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GLIMPSES OF BIODIVERSITY IN THE KADALUNDI-VALLIKUNNU COMMUNITY RESERVE

THE FIRST COMMUNITY RESERVE OF KERALA

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ICAR-Central Marine Fisheries Research Institute
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Foreword

Biodiversity is the mainstay of ecosystem services and functions and supports the livelihood of millions of people. Sustainable utilization and conservation of our rich biological diversity is a pre-requisite for human survival. India is a megadiverse country and with only 2.4% of the world's geographical area, it accounts for 7 to 8% of all recorded species. Our country is a signatory to various international instruments focussing on matters of biodiversity, including the Convention on Biological Diversity (CBD). The country has an obligation to protect our rich biological diversity and is one of the leaders in having established a comprehensive legal and institutional system to achieve the objectives of the CBD. Expansion of India's Protected Area (PA) network, including 'Conservation and Community Reserves' is one of the important action points of the National Biodiversity Action Plan of our country.

The Kadalundi-Vallikunnu Community Reserve which lies in the Malabar region is the first Community Reserve of Kerala and is known for its rich biological diversity. Endowed with dense mangrove forests and mudflats, the Community Reserve is an abode to a large number of avian fauna, including many migratory species. Fishing and eco-tourism have been the mainstay of income generation for many local inhabitants of the Community Reserve. Considering the ecological significance, diversity of wetland avian fauna and the burden of heavy anthropogenic pressures, the Kadalundi estuary was officially declared as the 'Kadalundi-Vallikunnu Community Reserve' in October, 2007.

Bio-inventorying and documentation of biodiversity is invaluable for the wise use of our ecosystems and the sustainability of biological resources. This publication is an outcome of a detailed study conducted by the ICAR-Central Marine Fisheries Research Institute in collaboration with the Kerala State Biodiversity Board to document the rich biodiversity of the Kadalundi-Vallikunnu Community Reserve and to assess the economic value of the various ecosystem services rendered by the Community Reserve. The publication provides an insight in to the diversity of plankton, seagrass, mangroves, mangrove associates, avian fauna, molluscs, crustaceans and finfishes of the Community Reserve with an overview of the economic value of the ecosystem services. The various threats faced by the Community Reserve and meaningful options for the conservation and sustainable management of the Reserve is also highlighted in this document.

I sincerely hope that this publication will be useful for the scientific community as well as planners to take appropriate measures for the conservation and sustainable use of Kadalundi-Vallikunnu Community Reserve. The wise use of this mangrove wetland for income generation activities, through scientific planning, is also emphasized which would not only help in enhancing the livelihood options of the local people but also ensures protection of mangroves and the associated biodiversity. Proper planning and implementation of livelihood and conservation programmes will make the Kadalundi-Vallikunnu Community Reserve emerge as a model Community Reserve in the country.

Dr. A. Gopalakrishnan
Director,
ICAR-CMFRI, Kochi

Contents

KADALUNDI RIVER

Originates from the Western Ghats at the western border of the Silent Valley. It is formed by the confluence of two main tributaries namely the Olippuzha which originates from Cherakkombanmala and Veliyar which originates from Erattakkombanmala. The river which flows mainly through the Malappuram district of Kerala is about 130 km long and has a drainage area of 1,122 sq. km.


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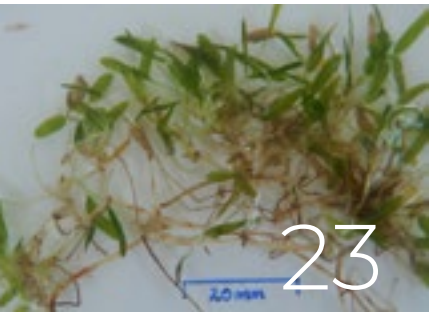
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KADALUNDI-VALLIKUNNU COMMUNITY RESERVE

THE FIRST COMMUNITY RESERVE OF KERALA

PREAMBLE >>

Preamble

The Kadalundi estuary (11°7'28" - 11°8'1" N and 75°49'36" - 75°50'20" E) - located at the mouth of the river Kadalundi, drains into the Arabian Sea on the west coast of India (Fig. 1 & 2). The important characteristics of the estuary include mangroves, mudflats, rich avian diversity, fin and shellfishes and other faunal diversity. Considering the ecological significance, diversity of wetland avian fauna and the burden of heavy anthropogenic pressures, the Kadalundi estuary has been officially declared as the 'Kadalundi-Vallikunnu Community Reserve' by G.O. (MS) No.66/2007/F&WLD dated 17th October 2007.

The Kadalundi-Vallikunnu Community Reserve (KVCR) is the first Community Reserve of Kerala and lies partly in Kozhikode and Malappuram districts and managed jointly by the Kadalundi and Vallikunnu Grama Panchayaths. The total area of the Community Reserve is 153.84 ha and of this, an extent of 21.22 ha (0.44 ha in Kadalundi Panchayath and 20.78 ha in Vallikunnu Panchayath) has the status of Reserve Forest notified as per S.R.O. No.1186/2003, G.O.(M) No.64/03/F&WLD dated 20th December 2003. The Kadalundi Panchayath is the northern boundary of the Community Reserve, while the southern boundary is the mangrove-rich area of the left bank of the Kadalundi river of Vallikunnu Panchayath; the eastern boundary is the Kottakadavu bridge and the western boundary is the Arabian Sea. There are five islands in the Community Reserve namely, Company Thuruthu, Cheru Thuruthu, Cee Pee Thuruthu, Bala Thuruthu and Mannan Thuruthu.

Community Reserve

- *Community reserves in India are protected areas that typically act as buffer zones to or connectors and migration corridors between established national parks, wildlife sanctuaries and reserved and protected forests of India.*

- *Conservation reserves are those protected areas that are uninhabited and owned by the Govt. but used for subsistence by communities while the Community reserves are those protected areas where part of the lands are privately owned.*

- *This protected area category was first introduced in the Wildlife (Protection) Amendment Act of 2002 – an amendment to the Wildlife Protection Act of 1972.*

- *There are 214 Community Reserves in India covering an area of 1,302 km² (National Wildlife Database, Wildlife Institute of India, 2020) and of these, 114 are located in Nagaland, 71 in Meghalaya, 10 in Manipur, 9 in Arunachal Pradesh, 5 in Haryana, 3 in Punjab and one each in Karnataka and Kerala.*

The government constituted a Community Reserve Management Committee in 2008 to conserve, maintain and manage the Community Reserve. The Management Committee comprises five Members of whom two Members are from Kadalundi

Fig. 1. Map of Kadalundi estuary

Grama Panchayath and three Members from Vallikunnu Grama Panchayath. Besides, there are also five Eco-development Committees of which two Committees are in Kadalundi Grama Panchayath while three Committees are in Vallikunnu Grama Panchayath, with nine Members in each Committee.

Globally, the Kadalundi-Vallikunnu Community Reserve is a part of the "Important Bird Area" listed by the Indian Bird Conservation Network (IBCN) and qualified to declare as a Ramsar site. The mangrove forests in the Reserve (Fig. 3) serve as an excellent shelter and nesting place for the birds and the vast extent of mudflats which are rich in wide varieties of invertebrates like polychaetes and crabs are excellent foraging grounds attracting the avian fauna. The mangrove wetland of the Community Reserve is an excellent spawning and nursery ground for many invertebrates and fishes, thereby supporting the coastal fisheries. Fishing, oyster picking and mussel farming are important avocations of some of the local communities. The enchanting estuary, mangrove forests, traditional fishing practices and visit of migratory birds have been attracting students, researchers and

Fig. 2. A panoramic aerial view of the Kadalundi-Vallikunnu Community Reserve from the eastern boundary

Fig. 3. Dense mangroves of Mannan Thuruthu at Kadalundi

tourists from within the country as well as from overseas. The possibility of eco-tourism is being effectively tapped by the local inhabitants who arrange boat ride for the tourists cruising through the mangrove swamps and creeks and explaining to them the significance of the Community Reserve. The local people inhabiting the Community Reserve are the key stakeholders who play a pivotal role in the overall management and conservation of the Community Reserve.

The Management Plan of the Kadalundi-Vallikunnu Community Reserve has listed 38 species of butterflies, 7 species of frogs, 23 species of reptiles, 15 species of mammals, 326 species of plants which include 168 species of medicinal plants.

The present publication is envisaged to provide an overview of the coastal biodiversity of the Kadalundi-Vallikunnu Community Reserve for the benefit of students, researchers and the general public.

PLANKTON >>

Plankton

A total of 111 species of phytoplankton (Table 1) were recorded from the Kadalundi estuary during 2018-2019. These phytoplankton (Fig. 5) belonged to five major groups *viz*., Bacillariophyta, Miozoa, Cyanobacteria, Chlorophyta and Charophyta. A majority of species (66 species) belonged to the group Bacillariophyta, while Miozoa, Cyanobacteria, Chlorophyta and Charophyta were comprised of 26, 5, 6 and 8 species respectively (Fig. 4).

Phytoplankton

⊙ *Phytoplankton are microscopic marine algae that live suspended in the water column. They are the most vital components in the food chain and forms the base of the trophic pyramid. Phytoplankton provide food to a wide range of animals in the aquatic ecosystem. The growth of phytoplankton depends on sunlight, carbon dioxide and nutrients; however, excess nutrients in the water body can cause harmful algal blooms.*

Table 1. List of phytoplankton species recorded from Kadalundi estuary during 2018-19

Sl. No.	Species
A)	**Bacillariophyta**
1	*Amphora lineolata*
2	*Asterionellopsis glacialis*
3	*Asteromphalus flabellatus*
4	*Bacillaria paxillifera*
5	*Bacteriastrum hyalinum*
6	*Cerataulus heteroceros*
7	*Biddulphia mobilensis*
8	*Odontella obtusa*
9	*Biddulphia biddulphiana*
10	*Zygoceros rhombus*
11	*Trieres chinensis*
12	*Chaetoceros affinis*

Sl. No.	Species
13	*Chaetoceros compressus*
14	*Chaetoceros curvisetus*
15	*Chaetoceros didymus*
16	*Chaetoceros diversus*
17	*Chaetoceros indicus*
18	*Chaetoceros peruvianus*
19	*Climacosphenia moniligera*
20	*Coscinodiscus apiculatus*
21	*Coscinodiscus centralis*
22	*Coscinodiscus concinnus*
23	*Thalassiosira eccentrica*
24	*Coscinodiscus gigas*
25	*Coscinodiscus granii*

Sl. No.	Species
26	*Thalassiosira angustelineata*
27	*Coscinodiscus marginatus*
28	*Coscinodiscus rothii*
29	*Cyclotella striata*
30	*Cylindrotheca closterium*
31	*Cymbella lanceolata*
32	*Diploneis puella*
33	*Ditylum* sp.
34	*Eucampia zodiacus*
35	*Grammatophora undulata*
36	*Gyrosigma acuminatum*
37	*Hemiaulus sinensis*
38	*Lauderia annulata*
39	*Leptocylindrus danicus*
40	*Leptocylindrus minimus*
41	*Licmophora abbreviata*
42	*Lithodesmium undulatum*
43	*Mastogloia exilis*
44	*Mastogloia minuta*
45	*Paralia sulcata*
46	*Navicula distans*
47	*Navicula elongata*
48	*Cylindrotheca closterium*
49	*Nitzschia frigida*
50	*Nitzschia longissima*
51	*Pseudonitzschia seriata*
52	*Planktoniella sol*
53	*Pleurosigma directum*
54	*Pleurosigma elongatum*
55	*Pleurosigma normanii*
56	*Rhaphoneis amphiceros*

Sl. No.	Species
57	*Rhaphoneis discoides*
58	*Proboscia alata*
59	*Guinardia cylindrus*
60	*Neocalyptrella robusta*
61	*Skeletonema costatum*
62	*Ardissonea formosa*
63	*Thalassionema nitzschioides*
64	*Thalassiosira subtilis*
65	*Thalassiothrix longissima*
66	*Triceratium alternans*
B)	**Miozoa**
67	*Tripos furca*
68	*Tripos fusus*
69	*Ceratium hirundinella*
70	*Tripos longipes*
71	*Tripos longirostrus*
72	*Tripos lunula*
73	*Tripos macroceros*
74	*Tripos minutus*
75	*Tripos trichoceros*
76	*Tripos muelleri*
77	*Dinophysis bicaudata*
78	*Dinophysis caudata*
79	*Gonyaulax fragilis*
80	*Gonyaulax spinifera*
81	*Karenia brevis*
82	*Gymnodinium* sp.
83	*Noctiluca scintillans*
84	*Ornithocercus* sp.
85	*Protoperidinium biconicum*
86	*Protoperidinium depressum*

Sl. No.	Species
87	*Peridinium* sp.
88	*Phalacroma* sp.
89	*Podolampas bipes*
90	*Podolampas spinifera*
91	*Prorocentrum* sp.
92	*Pyrophacus* sp.
C)	**Cyanobacteria**
93	*Dolichospermum affine*
94	*Dolichospermum circinale*
95	*Nodularia* sp.
96	*Oscillatoria limosa*
97	*Trichodesmium erythraeum*
D)	**Chlorophyta**
98	*Parapediastrum biradiatum*
99	*Pediastrum duplex*

Sl. No.	Species
100	*Monactinus simplex*
101	*Tetradesmus lagerheimii*
102	*Tetradesmus dimorphus*
103	*Volvox* sp.
E)	**Charophyta**
104	*Staurastrum alternans*
105	*Staurastrum paradoxum*
106	*Zygnema conspicuum*
107	*Cosmarium costatum*
108	*Cosmarium bioculatum*
109	*Cosmarium baileyi*
110	*Desmidium grevillei*
111	*Desmidium swartzii*

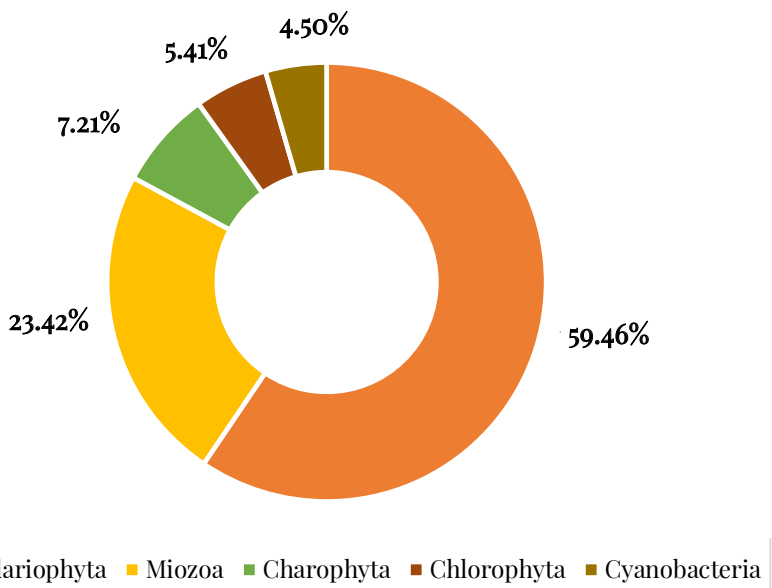
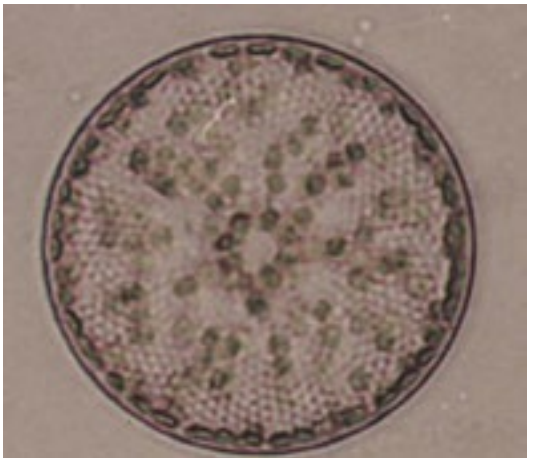
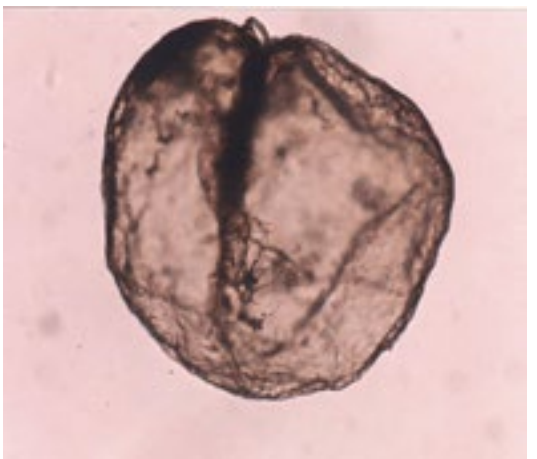


Fig. 4. Percentage of species belonging to different phytoplankton groups



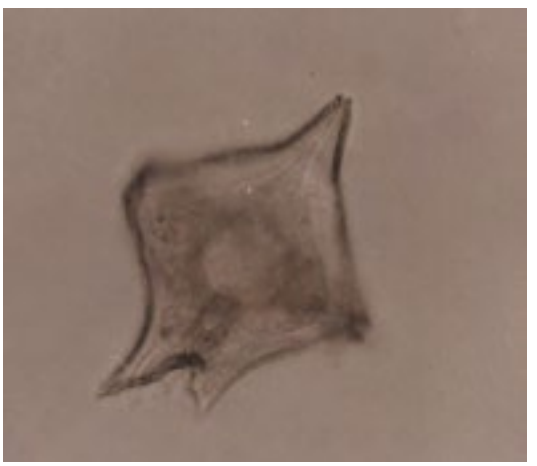
Coscinodiscus marginatus

Dinophysis caudata



Noctiluca sp.

