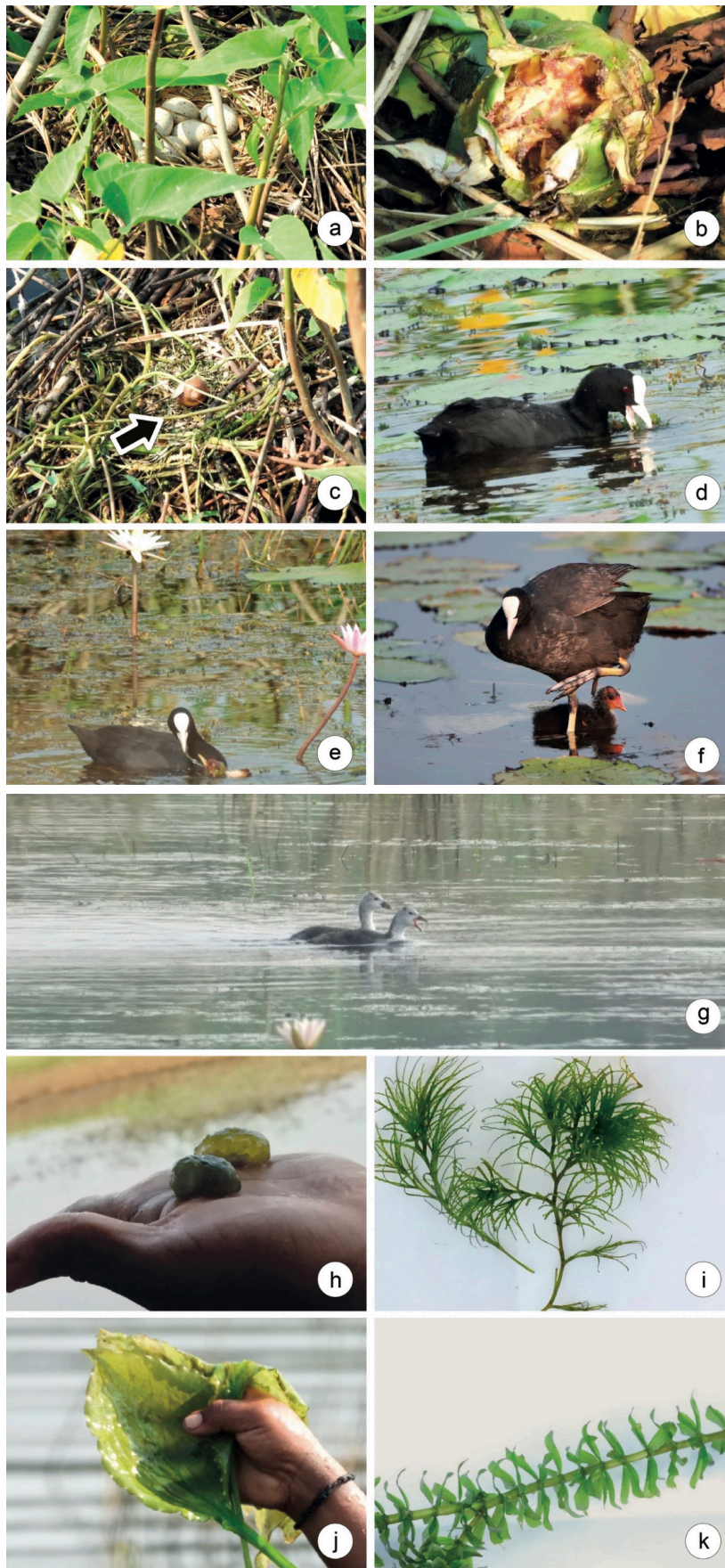


Image 2. Nest and foraging habits of Common Coot in the study area. a—Nest found hidden in *Ipomoea carnea* vegetation | b—Nest containing a partly eaten fruit of *Nymphaea* spp. | c—An empty shell of snail in nest cup | d—Common Coot consuming *Hydrilla verticillata* plant | e—Common Coot swallows thalli of blue-green alga *Aphanothece stagnina* | f—Foraging adult bird with a solitary chick | g—Two chicks foraging without a parent | h—Colonies of blue-green alga *Aphanothece stagnina* | i—*Chara zeylanica* thallus | j—Leaves of *Otella alsinoides* | k—*Hydrilla verticillata* plant. © M. Pandian.



Image 3. Threats and interactions with other bird species. a—Residents fishing in the study site | b—A chick jumped out of its nest and swims on seeing a fisherman, and | c—Lesser-whistling duck escapes on seeing Common Coot. © M. Pandian.

such as algae, macrophytes, seeds, insects, and benthic invertebrates (Draulans & Vanherck 1987; Howes & Perrow 1994). In the present study area, diverse animal/plant species, such as snails, insects, five algal species, and eleven macrophytes including submerged, floating and terrestrial plants played an important role as a food source of Common Coots. Hence, the present study corroborates the findings of Martin et al. (1997), Draulans & Vanherck (1987), Howes & Perrow (1994), and Nieoczym & Kloskowski (2018).