Pleurosigma sp.



Protoperidinium depressum

Tripos trichoceros

Fig. 5. Some of the common phytoplankton species encountered in Kadalundi estuary

Zooplankton

Zooplankton are small aquatic invertebrates with feeble locomotory powers. Some are herbivores feeding on phytoplankton while others are predatory carnivores. These primary consumers serve as food to several organisms in the food web.

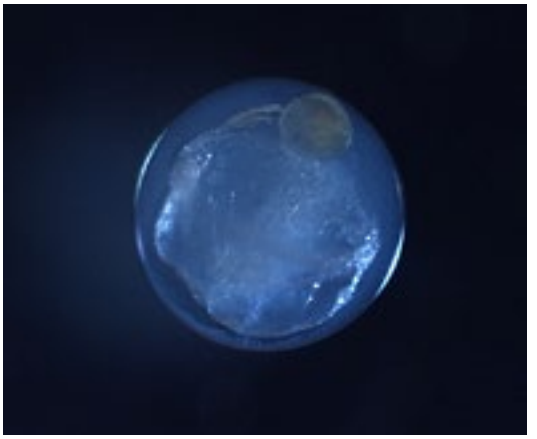
A total of 28 groups of zooplankters (Fig. 6) were recorded in the Kadalundi estuary during 2018-19 (Table 2).

Table 2. List of zooplankton recorded from Kadalundi estuary during 2018-19

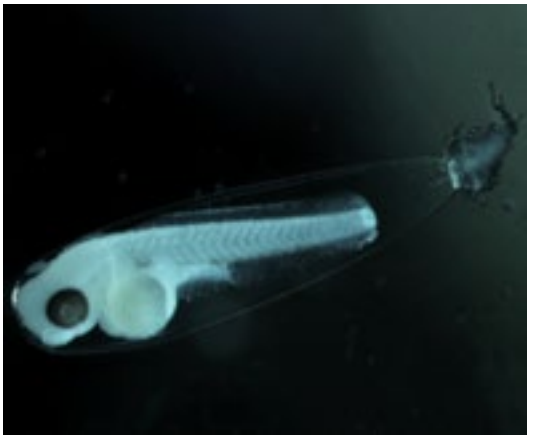
S.No.	Groups
1	Copepods
2	Foraminifera
3	Medusae
4	Chaetognaths
5	Siphonophores
6	Ctenophores
7	Ostracods
8	Cladocera
9	*Lucifer* sp.
10	Amphipods
11	Isopods
12	Appendicularia
13	Balanus nauplii
14	Cyphonautes larvae
15	Polychaete larvae
16	Echinoderm larvae
17	Ephyra larvae
18	Brachiopod larvae
19	Alima larvae
20	Aquatic insect larvae
21	Prawn larvae
22	Crab zoea
23	Crab megalopa larvae
24	Bivalve larvae
25	Pteropods
26	Gastropod larvae
27	Fish eggs
28	Fish larvae

Amphipod

Copepod

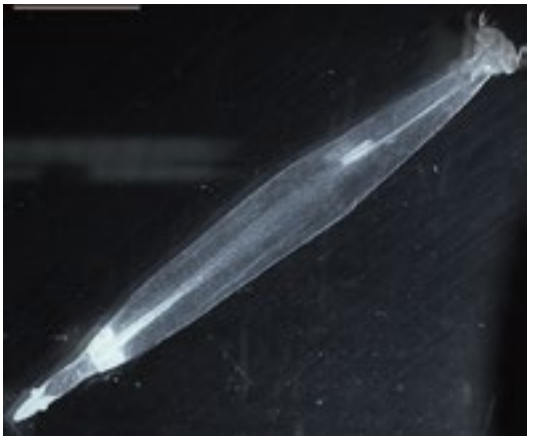


Fish egg



Fish larva

Lucifer sp.



Chaetognath

Fig. 6. Some of the common zooplankton observed in Kadalundi estuary

Seagrass

Halophila beccarii Ascherson, 1871

- Family : Hydrocharitaceae
- Common name: Ocean Turf Grass or the Beccari's seagrass
- Vernacular name: കടൽപ്പുല്ല്

- *Halophila beccarii is an aquatic submerged creeping herb.*
- *Stolons (creeping stem) help to bind the sand and avoid soil erosion in the sea bed.*
- *Leaves elliptic-ovate on long thin stems.*
- *The plant is monoecious, flowers are unisexual*
- *Fruits are tiny, contain up to six seeds.*

VU

IUCN Red List Category: Vulnerable (VU)

Halophila beccarii (Fig. 7 & 8) is an aquatic flowering plant and is known to have distribution in India, Bangladesh, China, Malaysia, Myanmar, Philippines, Singapore, Sri Lanka, Thailand and Vietnam. The Beccari's seagrass form dense vegetation and are home to many species of crabs and molluscs; besides, they also serve as nurseries to many other animals. The rhizomes bind well to the substratum, thereby stabilizes the substrate and help in sediment accretion. The accretion of sediment becomes conducive for the recruitment of successive species of mangroves, thereby promoting the seaward expansion of mangroves.

The seagrasses provide food and habitat to many marine organisms. They stabilize the bottom sediments with their dense rhizomes and thereby prevent erosion. Halophila beccarii is the only seagrass species found in the Kadalundi estuarine wetland. This species assumes conservation significance since it is listed as Vulnerable (VU) in the IUCN Red List of Threatened Species.

Fig. 7. A dense bed of the Ocean Turf Grass, *Halophila beccarii* in Kadalundi estuarine wetland

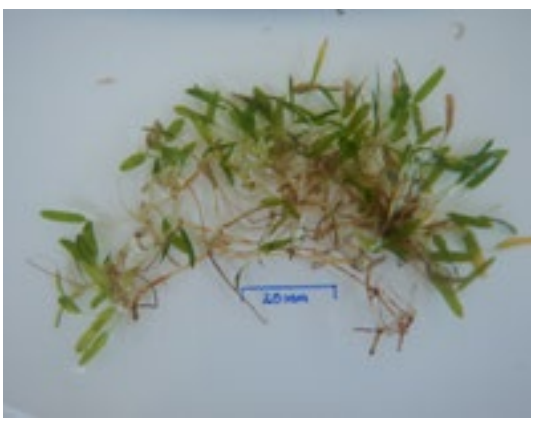


Fig. 8. A close view of *Halophila beccarii*

MANGROVES >>

- *A total of seven species of mangroves which belonged to 6 genera and 5 families were recorded from the Kadalundi mangrove wetland.*

Mangroves

⊙ *Mangroves are keystone ecosystems that render many ecological services. They are salt-tolerant trees or shrubs (halophytes) having an immense ability to thrive in the marshy wetland. They protect the coast from the vagaries of cyclonic storms and are capable of binding the soil through their network of roots, preventing soil erosion. They are important in maintaining the coastal water quality and act as a nutrient filter between the land and the sea. The mangrove habitats are an important breeding and nursery ground for many fishes and invertebrates. They are termed 'blue carbon ecosystem' owing to their ability to sequester and store large quantities of carbon in their biomass and sediments. A total of seven species of mangroves have been recorded in the Kadalundi-Vallikunnu Community Reserve.*

A total of seven species of mangroves *viz*., *Avicennia officinalis* (Family: Acanthaceae), *Avicennia marina* (Family: Acanthaceae), *Rhizophora mucronata* (Family: Rhizophoraceae), *Sonneratia alba* (Family: Lythraceae), *Bruguiera cylindrica* (Family: Rhizophoraceae), *Excoecaria agallocha* (Family: Euphorbiaceae) and *Acanthus ilicifolius* (Family: Acanthaceae) which belonged to 6 genera and 5 families were recorded from the Kadalundi mangrove wetland. Among the seven species, *A. officinalis* is the predominant one in terms of number as well as in terms of coverage of the area (Table 3 & Fig. 9`). *S. alba,* which is a planted vegetation forms a dense patch near the railway bridge. *Acanthus ilicifolius* forms a fringe in some islands but also forms dense patches in other areas. *Bruguiera cylindrica* and *E. agallocha* occur in small patches in some areas of the Kadalundi mangrove ecosystem. The total mangrove cover of Kadalundi is estimated to be 13.23 ha.

Table 3. Dominance of different mangrove species in KVCR

Species	Dominance	Remarks
Avicennia officinalis	******	Large area, forming dense forests
Avicennia marina	*	Very few numbers
Rhizophora mucronata	**	Forms small but dense patches in some places
Bruguiera cylindrica	**	Found scattered in some areas
Sonneratia alba	**	Only one small patch, close to the bar mouth
Excoecaria agallocha	**	Found scattered in some areas
Acanthus ilicifolius	****	Found fringing in many areas

Mangroves in Cee Pee Thuruthu: Cee Pee Thuruthu is a small island with patchy to dense mangroves dominated by *A. officinalis* and fringed by *A. ilicifolius* in the peripheral region. This island has mangrove vegetation in 1.59 ha and the rest of the area has coconut plantations and residential houses. The mangroves were also found to extend towards some of the coconut planted areas.

Mangroves in Bala Thuruthu: The total mangrove area of Bala Thuruthu is 3.22 ha with *A. officinalis* being the predominant mangrove species. This island is characterized by a dense patch of *R. mucronata* along the western side. There are few numbers of *Avicennia marina* on this island. This island has the maximum number of inhabitants with over one hundred houses spread from the mid to the eastern part of the island.

Mangroves in Mannan Thuruthu: This island is the largest with an approximate mangrove area of 7.39 ha. Except for *S. alba,* all other mangrove species recorded in the Kadalundi mangrove wetland are found here. However, the dominant species of this island is *A. officinalis*. There are three small patches of coconut plantations; however, there are no inhabitants in Mannan Thuruthu.

Mangroves on the Western side of Railway Bridge: Patchy to dense mangroves occur in this small area of 1.03 ha which lies very close to the estuarine bar mouth. The mangrove *A. officinalis* occupies about 50% of the area and the remaining 50% is comprised of *S. alba* of different sizes. In this sector, *A. officinalis* is a natural mangrove while *S. alba* is a planted one, and in between, *A. ilicifolius* is also found.

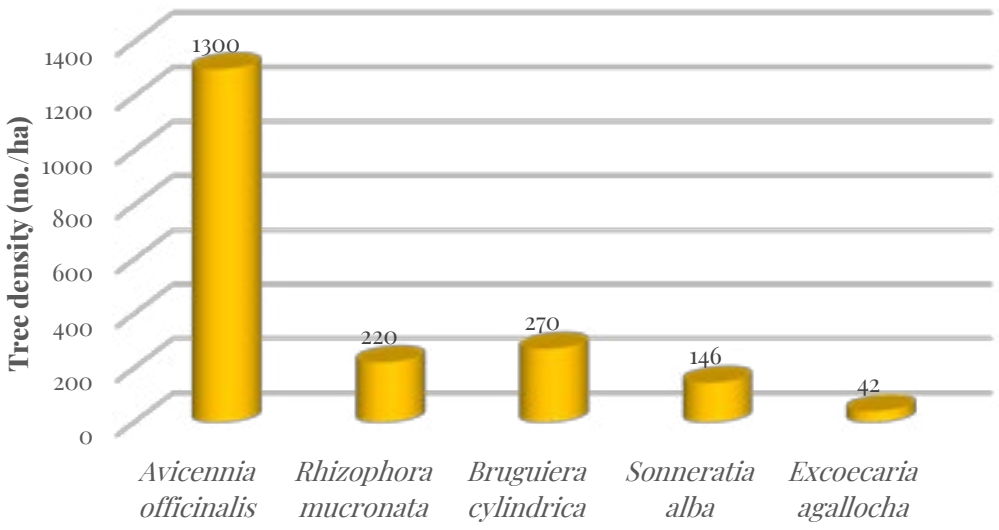


Fig. 9. Mangrove tree density in Kadalundi estuary

1. *Avicennia officinalis* L.

- Family: Acanthaceae
- Common name: Indian mangrove
- Vernacular name: ഉപ്പട്ടി

LC

IUCN Red List Category:
Least Concern (LC)

- *Avicennia officinalis (Fig. 10 to 13) is the most dominant mangrove species of Kadalundi with a tree density of 1300 individuals/ha.*
- *These are evergreen trees that grow to a height of about 5 to 15 meteres, with numerous pneumatophores.*
- *The leaves are green above while the underside is greenish-yellow. Leaf tip obtuse.*
- *The excreted salt can be seen on the underside of leaves.*
- *The flowers are orange-yellow.*
- *The fruits are yellowish-green and are compressed beaked (mango-shaped).*
- *Known to be used in traditional medicinal practices to treat various ailments like rheumatism, asthma, dyspepsia, etc.*

Fig. 10. Dense patches of *Avicennia officinalis* at Kadalundi

Fig. 11. A close view of *Avicennia officinalis*

Fig. 12. Flowering in *Avicennia officinalis*

Fig. 13. Fruits of *Avicennia officinalis*

2. *Avicennia marina* (Forssk.) Vierh.

- Family: Acanthaceae
- Common name: Grey mangrove
- Vernacular name: ചെറു ഉപ്പട്ടി

LC

IUCN Red List Category:
Least Concern (LC)

- *Only a few numbers of Avicennia marina (Fig. 14 & 15) are found in the Kadalundi estuary.*
- *These are evergreen trees that grow to a height of about 3 to 10 meters.*
- *Pneumatophores are straight, pencil-like which grows to a height of about 20 cm.*
- *The leaves are thick, glossy green above while the underside is silvery-white or grey. Leaf tip acute.*
- *The excreted salt can be seen on the underside of leaves.*
- *The flowers are golden yellow.*
- *The fruits are yellowish-green and are compressed beaked (mango-shaped).*

Fig. 14. A view of *Avicennia marina* at Kadalundi
- a closer view in the inset

Fig. 15. Flowers and fruits of *Avicennia marina*

3. *Rhizophora mucronata* Lam.

- Famil: Rhizophoraceae
- Common name: Red mangrove
- Vernacular name: പ്രാന്തൻ കണ്ടൽ

LC

IUCN Red List Category:
Least Concern (LC)

- *Rhizophora mucronata (Fig. 16 to 20) is an evergreen tree and is characterised by the presence of a large number of stilt roots by which it firmly holds on to the muddy substratum.*
- *The flowers are creamy-white. The fruit is single-seeded, up to 2.5 cm long and germinates while still on the tree, a phenomenon called viviparous germination.*
- *The radicle gradually protrudes from the fruit and grows into a rod-like structure.*
- *The seedling later falls from the tree to the mud and begins to grow.*
- *This species is predominantly found in the Bala Thuruthu islet of the Kadalundi wetland, forming a dense patch. They are also found in small numbers in Mannan Thuruthu.*

Fig. 16. A dense patch of *Rhizophora mucronata* in Kadalundi wetland - a closer view of stilt roots in the inset

Fig. 17. Buds of *Rhizophora mucronata*

Fig. 18. Flowering in *Rhizophora mucronata*

Fig. 19. Radicles of *Rhizophora mucronata*

Fig. 20. A close view of the radicles

4. *Sonneratia alba* Sm.

- Family: Lythraceae
- Common name: Sweet-scented apple mangrove
- Vernacular name: നക്ഷത്രക്കണ്ടൽ

LC

IUCN Red List Category: Least Concern (LC)

- *Sonneratia alba (Fig. 21 to 26) is found distributed as a single large patch on the western side of the railway bridge at Kadalundi.*
- *It is an evergreen tree with a broad spreading. New saplings of this species are found to emerge in the mudflats adjoining the dense patch of Sonneratia alba.*
- *The tree has several thick blunt pneumatophores.*
- *The fruit is depressed globose with persisting style.*
- *Wood is used for making canoes, boat ribs, floats etc. Further used as firewood.*

Fig. 21. Dense patch of *Sonneratia alba* close to the railway bridge

Fig. 22. Emerging plants of *Sonneratia alba* at Kadalundi

Fig. 23. Close view of *Sonneratia alba*

Fig. 24. Bud of *Sonneratia alba*

Fig. 25. Flower of *Sonneratia alba*

Fig. 26. Fruits of *Sonneratia alba*

5. *Excoecaria agallocha* L.

- Family: Euphorbiaceae
- Common name: Blinding tree
- Vernacular name: കണ്ണാംപൊട്ടി

LC

IUCN Red List Category:
Least Concern (LC)

- *Excoecaria agallocha (Fig. 27 to 30) is an evergreen or deciduous unisexual (dioecious) tree that grows up to about 20 m in height.*
- *The male inflorescence is drooping, long and 5-10 cm in length, while the female inflorescence is short, about 1-4 cm long.*
- *Exude poisonous white latex from all broken surfaces. The milky sap of the tree can cause temporary blindness.*
- *The fruit is a capsule of three cocci.*
- *The roots are soft and spongy and used for making floats.*
- *This species is found in more numbers in Mannan Thuruthu islet of Kadalundi estuary and also few numbers are distributed in the fringes in other locations of the estuary.*

Fig. 27. *Excoecaria agallocha*

Fig. 28. Close view of *Excoecaria agallocha*

Fig. 29. Male flower of *Excoecaria agallocha*

Fig. 30. Female flower of *Excoecaria agallocha*

6. *Bruguiera cylindrica* (L.) Bl.

- Family: Rhizophoraceae
- Common name: White Burma mangrove
- Vernacular name: കുറ്റിക്കണ്ടൽ

LC

IUCN Red List Category:
Least Concern (LC)

- *Bruguiera cylindrica (Fig. 31 to 35) are small trees growing up to 6 m in height.*
- *The underground roots of the tree produce numerous knee roots.*
- *The flowers are small axillary cymes in clusters of 2 to 5.*
- *Eight small greenish-white petals with several bristles on the tip.*
- *Wood is used for making keel of canoes in the Maldives and also as firewood.*

Fig. 31. *Bruguiera cylindrica*

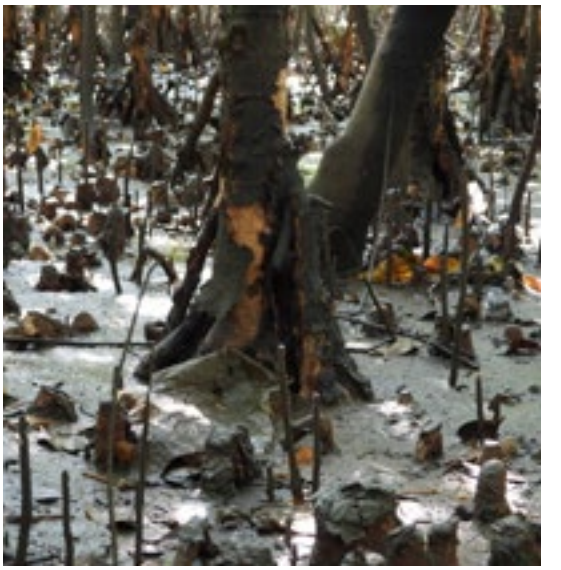


Fig. 32. A view of the knee roots of *Bruguiera cylindrica*

Fig. 33. A close view of *Bruguiera cylindrica*

Fig. 34. Flowering in *Bruguiera cylindrica*

Fig. 35. Radicles of *Bruguiera cylindrica*

7. *Acanthus ilicifolius* L.

- Family: Acanthaceae
- Common name: Holy-leaved acanthus
- Vernacular name: ചുള്ളിക്കണ്ടൽ

LC

IUCN Red List Category:
Least Concern (LC)

- *Acanthus ilicifolius (Fig. 36 to 39) is an erect or reclining evergreen shrub; grows to about one metre tall and produce adventitious aerial roots.*
- *The leaf margin pinnately lobed with poisonous and spinous tips.*
- *Flowers blue or violet in a dense spike.*
- *Capsule green apiculate.*
- *A decoction of the leaves and roots is used as a treatment for asthma.*

Fig. 36. A dense patch of *Acanthus ilicifolius* at Kadalundi

Fig. 37. *Acanthus ilicifolius* – A close view of the plant

Fig. 38. Flowering in *Acanthus ilicifolius*

Fig. 39. Fruiting in *Acanthus ilicifolius*

MANGROVE ASSOCIATES >>

Mangrove Associates

A total of ten species of mangrove associate flora were documented which belonged to seven orders, eight families and nine genera (Table 4).

Table 4. Mangrove associates observed in the Kadalundi-Vallikunnu Community Reserve

Sl. No.	Scientific name	Order	Family	Common name	Vernacular name
1.	*Derris trifoliata* Lour.	Fabales	Fabaceae	Three leaf derris	പൊന്നാംവള്ളി
2.	*Acrostichum aureum* L.	Polypodiales	Pteridaceae	Golden leather fern	മച്ചിൻതോൽ
3.	*Volkameria inermis* L.	Lamiales	Lamiaceae	Glory bower	പുഴമുല്ല
4.	*Premna serratifolia* L.	Lamiales	Lamiaceae	Headache tree	മുട്ടനാറി / മുഞ്ഞ
5.	*Terminalia catappa* L.	Myrtales	Combretaceae	Indian Almond	അടമരം
6.	*Thespesia populnea,* (L.) Sol.	Malvales	Malvaceae	Indian tulip tree	പൂവരശ്
7.	*Cerbera odollam* Gaertn	Gentianales	Apocynaceae	Suicide tree	ഒതളം
8.	*Morinda citrifolia* L.	Gentianales	Rubiaceae	Noni/ Indian Mulberry	ചെറു മഞ്ഞനാത്തി
9.	*Ipomoea violacea* L.	Solanales	Convolvulaceae	Beach Moonflower	മണിവള്ളി
10.	*Ipomoea pes-caprae* (L.) R. Br.	Solanales	Convolvulaceae	Goat's Footvine	നാരീപാദം

1. *Derris trifoliata* Lour.

- Family: Fabaceae
- Common name: Three leaf derris
- Vernacular name:പാന്നാംവള്ളി

NE

IUCN Red List Category
Not Evaluated (NE)

- *Derris trifoliata (Fig. 40 to 42) is a common climber in the mangrove areas of Kadalundi, particularly in the fringes of the islets.*
- *They are evergreen climbers, used as a source of tannin and insecticide.*
- *Leaves alternate, leaflets 3 to 5*
- *Flowers in the axillary raceme. Pods obliquely rounded.*
- *The plant contains rotenone which is traditionally used as a fish poison.*

Fig. 40. *Derris trifoliata*

Fig. 41. Fruits of *Derris trifoliata*

Fig. 42. Inflorescence of *Derris trifoliata*

2. *Acrostichum aureum* L.

- Family: Pteridaceae
- Common name: Golden leather fern
- Vernacular name:മുള്ളൻതോൽ

LC

IUCN Red List Category:
Least Concern (LC)

- *Acrostichum aureum (Fig. 43) is a fern of saline or marshy habitat.*
- *The leaves are glossy, broad and pinnate.*
- *Reproductive pinnae are found only distally.*

Fig. 43.
Acrostichum aureum

3. *Volkameria inermis* L.

- Family: Lamiaceae
- Common name: Glory bower
- Vernacular name:പുഴമുല്ല

NE

IUCN Red List Category
Not Evaluated (NE)

- *Volkameria inermis (Fig. 44 & 45) is a very common mangrove associate found in the fringes of mangrove areas in Kadalundi.*
- *This species is a much-branched straggling shrub.*
- *Leaves ovate to elliptical, green with a slightly shiny upper surface.*
- *Flowers in axillary, three-flowered cymes.*
- *It is commonly used as a hedge plant in India.*
- *A decoction of leaves is used for the treatment of skin diseases.*

Fig. 44. *Volkameria inermis*

Fig. 45. *Volkameria inermis* – a closer view of the flower

4. *Premna serratifolia* L.

- Family: Lamiaceae
- Common name: Headache tree
- Vernacular name: മുട്ടനാറി/ മുഞ്ഞ

LC

IUCN Red List Category: Least Concern (LC)

- *Premna serratifolia (Fig. 46 to 48) is a shrub or a small tree.*
- *In Kadalundi, they were found in the sand formations, close to the bar mouth.*
- *It mostly grows in moist sandy soils and scrub jungles along the coasts and mangrove forests.*
- *Leaves elliptic-oblong or ovate shortly acuminate at the apex.*
- *The inflorescence is terminal and corymbose; the flowers are unpleasantly aromatic.*
- *The fruits are succulent and black.*
- *They are extensively used in Indian traditional medicines.*

Fig. 46. *Premna serratifolia*

Fig. 47. Inflorescence of *Premna serratifolia*

Fig. 48. Fruits of *Premna serratifolia*

5. *Terminalia catappa* L.

- Family: Combretaceae
- Common name: Indian Almond
- Vernacular name: ആൽമരം

LC

IUCN Red List Category: Least Concern (LC)

- *Terminalia catappa (Fig. 49 to 52) are large deciduous spreading trees with big leathery oval leaves which turn red before falling.*
- *They are found in some islets of the Kadalundi-Vallikunnu Community Reserve.*
- *The horizontal branches grow in wide-spreading circles at different levels on the trunk.*
- *Flowers small green or white in spike, unisexual - lower female & upper male.*

Fig. 49. *Terminalia catappa*

- *Fruit ellipsoid, more or less compressed, two-ridged.*
- *It has a corky light fruit and the nuts are edible when ripe.*
- *Wood is used for making keel of canoes, construction works, etc.*

Fig. 50. Closer view of the tree

Fig. 51. Fruits of *Terminalia catappa*

Fig. 52. Inflorescence of *Terminalia catappa* (closer view right side)

6. *Thespesia populnea* (L.) Soland. ex Correa

- Family: Malvaceae
- Common name: Indian tulip tree
- Vernacular name: പൂവരശ്

LC

IUCN Red List Category:
Least Concern (LC)

- *Thespesia populnea (Fig. 53 & 54) is an evergreen bushy tree; grows to 40 ft or more.*
- *It is characterised by heart-shaped leaves and cup-shaped yellow flowers with a purple base.*
- *Fruits are apple-shaped and their buoyant and hardy seed is adapted for oceanic dispersal.*
- *The heartwood is reddish-brown and is used for making boats and furniture, especially as carving wood and for turnery. Parts of the trees are used in traditional medicines.*

Fig. 53. *Thespesia populnea*

Fig. 54. A closer view of the tree with flowers

7. *Cerbera odollam* Gaertn.

- Family: Apocynaceae
- Common name: Suicide tree
- Vernacular name: ഒതളം

LC

IUCN Red List Category:
Least Concern (LC)

- *Cerbera odollam (Fig. 55 & 56) is a small evergreen tree that grows in salt swamps and marshy areas.*
- *They were recorded from the Bala Thuruthu islet of the Kadalundi wetland.*
- *The branchlets are whorled about the trunk and the leaves are terminally crowded.*
- *Inflorescence in terminal cymes, flowers large, white with a yellow throat.*
- *Fruits drupe with fibrous pericarp, subglobose, smooth green*
- *The fruit of the tree yields a potent poison, and hence the name suicide tree.*

Fig. 55. *Cerbera odollam* | Fig. 56. Flowering in *Cerbera odollam* (inset)

8. *Morinda citrifolia* L.

- Family: Rubiaceae
- Common name: Noni / Indian Mulberry
- Vernacular name: ചെറു മഞ്ഞനാത്തി

NE

IUCN Red List Category
Not Evaluated (NE)

- *Morinda citrifolia (Fig. 57 to 59) grows in shady forests as well as in open rocky or sandy shores.*
- *They were found in the sand bar formations near the bar mouth at Kadalundi.*
- *It is tolerant of saline soils and to drought conditions.*
- *The plant bears flowers and fruits all year round.*
- *The fruit of the tree, despite its strong smell and bitter taste, was used as food by indigenous people at times of famine. The seeds are also edible when roasted.*
- *The roots and bark are used in dyes and medicines.*

Fig. 57. *Morinda citrifolia*

Fig. 58. Flowering in *Morinda citrifolia*

Fig. 59. Fruits of *Morinda citrifolia*

9. *Ipomoea violacea* L.

- Family: Convolvulaceae
- Common name: Beach Moonflower
- Vernacular name: മണിവള്ളി

NE

IUCN Red List Category
Not Evaluated (NE)

- *Ipomoea violacea (Fig. 60 to 62) is a large stout glabrous twiner that twine and climb to tree tops.*
- *They are common in the Kadalundi wetland, found climbing on to the mangrove trees.*
- *The leaves are simple, alternate, heart-shaped, broadly ovate at the apex and cordate at base; 6 to 15 cm long.*
- *Flower white, funnel-shaped, one or two together; pedicels long and stout.*
- *Fruit globose capsule, glabrous, seeds black, sericeous shaggy hairs on the margins.*

Fig. 60. *Ipomoea violacea*; a closer view with buds in the inset

Fig. 61. Flower of *Ipomoea violacea*

Fig. 62. Fruit of *Ipomoea violacea* (a) Immature (b) Mature

10. *Ipomoea pes-caprae* (L.) R. Br.

- Family: Convolvulaceae
- Common name: Goat's foot vine
- Vernacular name: നാരീപാദം /അടമ്പുവള്ളി

NE

IUCN Red List Category
Not Evaluated (NE)

- *Ipomoea pes-caprae (Fig. 63) is one of the most common salt-tolerant creeping vines that grow on upper parts of beaches and they are excellent sand binders.*
- *They were found in the sandy stretches near the bar mouth at Kadalundi.*
- *The leaves are fleshy, leathery and bilobed (notched at the apex), creating two equal lobes which look like the imprints of a goat's foot.*
- *The flowers are funnel-shaped and their colouration is pink to lavender purple.*
- *Fruits ovoid, glabrous.*
- *Leaves externally used in rheumatism, also used as a good sand binder.*

Fig. 63. Dense growth of *Ipomoea pes-caprae* on the sandy stretches near the bar mouth at Kadalundi- closer view of flower and bud in the inset

Jellyfish

Acromitus flagellatus (Maas, 1903)

- Class : Scyphozoa
- Order : Rhizostomeae
- Family : Catostylidae
- Vernacular name: കടൽച്ചൊറി/ കാനാംപോത്ത്

NE

IUCN Red List Category
Not Evaluated (NE)

- *Acromitus flagellatus (Fig. 64) is found distributed in the Indo-Pacific region from India to Japan.*
- *They are generally inhabitants of coastal waters, but at times they are found to enter the Kadalundi estuary and have been recorded even up to 3 km upstream, indicating their tolerance to low salinities. Their occurrence is more during November to February months.*
- *The maximum bell diameter reported for this species is 20 cm.*
- *They are characterised by eight oral arms which are short, pyramidal and subumbrellar in position.*
- *They have brownish spots uniformly scattered over the pale white umbrella.*
- *They move by slow contraction movements.*

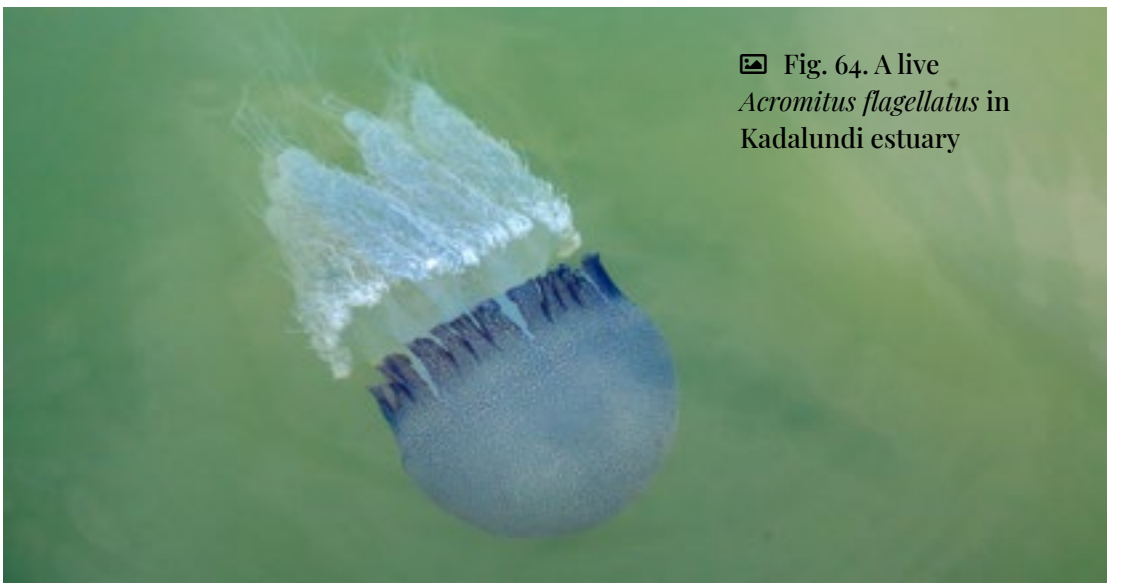


Fig. 64. A live *Acromitus flagellatus* in Kadalundi estuary

Magallana bilineata

Saccostrea cucullata

Perna viridis

Mytella strigata

Meretrix casta

Polymesoda bengalensis

Modiolus sp

Tegillarca granosa

MOLLUSCS >>

Molluscs

⊙ *Thirteen species of molluscs were found to inhabit the Kadalundi estuary. The Indian backwater oyster Magallana bilineata (=Crassostrea madrasensis) is commercially exploited by the local communities of the Community Reserve. The exotic invasive brackish water mussel species Mytella strigata has also entered the Kadalundi estuary.*

A total of 13 species of molluscs were found to inhabit the Kadalundi estuarine system, which belonged to 13 genera under 9 families and 7 orders (Table 5). The orders Caenogastropoda and Mytilida have the maximum number of species (3 species), while the orders Ostreoida and Venerida had 2 species each and Arcida, Cycloneritomorpha and Ellobiida had one species each (Fig. 65).