CONCLUSION

The present study area harbours 4054 individuals of Common Coot including 467 juveniles and 1327 nests. Birds collected nest material mainly from *I. carnea* and eight other plant species for the construction of nests. The wetland habitats contained a wide range of food materials and nesting sites. Despite rapid urbanization, industrialization, population increase, habitat destruction, and decreasing areas of wetlands,

considerable populations of the Common Coot exist in the study area. A special management plan could be devised for the area, considering the anthropogenic pressures on the habitats like fishing, and harvesting of flowers and reeds by residents.

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Communications

New records of pteridophytes in Mount Matutum Protected Landscape, South Central Mindanao, Philippines with notes on its economic value and conservation status

– Christine Dawn Galope-Obemio, Inocencio E. Buot Jr. & Maria Celeste Banaticla-Hilario, Pp. 22039–22057

Some threatened woody plant species recorded from forests over limestone of the Philippines

– Inocencio E. Buot Jr., Marne G. Origenes, Ren Divien R. Obeña, Elaine Loreen C. Villanueva & Marjorie D. delos Angeles, Pp. 22058–22079

Status of mangrove forest in Timaco Mangrove Swamp, Cotabato City, Philippines

– Cherie Cano-Mangaoang, Zandra Caderon Amino & Baingan Brahmin Mastur, Pp. 22080–22085

A comparative analysis of the past and present occurrences of some species of *Paphiopedilum* (Orchidaceae) in northeastern India using MaxEnt and GeoCAT

– Debonina Dutta & Aparajita De, Pp. 22086–22097

Foraging activity and breeding system of *Avicennia officinalis* L. (Avicenniaceae) in Kerala, India

– K. Vinaya & C.F. Binoy, Pp. 22098–22104

Diversity patterns and seasonality of hawkmoths (Lepidoptera: Sphingidae) from northern Western Ghats of Maharashtra, India

– Aditi Sunil Shere-Kharwar, Sujata M. Magdum, G.D. Khedkar & Supriya Singh Gupta, Pp. 22105–22117

Population trends of Mugger Crocodile and human-crocodile interactions along the Savitri River at Mahad, Maharashtra, India

– Utkarsha Manish Chavan & Manoj Ramakant Borkar, Pp. 22118–22132

Paresis as a limiting factor in the reproductive efficiency of a nesting colony of *Lepidochelys olivacea* (Eschscholtz, 1829) in La Escobilla beach, Oaxaca, Mexico

– Alejandra Buenrostro-Silva, Jesús García-Grajales, Petra Sánchez-Nava & María de Lourdes Ruiz-Gómez, Pp. 22133–22138

Notes on the nesting and foraging behaviours of the Common Coot *Fulica atra* in the wetlands of Viluppuram District, Tamil Nadu, India

– M. Pandian, Pp. 22139–22147

Population abundance and threats to Black-headed Ibis *Threskiornis melanocephalus* and Red-naped Ibis *Pseudibis papillosa* at study sites in Jhajjar district, Haryana, India

– Anjali & Sarita Rana, Pp. 22148–22155

Crop raiding and livestock predation by wildlife in Khaptad National Park, Nepal

– Ashish Bashyal, Shyam Sharma, Narayan Koirala, Nischal Shrestha, Nischit Aryal, Bhupendra Prasad Yadav & Sandeep Shrestha, Pp. 22156–22163

Review

An annotated checklist of odonates of Amboli-Chaukul-Parpoli region showing new records for the Maharashtra State, India with updated state checklist

– Dattaprasad Sawant, Hemant Ogale & Rakesh Mahadev Deulkar, Pp. 22164–22178

Short Communications

The new addition of Blue Pimpernel of Primulaceae to the state flora of Assam, India

– Sushmita Kalita, Barnali Das & Namita Nath, Pp. 22179–22183

A new species of genus *Neocerura* Matsumura, 1929 (Notodontidae: Lepidoptera) from India

– Amritpal Singh Kaleka & Rishi Kumar, Pp. 22184–22189

Rediscovery of an interesting preying mantis *Deiphobella laticeps* (Mantodea: Rivetiniidae) from Maharashtra, India

– Gauri Sathaye, Sachin Ranade & Hemant V. Ghate, Pp. 22190–22194

Camera trapping records confirm the presence of the elusive Spotted Linsang *Prionodon pardicolor* (Mammalia: Carnivora: Prionodontidae) in Murlen National Park (Mizoram, India)

– Amit Kumar Bal & Anthony J. Giordano, Pp. 22195–22200

Notes

First sighting record of the Orange-breasted Green-Pigeon *Treron bicinctus* (Aves: Columbiformes: Columbidae) from Chittaranjan, West Bengal, India

– Shahbaz Ahmed Khan, Nazneen Zehra & Jamal Ahmad Khan, Pp. 22201–22202

Book Reviews

Decoding a group of winged migrants!

– Review by Priyanka Iyer, Pp. 22203–22204

First steps of citizen science programs in India

– Review by Aishwarya S. Kumar & Lakshmi Nair, Pp. 22205–22206

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