Saccostrea cucullata, commonly called the small rock oyster or the hooded oyster is found in large numbers in the mouth of the Kadalundi estuary. They are found in dense colonies attached to the hard rocky substrate and also on the stilt roots of the mangrove *Rhizophora mucronata*. These are commercially exploited by the local communities for their meat. The Indian backwater oyster *Magallana bilineata (=Crassostrea madrasensis)* is also found as thick beds near the mouth of the Kadalundi estuary; they are commercially exploited and supports the livelihood of some of the local communities living in the Community Reserve. *Polymesoda bengalensis*, commonly called the Bengali Geloina has been found in the soft mangrove mud and are also utilised for domestic consumption by the local people (Fig. 66).

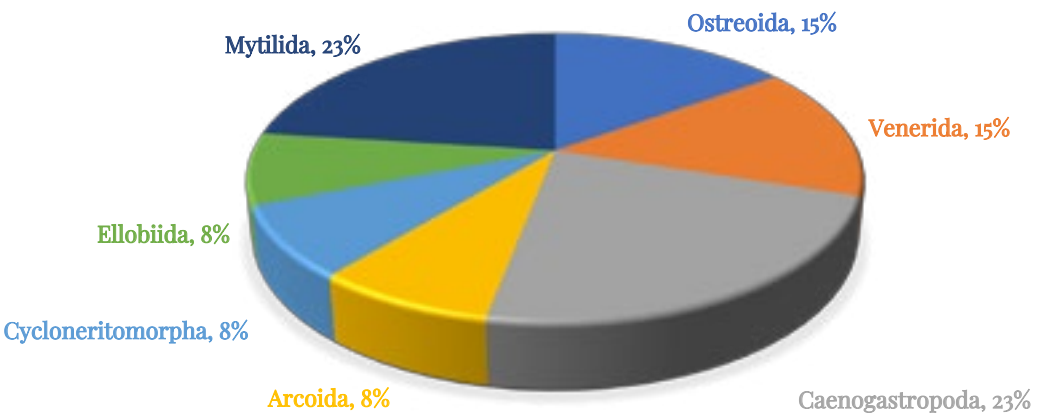


Fig. 65. Percentage of molluscan species representing different orders

Meretrix casta, which are suspension-feeding bivalves were found only in the sandy stretches very close to the estuarine bar mouth. The bivalve *Tegillarca granosa* is found in sandy as well as in muddy habitats of the Kadalundi estuary.

Table 5. Diversity of molluscs in Kadalundi-Vallikunnu Community Reserve

Sl. No.	Species	Common name	Order	Family	IUCN Red List Status*
1.	*Saccostrea cucullata*	Hooded oyster	Ostreoida	Ostreidae	NE
2.	*Magallana bilineata (=Crassostrea madrasensis)*	Indian backwater oyster	Ostreoida	Ostreidae	NE
3.	*Polymesoda bengalensis*	Bengali Geloina	Venerida	Cyrenidae	LC
4.	*Telescopium telescopium*	Telescope snail	Caenogastropoda	Potamididae	LC
5.	*Meretrix casta*	Backwater hard clam	Venerida	Veneridae	NE
6.	*Tegillarca granosa*	Granular ark	Arcoida	Arcidae	NE
7.	*Cerithidea cingulata*	Girdled horn shell	Caenogastropoda	Potamididae	NE
8.	*Clypeomorus batillariaeformis*	Necklace cerith	Caenogastropoda	Cerithiidae	NE
9.	*Neritina violacea*	Violet nerite	Cycloneritomorpha	Neritidae	LC
10.	*Cassidula nucleus*	Banded mangrove ear snail	Ellobiida	Ellobiidae	NE
11.	*Perna viridis*	Asian green mussel	Mytilida	Mytilidae	NE
12.	*Mytella strigata*	Charru mussel	Mytilida	Mytilidae	NE
13.	*Modiolus* sp.	Horse mussel	Mytilida	Mytilidae	NE
* LC-Least Concern; NE-Not Evaluated					

The telescope snail *Telescopium telescopium* (Fig. 67) are commonly found in the mudflats, particularly in the mangrove area and lie partly buried in mud, with only the top of the spire projecting out. The gastropod *Cerithidea cingulata* (Fig. 68), commonly called the girdled horn shell are found in dense numbers in the mudflats and are known to be detritus feeders. The gastropod *Clypeomorus batillariaeformis* is commonly found in the mudflats, often in large numbers. *Cassidula nucleus* (Fig. 69), an air-breathing gastropod is generally found on the pneumatophores and stems of mangroves. The green mussel (*Perna viridis)* are found attached to the hard substrata in the bar mouth area. The on-bottom culture of this species is also carried out by the local people. Dense colonies of *Modiolus* sp. were found attached to the boulders, on sandy substrata as well as in the muddy gravel.

An exotic invasive species *Mytella strigata* which is a brackish water mussel native to Central and South America has entered the Kadalundi estuary. This invasive species may pose a threat to the indigenous species of the Kadalundi estuary.

Fig. 66. Molluscan species recorded from the Kadalundi estuary

Polymesoda bengalensis

Saccostrea cucullata

Telescopium telescopium

Neritina violacea

Cerithidea cingulata

Clypeomorus batillariaeformis

Cassidula nucleus

Meretrix casta

Tegillarca granosa

Mytella strigata

Modiolus sp.

Fig. 67. *Telescopium telescopium* in the mangrove area of KVCR

Fig. 69. *Cassidula nucleus* on a mangrove plant

Fig. 68. *Cerithidea cingulata* in the mudflat

Etroplus suratensis

Siganus vermiculatus

Caranx sem (juvenile)

FINFISH AND CRUSTACEAN RESOURCES >>

Scylla serrata

Metapenaeus monoceros

Finfish & crustacean resources

The Kadalundi estuary is a dynamic ecosystem that supports diverse species of fishes and invertebrate resources. The estuary serves as an excellent feeding ground and sheltered habitat for these resources. This estuarine wetland is endowed with 59 species of finfishes which belong to 39 genera, 33 families and 10 orders. The fish resources of the estuary support the livelihood of many local inhabitants of the Community Reserve. Some of the crustacean resources like the mud crab, Scylla serrata and the Indian white shrimp, Fenneropenaeus indicus also supports the commercial fishery of Kadalundi estuary.

A total of 59 species of finfishes were recorded from the Kadalundi estuary which belonged to 39 genera, 33 families and 10 orders (Table 6; Fig. 71). The order Perciformes comprised the maximum number of 37 species (62.71%), followed by Clupeiformes which comprised of 8 species (13.57%) and Pleuronectiformes which comprised of 3 species (5.09%). The orders Anguilliformes, Siluriformes, Cyprinodontiformes and Scorpaeniformes had 2 species each, while the orders Elopiformes, Gonorhynchiformes and Tetraodontiformes had one species each (Fig. 70).

Table 6. Finfish diversity of Kadalundi estuarine wetland

Sl. No.	Species	Order	Family
1	*Megalops cyprinoides*	Elopiformes	Megalopidae
2	*Anguilla bengalensis bengalensis*	Anguilliformes	Anguillidae
3	*Anguilla bicolor*	Anguilliformes	Anguillidae
4	*Sardinella dayi*	Clupeiformes	Clupeidae
5	*Sardinella longiceps*	Clupeiformes	Clupeidae
6	*Anodontostoma chacunda*	Clupeiformes	Clupeidae
7	*Nematalosa nasus*	Clupeiformes	Clupeidae
8	*Stolephorus commersoni*	Clupeiformes	Engraulidae
9	*Thryssa malabarica*	Clupeiformes	Engraulidae

Sl. No.	Species	Order	Family
10	*Thryssa mystax*	Clupeiformes	Engraulidae
11	*Thryssa dussumieri*	Clupeiformes	Engraulidae
12	*Chanos chanos*	Gonorhynchiformes	Chanidae
13	*Arius maculatus*	Siluriformes	Ariidae
14	*Mystus gulio*	Siluriformes	Bagridae
15	*Strongylura strongylura*	Cyprinodontiformes	Belonidae
16	*Aplocheilus lineatus*	Cyprinodontiformes	Aplocheilidae
17	*Platycephalus indicus*	Scorpaeniformes	Platycephalidae
18	*Thysanophrys* sp.	Scorpaeniformes	Platycephalidae
19	*Lates calcarifer*	Perciformes	Centropomidae
20	*Ambassis commersoni*	Perciformes	Ambassidae
21	*Ambassis gymnocephalus*	Perciformes	Ambassidae
22	*Terapon jarbua*	Perciformes	Terapontidae
23	*Terapon theraps*	Perciformes	Terapontidae
24	*Sillago sihama*	Perciformes	Sillaginidae
25	*Lactarius lactarius*	Perciformes	Lactariidae
26	*Caranx sexfasciatus*	Perciformes	Carangidae
27	*Caranx ignobilis*	Perciformes	Carangidae
28	*Caranx heberi*	Perciformes	Carangidae
29	*Carangoides malabaricus*	Perciformes	Carangidae
30	*Carangoides coeruleopinnatus*	Perciformes	Carangidae
31	*Leiognathus blochii*	Perciformes	Leiognathidae
32	*Leiognathus splendens*	Perciformes	Leiognathidae
33	*Leiognathus brevirostris*	Perciformes	Leiognathidae
34	*Lutjanus argentimaculatus*	Perciformes	Lutjanidae

Sl. No.	Species	Order	Family
35	*Lutjanus fulviflamma*	Perciformes	Lutjanidae
36	*Lutjanus russellii*	Perciformes	Lutjanidae
37	*Gerres filamentosus*	Perciformes	Gerridae
38	*Gerres limbatus*	Perciformes	Gerridae
39	*Monodactylus argenteus*	Perciformes	Monodactylidae
40	*Scatophagus argus*	Perciformes	Scatophagidae
41	*Etroplus maculatus*	Perciformes	Cichlidae
42	*Etroplus suratensis*	Perciformes	Cichlidae
43	*Liza macrolepis*	Perciformes	Mugilidae
44	*Liza parsia*	Perciformes	Mugilidae
45	*Liza tade*	Perciformes	Mugilidae
46	*Liza melanoptera*	Perciformes	Mugilidae
47	*Mugil cephalus*	Perciformes	Mugilidae
48	*Eleutheronema tetradactylum*	Perciformes	Polynemidae
49	*Glossogobius giuris*	Perciformes	Gobiidae
50	*Siganus canaliculatus*	Perciformes	Siganidae
51	*Siganus javus*	Perciformes	Siganidae
52	*Siganus vermiculatus*	Perciformes	Siganidae
53	*Acanthopagrus berda*	Perciformes	Sparidae
54	*Ostorhinchus fasciatus*	Perciformes	Apogonidae
55	*Trypauchen vagina*	Perciformes	Trypauchenidae
56	*Cynoglossus macrostomus*	Pleuronectiformes	Cynoglossidae
57	*Psettodes erumei*	Pleuronectiformes	Bothidae
58	*Pseudorhombhus elevatus*	Pleuronectiformes	Paralichthyidae
59	*Chelonodon patoca*	Tetraodontiformes	Tetraodontidae

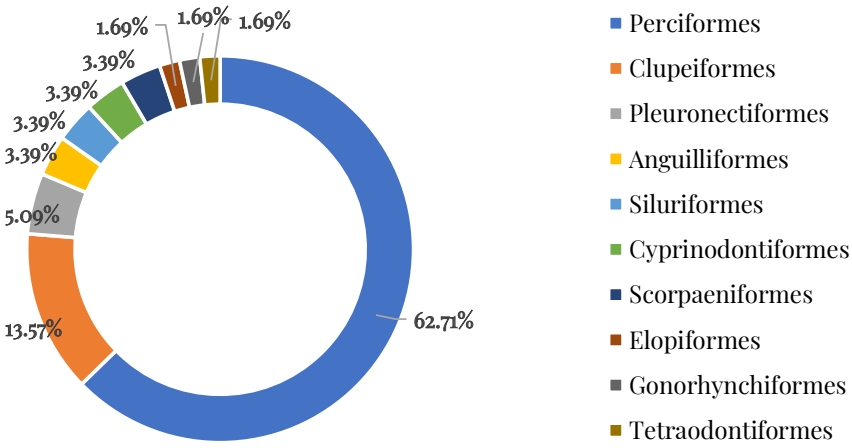


Fig. 70. Percentage of fish species of Kadalundi estuary belonging to different orders

Fig. 71. Some of the common finfish species of Kadalundi estuary

Pseudorhombhus elevatus

Scatophagus argus

Etroplus suratensis

Siganus vermiculatus

Caranx ignobilis

Caranx sem (juvenile)

Lutjanus argentimaculatus

Lutjanus fulviflamma

Sillago sihama

Gerres filamentosus

Terapon jarbua

Platycephalus indicus

In addition to the finfishes, four species of shrimps *viz*., *Fenneropenaeus indicus*, *Penaeus monodon*, *Metapenaeus monoceros* and *Metapenaeus dobsoni* were recorded from the Kadalundi estuary (Table 7) and all these four species are commercially exploited. A total of nine species of true mangrove crabs were also documented (Table 8) which belonged to five families *viz*., Portunidae (3 species), Grapsidae (3 species), Dotillidae (1 species), Sesarmidae (1 species) and Ocypodidae (1 species). The green mud crab *Scylla serrata* and the mangrove mud crab *Scylla tranquebarica* are commercially exploited by fishermen of the Community Reserve (Fig.72).

Table 7. Shrimp diversity of Kadalundi estuarine wetland

Sl. No.	Species	Order	Family	Common name	Vernacular name	IUCN Red List Status
1.	*Fenneropenaeus indicus*	Decapoda	Penaeidae	Indian white shrimp	Naran / Vella Chemmeen	NE
2.	*Penaeus monodon*	Decapoda	Penaeidae	Giant tiger shrimp	Kara Chemmeen	NE
3.	*Metapenaeus monoceros*	Decapoda	Penaeidae	Speckled shrimp	Choodan	NE
4.	*Metapenaeus dobsoni*	Decapoda	Penaeidae	Flower-tail shrimp	Poovalan	NE

Table 8. Brachyuran crab diversity of Kadalundi estuary

Sl. No.	Species	Order	Family	Common name	IUCN Red List Status
1.	*Scylla serrata*	Decapoda	Portunidae	Green mud crab	NE
2.	*Scylla tranquebarica*	Decapoda	Portunidae	Mangrove mud crab	NE
3.	*Thranita crenata*	Decapoda	Portunidae	Crenate swimming crab	NE
4.	*Grapsus albolineatus*	Decapoda	Grapsidae	Mottled crab	NE
5.	*Metopograpsus latifrons*	Decapoda	Grapsidae	Purple-claw mudflat crab	NE
6.	*Metopograpsus thukuhar*	Decapoda	Grapsidae	Thukuhar shore crab	NE
7.	*Dotilla myctiroides*	Decapoda	Dotillidae	Soldier crab	NE
8.	*Parasesarma plicatum*	Decapoda	Sesarmidae	Orange-claw marsh crab	NE
9.	*Austruca perplexa*	Decapoda	Ocypodidae	Perplexing fiddler crab	NE

Fig.72 Common crustacean species of KVCR

Fenneropenaeus indicus

Penaeus monodon

Metapenaeus monoceros (Juvenile)

Metapenaeus dobsoni (Juvenile)

Green mud crab, *Scylla serrata,* a commercially important species

Commercially exploited mangrove mud crab, *Scylla tranquebarica*

Crenate swimming crab, *Thranita crenata*

Mottled crab, *Grapsus albolineatus*

Purple-claw mudflat crab, *Metopograpsus latifrons*

Orange-claw marsh crab, *Parasesarma plicatum*

Soldier crab, *Dotilla myctiroides,* closer view (inset)

Perplexing fiddler crab,
Austruca perplexa

Thukuhar shore crab,
Metopograpsus thukuhar

AVIAN FAUNA >>

Avian fauna

The Kadalundi-Vallikunnu Community Reserve is an abode for a large number of birds, both resident and migratory, attracting tourists, bird enthusiasts, researchers and students from the length and breadth of the country.

During the period 2018 and 2019, a total of 95 species of avian fauna were recorded from the Community Reserve (Table 7) which belonged to 69 genera, 33 families and 15 orders. Of the 33 families, 11 families (33.33%) belonged to the order Passeriformes, while 5 families (15.15%) belonged to the order Charadriiformes (Fig. 73). The orders Piciformes, Coraciiformes, Suliformes and Pelecaniformes were represented by species of two families each (6.06% each), while the orders Cuculiformes, Accipitriformes, Columbiformes, Gruiformes, Psittaciformes, Podicipediformes, Phoenicopteriformes Anseriformes and Ciconiiformes comprised of one family in each (3.03% each).

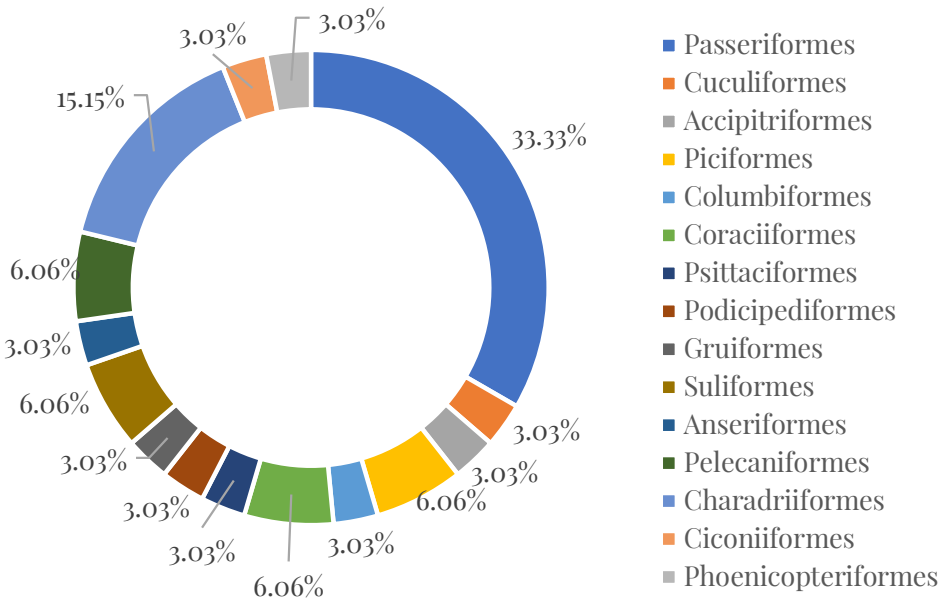


Fig. 73. Percentage of families of avian fauna under different orders

The Order Charadriiformes forms the most diverse group with 38 species (40.0%) followed by Passeriformes with 19 species (20.0%), Pelecaniformes with 13 species (13.68%), and the order Coraciiformes with 5 species (5.25%) (Fig. 74). The orders Accipitriformes and Suliformes had three species each (3.16%) while the orders Cuculiformes, Piciformes, Gruiformes, Anseriformes and Ciconiiformes had two species each (2.11%). The orders Columbiformes, Psittaciformes, Podicipediformes and Phoenicopteriformes had one species each (1.05%).

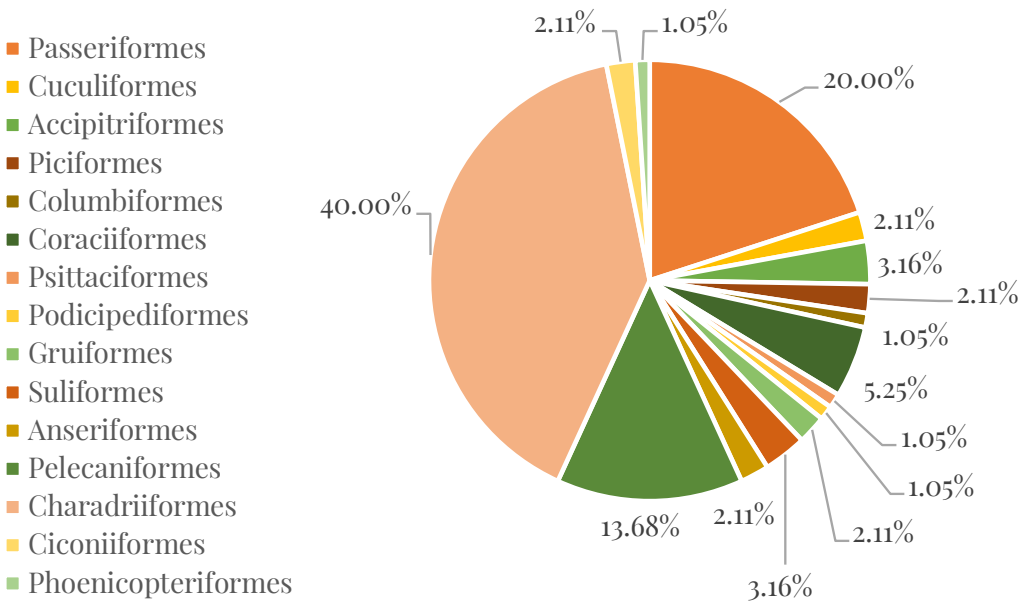


Fig. 74. Percentage of species of avian fauna under different orders

Of the 95 species of birds recorded, 44 species were resident fauna, seven species *viz*., the black-headed Ibis *Threskiornis melanocephalus*, Asian openbill stork *Anastomus oscitans*, Woolly-necked stork *Ciconia episcopus*, Intermediate egret *Ardea intermedia*, Great egret *A. alba*, Cattle egret *Bubulcus ibis* and Jungle myna *Acridotheres fuscus* shows local migration, while the remaining 44 species are migratory. (Fig. 77 to 79)

Species such as Eurasian curlew *Numenius arquata*, Eurasian whimbrel *Numenius phaeopus*, Common redshank *Tringa totanus*, Lesser sandplover *Charadrius mongolus*, Little tern *Sternula albifrons* and the Lesser crested tern *Thalasseus bengalensis* were found over-wintering during June and July at the Kadalundi-Vallikunnu Community Reserve (Table 8).

Table 7. Avian faunal diversity in the Kadalundi-Vallikunnu Community Reserve and their conservation status

Sl. No	Common name	Scientific name	Vernacular name	R/M/ LM*	Order	Family	IUCN Red List Status	IWPA, 1972 Schedule
1	House crow	*Corvus splendens*	പേനക്കാക്ക, കാവതിക്കാക്ക	R	Passeriformes	Corvidae	LC	V
2	Large-billed crow	*Corvus macrorhynchos*	ബലിക്കാക്ക	R	Passeriformes	Corvidae	LC	IV
3	Rufous treepie	*Dendrocitta vagabunda*	ഓലേഞ്ഞാലി	R	Passeriformes	Corvidae	LC	IV
4	Common myna	*Acridotheres tristis*	നാട്ടുമൈന	R	Passeriformes	Sturnidae	LC	IV
5	Jungle myna	*Acridotheres fuscus*	കിന്നരിമൈന	LM	Passeriformes	Sturnidae	LC	IV
6	Racket-tailed drongo	*Dicrurus paradiseus*	കാടുമുഴക്കി	R	Passeriformes	Dicruridae	LC	IV
7	Purple sunbird	*Cinnyris asiaticus*	കറുപ്പൻ തേൻകിളി	R	Passeriformes	Nectariniidae	LC	IV
8	Purple-rumped sunbird	*Leptocoma zeylonica*	മഞ്ഞ തേൻകിളി	R	Passeriformes	Nectariniidae	LC	IV
9	Black-hooded oriole	*Oriolus xanthomus*	മഞ്ഞക്കറുപ്പൻ	R	Passeriformes	Oriolidae	LC	IV
10	Pale-billed flowerpecker	*Dicaeum erythrorhynchos*	ചെങ്കൊക്കൻ ഇത്തിക്കണ്ണിക്കുരുവി	R	Passeriformes	Dicaeidae	LC	IV
11	Ashy prinia	*Prinia socialis*	കതിർവാലൻകുരുവി	R	Passeriformes	Cisticolidae	LC	IV
12	Common tailorbird	*Orthotomus sutorius*	തുന്നാരൻ	R	Passeriformes	Cisticolidae	LC	IV
13	Grey-breasted prinia	*Prinia hodgsonii*	താലിക്കുരുവി	R	Passeriformes	Cisticolidae	LC	IV
14	Oriental magpie robin	*Copsychus saularis*	മണ്ണാത്തിപ്പുള്ള്	R	Passeriformes	Muscicapidae	LC	IV
15	Red-whiskered bulbul	*Pycnonotus jocosus*	ഇരട്ടത്തലച്ചി	R	Passeriformes	Pycnonotidae	LC	IV
16	Red-rumped swallow	*Cecropis daurica*	വരയൻ കത്രിക	R	Passeriformes	Hirundinidae	LC	IV
17	Barn swallow	*Hirundo rustica*	വയൽക്കോതിക്കത്രിക	M	Passeriformes	Hirundinidae	LC	IV

Sl. No	Common name	Scientific name	Vernacular name	R/M/ LM*	Order	Family	IUCN Red List Status	IWPA, 1972 Schedule
18	Blyth's reed warbler	*Acrocephalus dumetorum*	ഈറ്റപൊളപ്പൻ	M	Passeriformes	Acrocephalidae	LC	IV
19	Clamorous reed warbler	*Acrocephalus stentoreus*	കൈതക്കള്ളൻ	M	Passeriformes	Acrocephalidae	LC	IV
20	Asian koel	*Eudynamys scolopaceus*	കരിങ്കുയിൽ, നാട്ടുകുയിൽ	R	Cuculiformes	Cuculidae	LC	IV
21	Greater coucal	*Centropus sinensis*	ചെമ്പോത്ത്, ഉപ്പൻ	R	Cuculiformes	Cuculidae	LC	IV
22	Brahminy kite	*Haliastur indus*	കൃഷ്ണപ്പരുന്ത്, ചെമ്പരുന്ത്	R	Accipitriformes	Accipitridae	LC	I
23	Black kite	*Milvus migrans*	ചക്കിപ്പരുന്ത്	R	Accipitriformes	Accipitridae	LC	I
24	Shikra	*Accipiter badius*	പ്രാപ്പിടിയൻ, ഷിക്ര, പുള്ള്	R	Accipitriformes	Accipitridae	LC	I
25	White-cheeked barbet	*Psilipogon viridis*	ചിന്നക്കുട്ടുറുവൻ	R	Piciformes	Megalaimidae	LC	IV
26	Lesser golden-backed woodpecker	*Dinopium benghalense*	നാട്ടുമരംകൊത്തി	R	Piciformes	Picidae	LC	IV
27	Rock pigeon	*Columba livia*	അമ്പലപ്രാവ്	R	Columbiformes	Columbidae	LC	IV
28	Blue-tailed bee-eater	*Merops philippinus*	വലിയ വേലിത്തത്ത	R	Coraciiformes	Meropidae	LC	IV
29	Common kingfisher	*Alcedo atthis*	ചെറിയ മീൻകൊത്തി	R	Coraciiformes	Alcedinidae	LC	IV
30	White-throated kingfisher	*Halcyon smyrnensis*	മീൻകൊത്തിച്ചാത്തൻ	R	Coraciiformes	Alcedinidae	LC	IV
31	Stork-billed kingfisher	*Pelargopsis capensis*	കാക്കമീൻകൊത്തി, കാക്കപ്പൊന്മാൻ	R	Coraciiformes	Alcedinidae	LC	IV
32	Pied kingfisher	*Ceryle rudis*	പുള്ളിമീൻകൊത്തി	R	Coraciiformes	Alcedinidae	LC	IV
33	Rose-ringed parakeet	*Psittacula krameri*	നാട്ടുതത്ത, മോതിരത്തത്ത	R	Psittaciformes	Psittaculidae	LC	IV
34	Little grebe	*Tachybaptus ruficollis*	മുങ്ങാങ്കോഴി	R	Podicipediformes	Podicipedidae	LC	IV

Sl. No	Common name	Scientific name	Vernacular name	R/M/ LM*	Order	Family	IUCN Red List Status	IWPA, 1972 Schedule
35	White-breasted waterhen	*Amaurornis phoenicurus*	കുളക്കോഴി	R	Gruiformes	Rallidae	LC	IV
36	Slaty-breasted rail	*Lewinia striata*	നീലമാറൻ കുളക്കോഴി	R	Gruiformes	Rallidae	LC	IV
37	Little cormorant	*Microcarbo niger*	ചെറിയ നീർക്കാക്ക	R	Suliformes	Phalacrocoracidae	LC	IV
38	Indian cormorant	*Phalacrocorax fuscicollis*	കിന്നരി നീർക്കാക്ക	R	Suliformes	Phalacrocoracidae	LC	IV
39	Oriental darter	*Anhinga melanogaster*	ചേരക്കോഴി	R	Suliformes	Anhingidae	NT	IV
40	Lesser whistling duck	*Dendrocygna javanica*	ചൂളൻ എരണ്ട	R	Anseriformes	Anatidae	LC	IV
41	Bar-headed goose	*Anser indicus*	കുറിത്തലയൻ വാത്ത്	M	Anseriformes	Anatidae	LC	IV
42	Little egret	*Egretta garzetta*	ചിന്നമുണ്ടി	R	Pelecaniformes	Ardeidae	LC	IV
43	Intermediate egret	*Ardea intermedia*	ചെറുമുണ്ടി	LM	Pelecaniformes	Ardeidae	LC	IV
44	Great egret	*Ardea alba*	പെരുമുണ്ടി	LM	Pelecaniformes	Ardeidae	LC	IV
45	Cattle egret	*Bubulcus ibis*	കാലിമുണ്ടി	LM	Pelecaniformes	Ardeidae	LC	IV
46	Indian pond heron	*Ardeola grayii*	കുളക്കൊക്ക്	R	Pelecaniformes	Ardeidae	LC	IV
47	Grey heron	*Ardea cinerea*	ചാരമുണ്ടി	R	Pelecaniformes	Ardeidae	LC	IV
48	Striated heron	*Butorides striata*	ചിന്നക്കൊക്ക്	R	Pelecaniformes	Ardeidae	LC	IV
49	Western Reef heron	*Egretta gularis*	തിരമുണ്ടി	M	Pelecaniformes	Ardeidae	LC	IV
50	Black crowned night heron	*Nycticorax nycticorax*	പാതിരാക്കൊക്ക്	R	Pelecaniformes	Ardeidae	LC	IV
51	Purple heron	*Ardea purpurea*	ചായമുണ്ടി	R	Pelecaniformes	Ardeidae	LC	IV
52	Yellow bittern	*Ixobrychus sinensis*	മഞ്ഞക്കൊച്ച	R	Pelecaniformes	Ardeidae	LC	IV

Sl. No	Common name	Scientific name	Vernacular name	R/M/ LM*	Order	Family	IUCN Red List Status	IWPA, 1972 Schedule
53	Black-headed Ibis	*Threskiornis melanocephalus*	വെള്ള അരിവാൾകൊക്കൻ, കഷണ്ടിക്കൊക്ക്	LM	Pelecaniformes	Threskiornithidae	NT	IV
54	Glossy Ibis	*Plegadis falcinellus*	ചെമ്പൻ അരിവാൾകൊക്കൻ	M	Pelecaniformes	Threskiornithidae	LC	IV
55	Common snipe	*Gallinago gallinago*	വിശറിവാലൻ ചുണ്ടൻകാട	M	Charadriiformes	Scolopacidae	LC	IV
56	Little stint	*Calidris minuta*	കുരുവി മണലൂതി	M	Charadriiformes	Scolopacidae	LC	IV
57	Broad-billed sandpiper	*Calidris falcinellus*	വരയൻ മണലൂതി	M	Charadriiformes	Scolopacidae	LC	IV
58	Curlew sandpiper	*Calidris ferruginea*	കടൽക്കാട	M	Charadriiformes	Scolopacidae	LC	IV
59	Common sandpiper	*Actitis hypoleucos*	നീർക്കാട	M	Charadriiformes	Scolopacidae	LC	IV
60	Terek sandpiper	*Xenus cinereus*	ടെറക് മണലൂതി	M	Charadriiformes	Scolopacidae	LC	IV
61	Marsh sandpiper	*Tringa stagnatilis*	ചതുപ്പൻ	M	Charadriiformes	Scolopacidae	LC	IV
62	Wood sandpiper	*Tringa glareola*	പുള്ളിക്കാടക്കൊക്ക്	M	Charadriiformes	Scolopacidae	LC	IV
63	Sanderling	*Calidris alba*	തിരക്കാട	M	Charadriiformes	Scolopacidae	LC	IV
64	Eurasian curlew	*Numenius arquata*	വാൾക്കൊക്കൻ	M	Charadriiformes	Scolopacidae	NT	IV
65	Dunlin	*Calidris alpina*	ഡണ്ലിൻ	M	Charadriiformes	Scolopacidae	LC	IV
66	Common greenshank	*Tringa nebularia*	പച്ചക്കാലി	M	Charadriiformes	Scolopacidae	LC	IV
67	Common redshank	*Tringa totanus*	ചോരക്കാലി	M	Charadriiformes	Scolopacidae	LC	IV
68	Eurasian whimbrel	*Numenius phaeopus*	തെറ്റിക്കൊക്കൻ	M	Charadriiformes	Scolopacidae	LC	IV

Sl. No	Common name	Scientific name	Vernacular name	R/M/ LM*	Order	Family	IUCN Red List Status	IWPA, 1972 Schedule
69	Bar tailed godwit	*Limosa lapponica*	വരവാലൻ സ്നാപ്പ്	M	Charadriiformes	Scolopacidae	NT	IV
70	Black-tailed godwit	*Limosa limosa*	പട്ടവാലൻ സ്നാപ്പ്	M	Charadriiformes	Scolopacidae	NT	IV
71	Great knot	*Calidris tenuirostris*	കിഴക്കൻ നട്ട്	M	Charadriiformes	Scolopacidae	EN	IV
72	Ruddy turnstone	*Arenaria interpres*	കല്ലുരുട്ടിക്കാട	M	Charadriiformes	Scolopacidae	LC	IV
73	Brown-headed gull	*Chroicocephalus brunnicephalus*	തവിട്ടുതലയൻ കടൽക്കാക്ക	M	Charadriiformes	Laridae	LC	IV
74	Black-headed gull	*Chroicocephalus ridibundus*	ചെറിയ കടൽക്കാക്ക	M	Charadriiformes	Laridae	LC	IV
75	Lesser black-backed gull	*Larus fuscus*	ഹ്യുഗ്ലിനി കടൽക്കാക്ക, സ്ലൂപ് കടൽക്കാക്ക	M	Charadriiformes	Laridae	LC	IV
76	Slender billed gull	*Chroicocephalus genei*	സൂചീമുഖി കടൽക്കാക്ക	M	Charadriiformes	Laridae	LC	IV
77	Pallas's gull	*Ichthyaetus ichthyaetus*	വലിയ കടൽക്കാക്ക	M	Charadriiformes	Laridae	LC	IV
78	Little tern	*Sternula albifrons*	ആളച്ചിന്നൻ	M	Charadriiformes	Laridae	LC	IV
79	Lesser crested tern	*Thalasseus bengalensis*	ചെറിയ കടലാള	M	Charadriiformes	Laridae	LC	IV
80	Great crested tern	*Thalasseus bergii*	വലിയ കടലാള	M	Charadriiformes	Laridae	LC	IV
81	Caspian tern	*Hydroprogne caspia*	വലിയ ചെങ്കൊക്കൻ ആള	M	Charadriiformes	Laridae	LC	IV
82	Gull-billed tern	*Gelochelidon nilotica*	പാത്തക്കൊക്കൻ ആള	M	Charadriiformes	Laridae	LC	IV
83	Sandwich tern	*Thalasseus sandvicensis*	കടലുണ്ടി ആള	M	Charadriiformes	Laridae	LC	IV

Sl. No	Common name	Scientific name	Vernacular name	R/M/ LM*	Order	Family	IUCN Red List Status	IWPA, 1972 Schedule
84	Eurasian oystercatcher	*Haematopus ostralegus*	കടൽമണ്ണാത്തി	M	Charadriiformes	Haematopodidae	NT	IV
85	Black-winged stilt	*Himantopu shimantopus*	പവിഴക്കാലി	M	Charadriiformes	Recurvirostridae	LC	IV
86	Lesser sand plover	*Charadrius mongolus*	മംഗോളിയൻ മണൽക്കോഴി, പാമീർ മണൽക്കോഴി	M	Charadriiformes	Charadriidae	LC	IV
87	Kentish plover	*Charadrius alexandrinus*	ചെറുമണൽക്കോഴി	M	Charadriiformes	Charadriidae	LC	IV
88	Grey plover	*Pluvialis squatarola*	ചാരമണൽക്കോഴി	M	Charadriiformes	Charadriidae	LC	IV
89	Pacific golden plover	*Pluvialis fulva*	പൊൻമണൽക്കോഴി	M	Charadriiformes	Charadriidae	LC	IV
90	Greater sand plover	*Charadrius leschenaultii*	വലിയ മണൽക്കോഴി	M	Charadriiformes	Charadriidae	LC	IV
91	Little-ringed plover	*Charadrius dubius*	ആറ്റുമണൽക്കോഴി	M	Charadriiformes	Charadriidae	LC	IV
92	Red-wattled lapwing	*Vanellus indicus*	ചെങ്കണ്ണി തിത്തിരി	R	Charadriiformes	Charadriidae	LC	IV
93	Asian openbill stork	*Anastomus oscitans*	ചേരാക്കൊക്കൻ	LM	Ciconiiformes	Ciconiidae	LC	IV
94	Woolly-necked stork	*Ciconia episcopus*	കരുവാരക്കുരു, വക്കീൽക്കൊക്ക്	LM	Ciconiiformes	Ciconiidae	NT	IV
95	Greater flamingo	*Phoenicopterus roseus*	വലിയ രാജഹംസം	M	Phoenicopteriformes	Phoenicopteridae	LC	IV

*	
	R: Resident
	LM: Local Migrant
	M: Migratory

Table 8. Occurrence of different species of migratory birds at KVCR during different months in 2018-2019*

Sl. No	Avian fauna	Apr '18	May '18	Jun '18	Jul '18	Aug '18	Sep '18	Oct '18	Nov '18	Dec '18	Jan '19	Feb '19	Mar '19	Apr '19
1	Glossy Ibis									■				
2	Common snipe							■						
3	Little stint					■								
4	Broad-billed sandpiper						■							
5	Common sandpiper	■	■				■	■	■	■	■	■	■	■
6	Terek sandpiper						■						■	
7	Marsh sandpiper									■	■			
8	Curlew sandpiper													■
9	Wood sandpiper							■	■	■	■	■	■	■
10	Eurasian curlew	■		■			■	■	■	■	■		■	■
11	Dunlin						■			■				
12	Common greenshank	■				■	■			■	■		■	■
13	Common redshank	■	■	■			■	■	■	■	■	■	■	■
14	Eurasian whimbrel	■	■		■	■	■	■	■	■	■	■	■	■
15	Bar-tailed godwit						■				■			
16	Black-tailed godwit								■	■				
17	Brown-headed gull	■								■	■	■	■	■
18	Black-headed gull	■								■	■	■	■	
19	Lesser black-backed gull								■					
20	Slender billed gull										■	■	■	
21	Pallas's gull								■	■				
22	Little tern	■		■		■								
23	Lesser crested tern	■		■	■	■								
24	Great crested tern											■		
25	Caspian tern										■			
26	Eurasian oystercatcher						■	■		■	■	■	■	
27	Black-winged stilt							■						
28	Lesser sand plover	■	■	■	■	■	■	■		■	■	■	■	■
29	Kentish plover	■								■	■		■	■
30	Grey plover								■	■	■	■	■	■
31	Pacific golden plover	■								■	■	■	■	
32	Greater sand plover									■				
33	Little-ringed plover									■	■			
34	Barn swallow								■	■	■	■	■	■
35	Blyth's reed warbler								■	■	■	■		
36	Clamorous reed warbler								■	■	■	■		

Sl. No	Avian fauna	Apr '18	May '18	Jun '18	Jul '18	Aug '18	Sep '18	Oct '18	Nov '18	Dec '18	Jan '19	Feb '19	Mar '19	Apr '19
37	Bar-headed goose													
38	Sanderling													
39	Great knot													
40	Ruddy turnstone													
41	Gull-billed tern													
42	Sandwich tern													
* at least one sighting in the shaded month														

Conservation status of avian fauna of KVCR

Of the 95 species of birds recorded during 2018-2019, the Great knot *Calidris tenuirostris* is listed as an endangered species (EN) in the IUCN Red List of Threatened Species. Seven species of birds *viz*., the Oriental darter *Anhinga melanogaster*, Black-headed Ibis *Threskiornis melanocephalus*, Eurasian curlew *Numenius arquata*, Bar-tailed godwit *Limosa lapponica*, Black-tailed godwit *Limosa limosa*, Eurasian oystercatcher *Haematopus ostralegus* and the Woolly-necked stork *Ciconia episcopus* are listed as Near Threatened (NT) while the remaining 87 species have been listed as Least Concern (LC) in the IUCN Red List of Threatened Species (Fig. 75). A vast majority of species (91 species) are listed in Schedule IV while one species (House crow, *Corvus splendens*) is listed in Schedule V of the Indian Wildlife (Protection) Act, 1972. Three species *viz*., the Brahminy kite *Haliastur indus*, Black kite *Milvus migrans* and Shikra *Accipiter badius* are listed in the Schedule I of Indian Wildlife (Protection) Act, 1972 (Fig. 76).

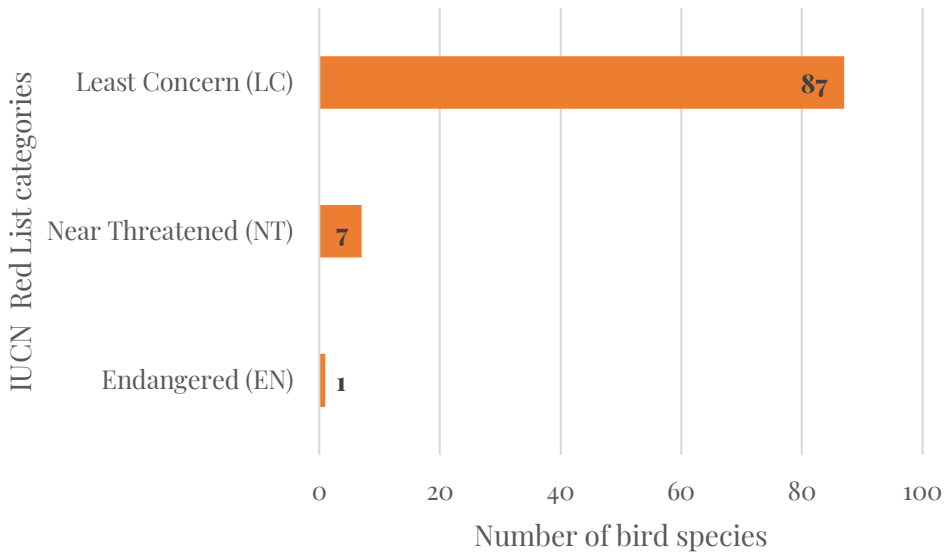


Fig. 75. Number of birds of KVCR listed in different categories of IUCN Red List of Threatened Species

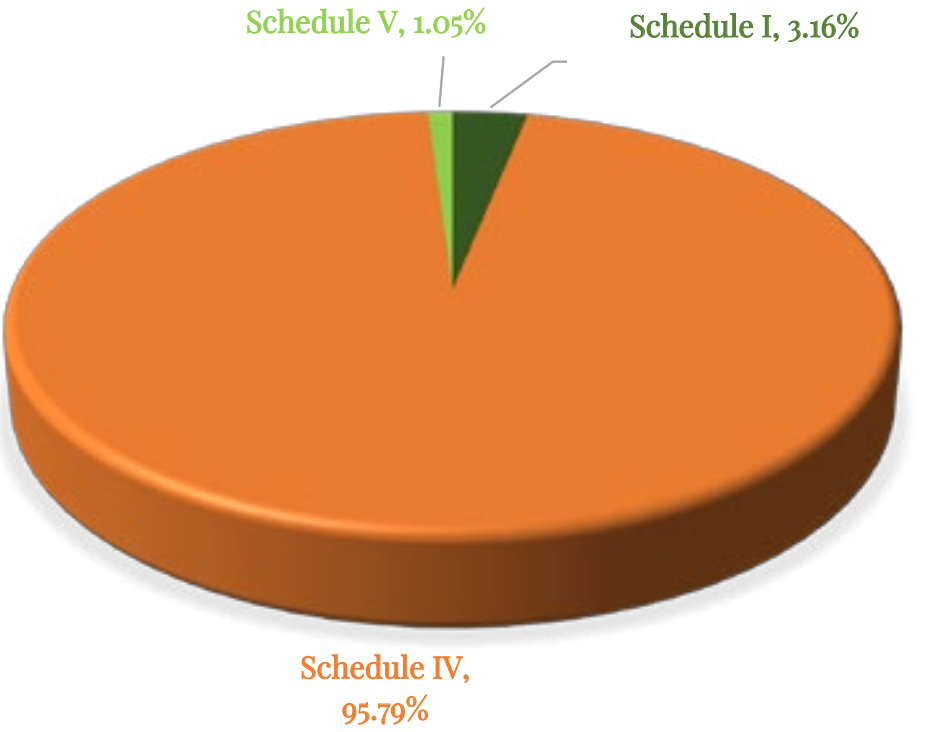


Fig. 76. Percentage of avian species listed under different Schedules of the Indian Wildlife (Protection) Act, 1972

Fig. 77. Some of the migratory birds that visit KVCR

Kentish plover, *Charadrius alexandrinus*

Dunlin, *Calidris alpina*

Bar-tailed godwit, *Limosa lapponica*

Eurasian Whimbrel, *Numenius phaeopus* feeding on crabs in the mudflat

Little tern, *Sternula albifrons*

Grey plover, *Pluvialis squatarola* in the mudflat of KVCR

Terek sandpiper, *Xenus cinereus*

Lesser sand plover, *Charadrius mongolus*

Eurasian oystercatcher, *Haematopus ostralegus* with gulls in Kadalundi mudflat

Common red shank, *Tringa totanus*

Pacific golden plover, *Pluvialis fulva*

Marsh sandpiper, *Tringa stagnatilis*

Black-headed gulls and brown-headed gulls in KVCR

Caspian tern, *Hydroprogne caspia*

Western Reef heron, *Egretta gularis*

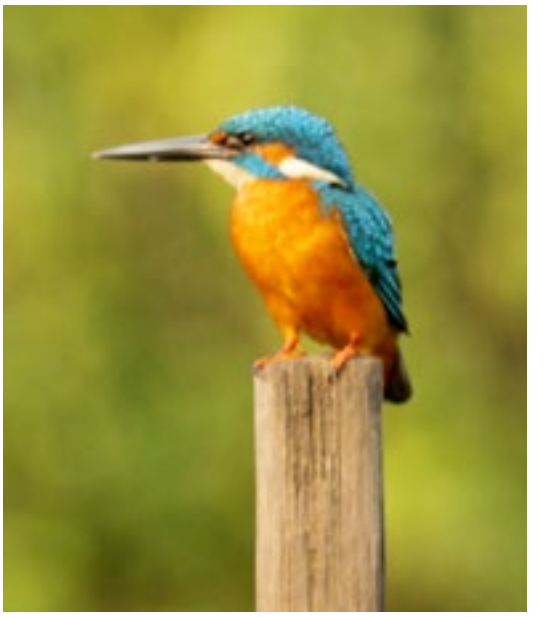
Bar-headed goose, *Anser indicus*

Fig. 78. Some of the resident avifauna of KVCR

Little egret, *Egretta garzetta*

Little cormorant, *Microcarbo niger*

Striated heron, *Butorides striata*



Common kingfisher, *Alcedo atthis*

Grey heron, *Ardea cinerea*

Juveniles of Brahminy Kite, *Haliastur indus* resting on the sand bar at Kadalundi

Fig. 79. Some of the avifauna at Kadalundi that shows local migration

A flock of Great egrets along with Little egrets in the mudflat

Great egret, *Ardea alba*

Black headed Ibis, *Threskiornis melanocephalus*

Mammal

Lutrogale perspicillata (I. Geoffroy Saint-Hilaire, 1826)

- Family : Mustelidae
- Common name: Smooth-coated Otter
- Vernacular name: നീർനായ

VU

IUCN Red List Category:
Vulnerable (VU)

The most significant apex predator of mangrove ecosystem is the smooth-coated otter, Lutrogale perspicillata. These are the largest of the otters found in south-east Asia and they are known to grow to about 1.3 m in length, weighing about 7-11 kg. They are listed as Vulnerable (VU) in the IUCN Red List of Threatened Species.

The smooth-coated otter *Lutrogale perspicillata* (Fig. 80) is a carnivorous mammal that belongs to the family Mustelidae. A maximum of 22 individuals of this species are reported from the Kadalundi-Vallikunnu Community Reserve. They are generally found to move in groups, feeding actively on fishes and their very sight has been attracting the visitors of the Community Reserve. They have short furs which are smooth, velvety and shiny. The fur is light to dark-brown dorsally and light-brown to grey ventrally. They are characterised by rounded heads, naked nose and flattened tails. They have strong webbed feet and dexterous paws with sharp claws.

Although adapted to live in water, they are also capable to move on land and can move even fairly long distances in search of suitable habitat. They are known to shelter in shallow burrows or live between piles of rocks.

Fig. 80. Smooth-coated otter, *Lutrogale perspicillata* found in Kadalundi wetland

ECOSYSTEM GOODS AND SERVICES >>

Economic value of ecosystem goods & services

The central theme of economic valuation of an estuarine ecosystem is the need to place proper values on the goods and services they provide, which are essential for utilisation and sustainable development. The capital assets of estuaries are of two distinct forms *viz*., the natural capital and the man-made capital. The natural capital of estuarine ecosystems provide various services like habitat, spawning and nursery grounds for fish and many invertebrates, shelter, foraging and breeding habitat for birds and other animals, nutrient cycling, shoreline protection, control of erosion and water filtration. The quality of the estuarine natural capital is dependent on the overall maintenance of the health of the estuary. On the other hand, the man-made capital depends on investment by the government agencies and the assets take advantage of the natural assets provided by the estuaries, like paths for navigation, biological resources, protected shoreline for industrial and urban development, disposal of effluents and natural ecological beauty for developing eco-tourism. It is pertinent to have an understanding of the economic value of the natural capital, to decide whether the ecosystem is worth preserving by undertaking capital works and by implementing management practices. However, valuing these are difficult when compared to marketable goods. Thus, valuing the estuarine ecosystem goods and services requires an assessment of the total economic value, which includes the use-benefits as well as the non-use benefits.

Table 9. Services provided by the Kadalundi-Vallikunnu Community Reserve

Provisional services	Regulating services	Supporting services	Cultural services
Fishing (Fishing by gill net, cast net, hook & line, traps, oyster picking), Aquaculture (fish seed production, mussel farming)	Nutrient cycling, biological production, control of erosion by mangroves, waste regulation by mangroves, carbon sequestration by mangroves	Nursery and feeding ground of fishes, mangroves as habitat for birds, mudflats as foraging area of birds	Tourism, rich species diversity of mangroves (recreational and educational), visit of birds (recreational and educational)

Table 10. Fish catch and revenue from bamboo fence *(thada)* fishing practice in KVCR

Fishes	Average annual catch (kg)	Average annual revenue (Rs.)	Price per kg (Rs.)
Mullets	2,568	8,98,831	350
Carangids	134	16,838	125
Scatophagus argus	113	5,680	50
Gerres spp.	113	9,067	80
Terapon spp.	105	7,946	75
Etroplus spp.	138	16,674	120
Glossogobius spp.	16	409	25
Sillago sihama	17	2,325	130
Catfish	396	31,744	80
Leiognathids	12	615	50
Snappers	70	7,767	110
Eel	8	1023	120
Half-beak	132	14,539	110
Lates calcarifer	27	6,791	250
Croaker	21	3,203	150
Acanthopagrus berda	47	11,799	250
Ambassis spp.	18	2,213	120
Rays	12	3,435	275
Shrimp	10	4,882	450
Crab	19	2,391	120
Output			
A. Revenue			
Average annual revenue		10,48,181	
B. Cost			
Average annual wages		2,62,045	
Annual operating cost		1,04,818	
C. Average annual net revenue		**6,81,317**	

The ecosystem services provided by the Kadalundi-Vallikunnu Community Reserve fall into four groups such as provisioning services, regulating services, cultural & recreational services and supporting services (Table 9).

Economic value from the provisional services (fisheries and aquaculture)

The villagers depend on the KVCR for fishing activities (for fishing, oyster picking), aquaculture activities (fish seed collection, fish culture, green mussel culture) and tourism. About 50 fishermen are regularly involved in fishing and operate various gears like the cast net (Fig. 81), gillnet and hook & line. Two groups of fishermen operate the specially designed bamboo fence, locally called '*thada*' (Fig. 82). In the case of the bamboo fence, the average number of fishing days in a year is 144. With an investment of Rs.3.66 lakhs (capital and labour), an average annual net revenue of Rs.6.81 lakhs is obtained (Table 10). Considering the other fishing practices (gill net, cast net, hook & line), oyster picking and mussel farming, an average annual net revenue of Rs.3 crores is obtained (Table 11).

Fig. 81. Cast net operation at the Kadalundi estuarine bar mouth

Table 11. Fish catch and revenue from fishing (gill net, cast net, hook & line), oyster picking and mussel farming

Fishes	Average annual catch (kg)	Average annual revenue (Rs.)	Price per kg (Rs.)
Mullets	4,329	15,15,150	350
Carangids	558	69,810	125
Scatophagus argus	397	19,897	50
Gerres spp.	350	28,028	80
Terapon spp.	338	25,415	75
Etroplus spp.	835	1,00,246	120
Glossogobius spp.	143	3,582	25
Sillago sihama	194	25,239	130
Catfish	488	39,064	80
Leiognathids	90	4,512	50
Snappers	723	79,611	110
Eel	85	10,267	120
Half-beak	981	1,07,951	110
Lates calcarifer	457	1,14,286	250
Croaker	347	52,138	150
Acanthopagrus berda	236	59,242	250
Ambassis spp.	144	17,367	120
Rays	48	13,272	275
Shrimp	202	90,907	450
Crab	243	29,269	120
Oyster	5,600	10,64,000	190
Mussel	2,25,000	4,27,50,000	190
Output			
A. Revenue			
Average annual revenue			4,62,19,260
B. Cost			
Average annual wages			1,15,54,815
Annual operating cost			46,21,926
C. Average annual net revenue			3,00,42,519

Fig. 82.
Bamboo fence with a filter trap locally called *thada* – a traditional fishing gear used at Kadalundi

Oyster picking in KVCR

There are two species of oysters in the Kadalundi wetland *viz.,* the Indian backwater oyster *Magallana bilineata (=Crassostrea madrasensis)* and the small rock oyster *Crassostrea cucculata*; the former is a larger variety with higher meat content and highly preferred by the pickers and consumers. Oyster picking is one of the high-income generation avenues for the fishermen of the Kadalundi-Vallikunnu Community Reserve (Fig. 83 & 84). The oyster picking season is very narrow extending for a period of three months, from April to June. There are about 20 oyster pickers in the entire KVCR who regularly pick oysters from the wetland. The estimated total harvest is 5,600 kg (Table 11).

Fig. 83. A rock oyster bed in Kadalundi estuary

Fig. 84. An oyster picker with his harvest of the Indian backwater oyster *Magallana bilineata* (=*Crassostrea madrasensis*)

Mussel farming

Mussel farming is gaining momentum in the Kadalundi estuary and many farmers are coming forward for this culture enterprise; despite the fact, they have suffered a huge loss during certain years. A total of 150 farmers are involved in mussel farming in Kadalundi estuarine wetland and they practice on-bottom mussel farming by spreading the mussel spats on the floor of the wetland. On average, each farmer broadcasts about 10 boxes; each box weighs about 60 kg and costs about Rs.2000/-. They harvest on an average 2.5 boxes for one box of mussel spats. The estimated investment is Rs.39 lakhs (from 150 farmers) which includes mussel spat and labour. The estimated total production in 6 months culture period is 3,750 boxes which are about 2,25,000 kg (Table 11).

Economic valuation from eco-tourism in KVCR

Eco-tourism is gaining momentum in the Kadalundi-Vallikunnu Community Reserve with an increase in the number of tourists year after year (Fig. 85 to 88). At present, there are 7 tourist operators in KVCR. Their investment for the boat is Rs.3 lakhs; besides they invest in life jackets and buoys which are mandatory for boat operators (Table 12). For each boat, the annual maintenance cost is Rs.3,000/-. There are also three registered homestays in KVCR.

Fig. 85. Office of the Kadalundi-Vallikunnu Community Reserve

Fig. 86. Boat jetty in KVCR

Fig. 87. Tourists taking a trip around the mangroves in KVCR

Fig. 88. Educational camp at KVCR

Table 12. Investment by the boat operators

Sl. No.	Agency	No. of boats	No. of persons in one boat	Capital cost (cost of boat – Rs. in lakhs)			Annual Maintenance (Rs.)
				Boats	Life jackets*	Ring buoys**	
1	Island Tourism	2	12	7.0	36,000	16,000	3,000
2	River Tourism	1	12	3.0	18,000	8,000	3,000
3	Miami Homestay & Ecotourism	1	20	3.0	26,000	8,000	3,000
4	Mangrove Tourism	1	12	3.0	18,000	8,000	3,000
5	Green Island Tourism	1	12	3.0	18,000	8,000	3,000
6	Kadalundi Tourism	1	12	3.0	18,000	8,000	3,000
7	River View Tourism	1	12	3.0	18,000	8,000	3,000
* 1 per tourist and 2 drivers + 4 extra jackets in each boat							
** 4 per boat @Rs.2000/- per buoy							

The prospects for eco-tourism in KVCR is bright and many people are now coming forward to this avocation. The annual revenue of the tourism operators ranged from Rs. 28,000/- to Rs. 16,48,000/- and the total annual revenue from tourism at the Kadalundi-Vallikunnu Community Reserve was estimated to be 20,83,000/- (Table 13).

Table 13. Income from tourism at KVCR

Sl. No	Agency	No. of trips	Average Annual Revenue (Rs.)
1	Island Tourism	420	16,48,000
2	River Tourism	40	28,000
3	Miami Homestay & Ecotourism	156	2,88,000
4	Mangrove Tourism	50	35,000
5	Green Island Tourism	40	28,000
6	Kadalundi Tourism	40	28,000
7	River View Tourism	40	28,000
	Total		**20,83,000**

Carbon sequestration potential of mangroves of Kadalundi

Mangroves assume significance as standing stores of sequestered atmospheric carbon and are, therefore, important in the light of climate change mitigation. The C-stocks of above ground and root biomass were 83.32 ± 11.06 t C ha^{-1} and 34.96 ± 4.30 t C ha^{-1} respectively, while the C-stock in sediment was estimated to be 63.87 ± 8.67 t C ha^{-1} . The estimates of mean combined C-stocks in the mangrove biomass and sediment of Kadalundi shows that this estuarine mangrove wetland stored 182.15 t C ha^{-1}, which was equivalent to 668.48 t CO_2 ha^{-1} (Fig. 89). The mangroves which cover an area of 13.23 ha in the Kadalundi wetland is assumed to have the potential to sequester and store a substantial quantity of 2,409.84 t C which is equivalent to 8,844.11 t CO_2. The study underscores the importance of these intertidal forests for climate change mitigation.

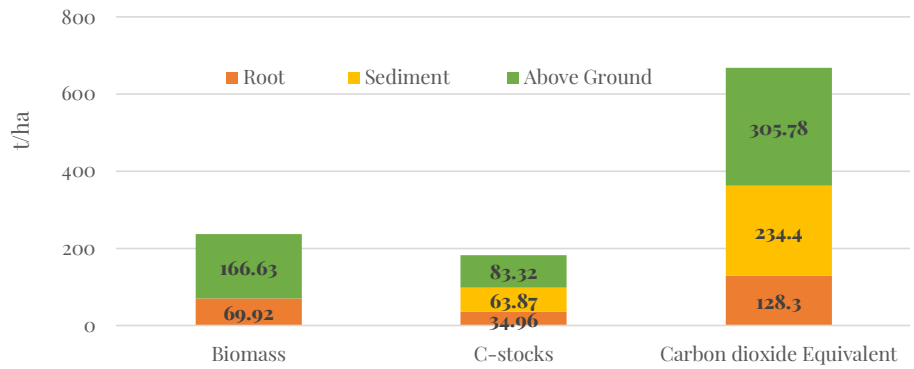


Fig. 89. Biomass, C-stocks and CO_2 equivalent potential of the Kadalundi mangrove wetland

Total economic value of Kadalundi estuary and adjoining coastal area

The economic value of different ecosystems of KVCR including the adjacent open ocean is given in Table 14. The Kadalundi estuary alone is estimated to have a value of Rs. 2.32 million and the mangrove ecosystem of the Kadalundi wetland is estimated to have a value of Rs.2.55 million. The total estimated value of the Kadalundi estuary and the adjoining ecosystems is Rs.56.11 million.

Table 14. Total Economic Value of ecosystem services of KVCR

Ecosystem	Area (ha)	Value (in million Indian Rupees)
Estuary	80.16	2.32
Mangroves	13.14	2.55
Sand deposition	19.23	0.16
Agricultural fields	33.47	0.42
Shelf area	196.00	0.44
Open ocean	280.00	0.18
River/stream	4000.00	50.05
Total value		**56.11**

It is necessary to adopt an integrated approach to the management of Kadalundi-Vallikunnu Community Reserve by mainstreaming the biodiversity conservation to get benefits of socio-economic well-being and sustainability of the biological resources for the present as well as for the future generation (Fig 90).

The value of the ecosystem services of KVCR is very high and the interrelation between the four services such as provisional, regulating, supporting and cultural services show that the existence of flora and fauna, physical factors, habitats and drivers of change will decide the continuous supply of services to the welfare of human beings (Fig. 91)

The ecosystem services, human well-being and poverty alleviation are directly related and intermingled in the Kadalundi-Vallikunnu Community Reserve (Fig. 93). The increase or decrease in the economic value of biodiversity will have a direct effect on the livelihood and income generation of the people of KVCR. Continuous research, monitoring and management of KVCR coupled with stakeholder participation in all decision-making process is vital for the sustainability of the Community Reserve (Fig. 92).

Fig. 90. Integrated approach to biodiversity and sustainablity of KVCR.

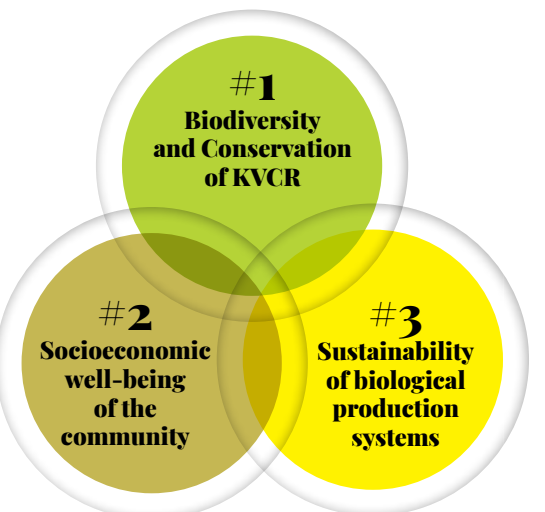
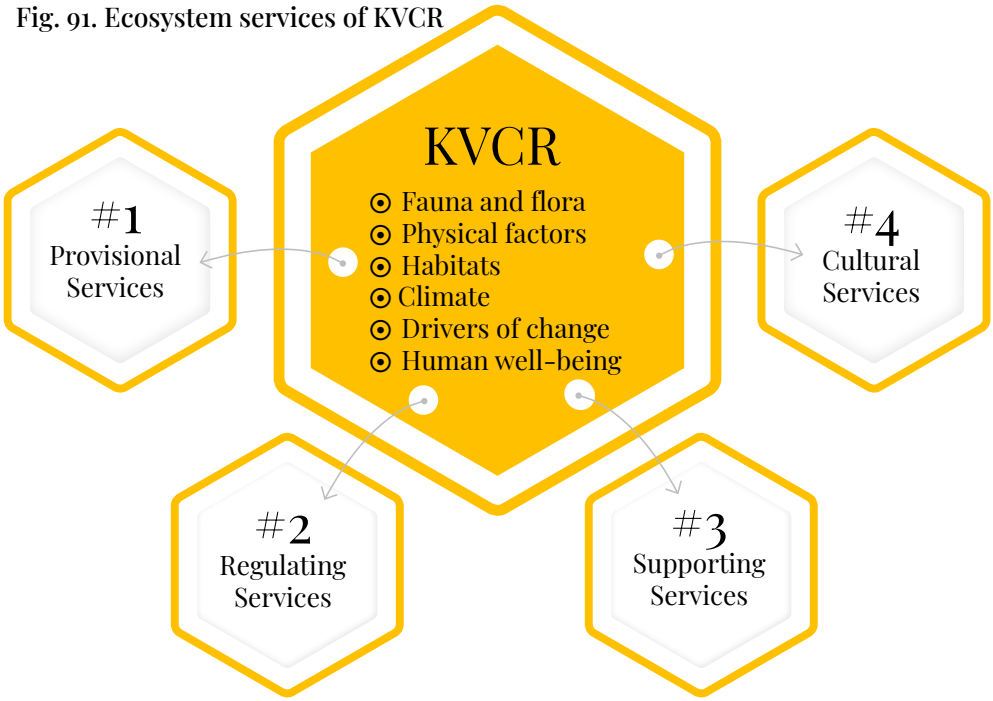


Fig. 91. Ecosystem services of KVCR



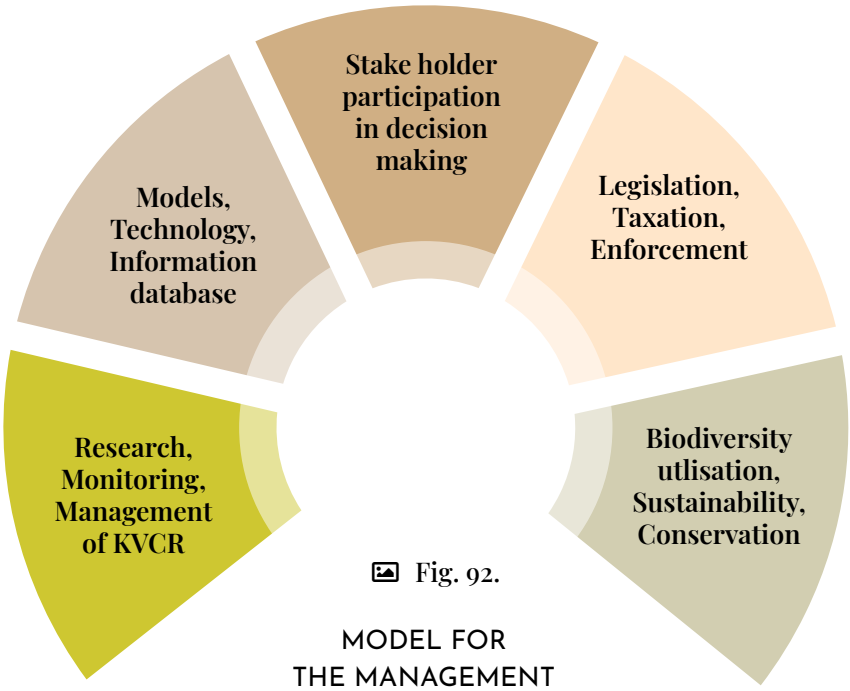


Fig. 92.

MODEL FOR THE MANAGEMENT OF KVCR

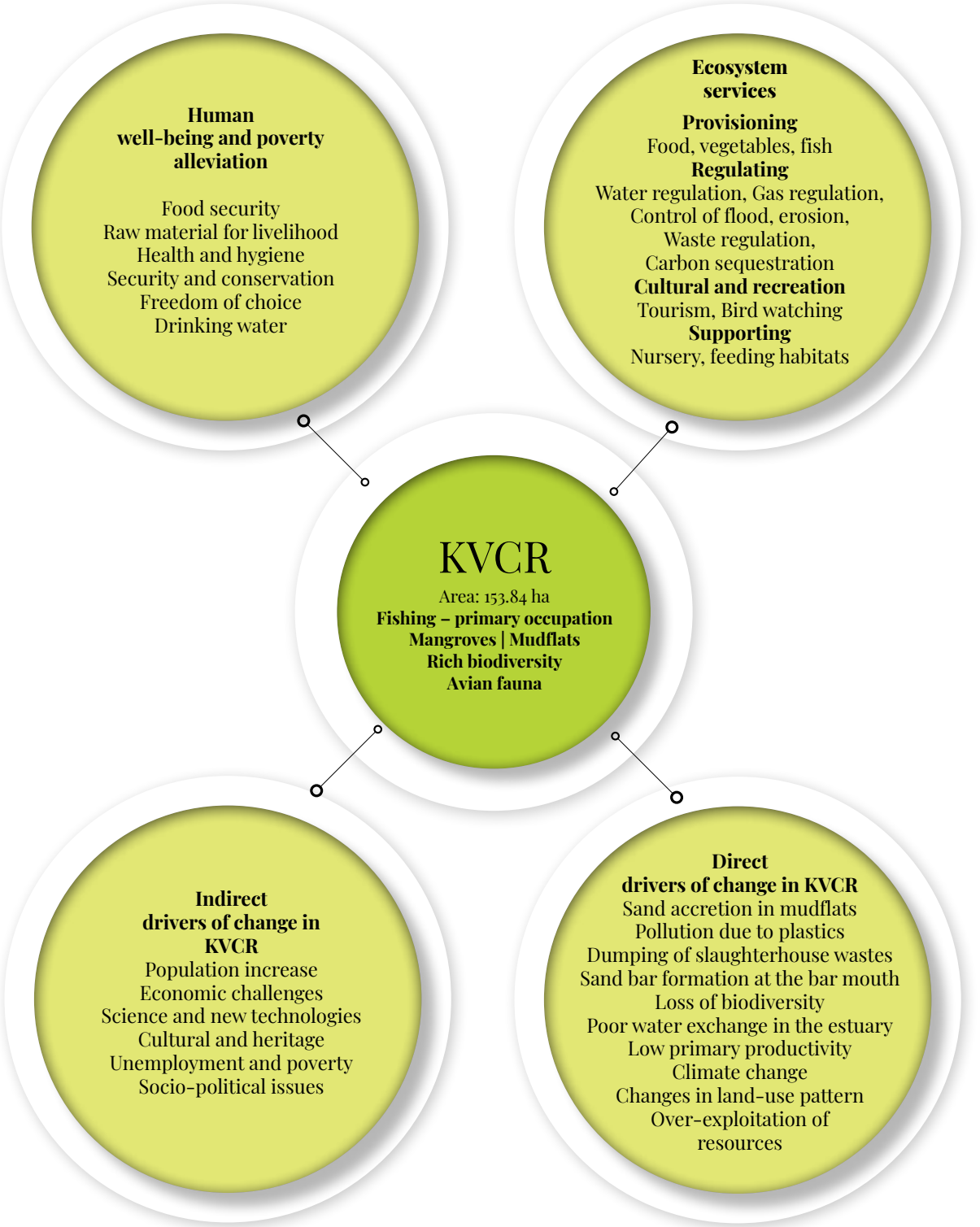


Fig. 93. Interrelation between the ecosystem services and drivers of change

Major issues and management options

The Kadalundi-Vallikunnu Community Reserve – the first Community Reserve of Kerala provides many ecological services. However, this ecosystem which is a well-known mangrove wetland and a wintering ground of many migratory birds face many challenges.

I. Sand bar formation at the bar mouth

Over the years, sand has accumulated at the bar mouth, which has resulted in the formation of a sand bar. The rate of change in sand bar formation at the bar mouth is evident from google maps (Figure 94 - A to F). A comparison of the maps indicate that the sand bar which covered only an area of 1.81 ha in the year 2002 had extended and spread to 18.81 ha by the year 2019. In 2002, the accumulation of sand was found only at the edges and there was no hindrance for the exchange of water between the sea and the river. However, over the years the sand accumulated and spread to 3.04 ha in 2018 with a steep increase in 2019. At present, the sand bar at the bar mouth considerably restricts the water exchange (Fig. 95 & 96). The reduced exchange and flow would have many deleterious effects including nutrient exchange between the sea and the river and dissipation of waste from the estuary. The constriction of the bar mouth would also affect the migration of many species of fishes and invertebrates which depend on the estuary for breeding and feeding.

II. Sand accretion in mudflats

Accretion of sand in the mudflats and adjoining mangrove area on the western side of the estuary is also of great concern. The mudflats harbour numerous small invertebrates including crabs, molluscs and polychaetes which attract the avian fauna. The accretion of sand over the mudflats has been found to diminish the foraging ground of birds. The accumulation of sand in the mangrove area on the western side of the railway bridge has been found to cause death of mangroves – *Avicennia officinalis* and *Sonneratia alba* in about 0.1 sq. Km. The accretion of sand smothers the pneumatophores of mangroves, consequently resulting in their death (Fig. 97).

III. Pollution due to plastics

Pollution, particularly due to plastics is a big menace in the Kadalundi-Vallikunnu Community Reserve. The plastic wastes enter the Kadalundi estuary from the upstream and also by the dumping discarded plastics in the mangrove area (Fig. 98). The plastic wastes get entangled in the respiratory roots and lower branches of mangroves and remain there for a very long period.

IV. Dumping of slaughterhouse wastes

The dumping of slaughterhouse wastes into the Kadalundi river and estuary has become a problem to the inhabitants of KVCR as well as to the tourists who visit the Community Reserve. The slaughterhouse wastes emanate obnoxious smell, posing difficulty to the local people.

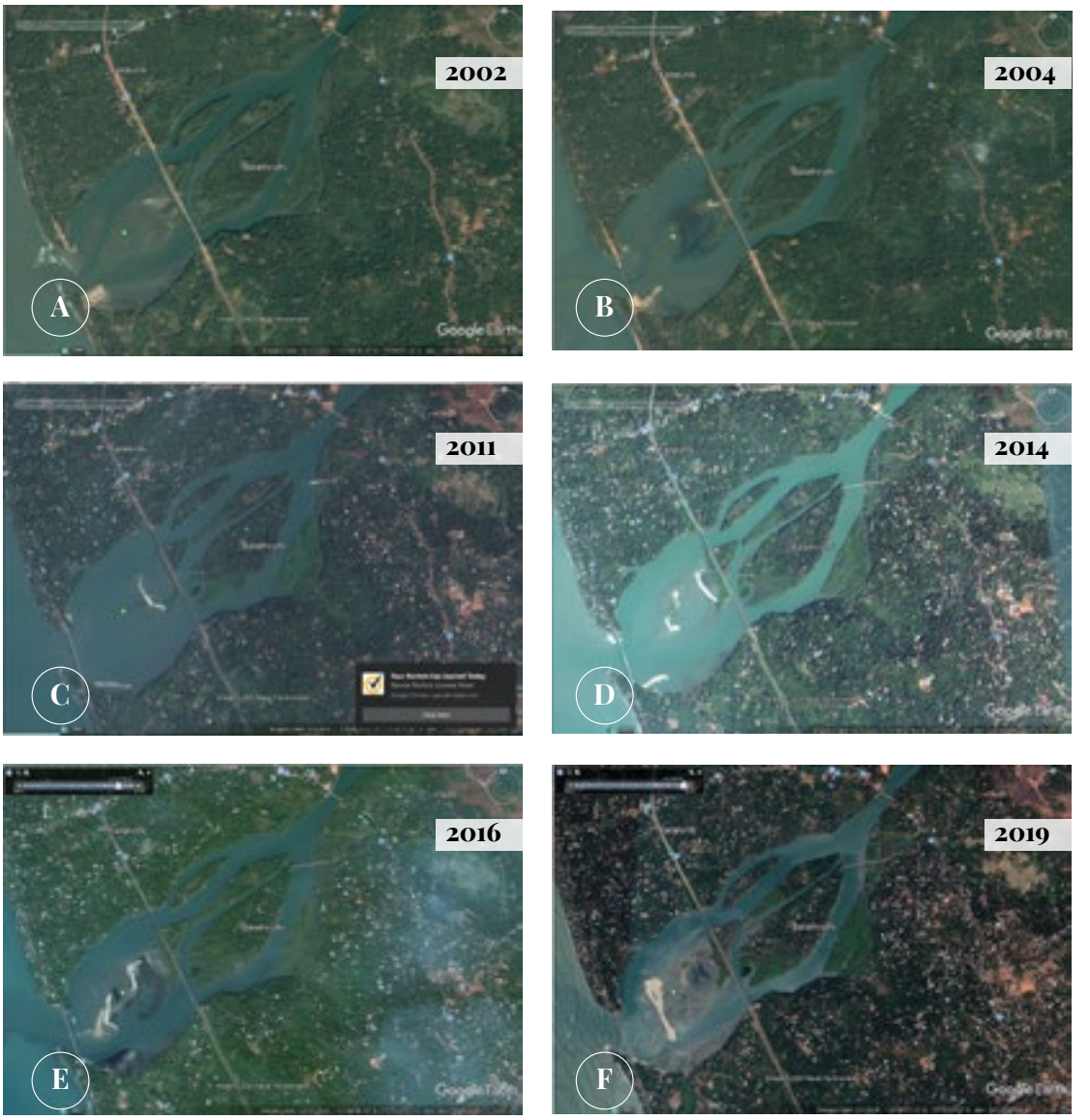


Fig. 94. Google maps showing the formation of sand bar in Kadalundi bar mouth from 2002 to 2019

Fig. 95. Sand bar formation at the estuarine bar mouth restricting the exchange of tidal water- an aerial view

Fig. 96. A close view of the sand bar

V. Anchoring of fishing vessels

Of late, anchoring of mechanised fishing vessels in KVCR near the barmouth is a matter of concern to the health of the Reserve forest (Fig. 99). These fishing vessels cause noise pollution and other problems associated with the mechanised vessels.

Fig. 97. A view of the dead trees of *Avicennia officinalis* on the western side of the railway bridge

Fig. 98. A view of plastics and discarded fishing nets in one of the sandy stretches near the bar mouth

Management Options

Based on the studies conducted by the ICAR-CMFRI and based on the stakeholder workshops conducted and the in-depth discussions held with various stakeholders, including officials of the Department of Forests, Department of Fisheries, members of the KVCR Management Committee, fishermen, oyster pickers, mussel farmers, residents, students and researchers, the following management options have emerged which are listed below.

i. Removal of sand from the bar mouth of the Kadalundi estuary is an urgent need to increase the flow of water, to revive the exchange of nutrients and to maintain the overall health of the estuarine ecosystem.

ii. Planting of suitable species of mangroves needs to be done in degraded areas of the wetland, particularly on the western side of the railway bridge, for replenishing the mangrove vegetation. Also, mangroves can be planted in the fallow areas available in the islands like Mannan Thuruthu to increase their standing stock biomass.

iii. Suitable areas in the wetland need to be identified for developing mangrove nurseries and the local people need to be trained in raising the mangrove seedlings and planting them. Incentives need to be provided to the local communities who are involved in the mangrove afforestation programme.

iv. Regular clean-up programmes for the removal of plastics need to be organised throughout the year involving volunteers.

v. Capacity building of local people of the Community Reserve is to be undertaken by imparting training in scientific methods of green mussel farming, edible oyster culture, mud crab culture, cage fish culture, ornamental fish culture etc. in the mangrove wetlands. The promotion of such income generation programmes will provide a livelihood to the local communities who will also shoulder the responsibility of protecting the mangroves.

vi. The Kadalundi-Vallikunnu Community Reserve has been attracting a large number of tourists every year. The promotion of eco-tourism is, therefore, an urgent need. At present, seven registered boat operators ferry the tourists in the mangrove areas. Steps need to be taken to educate the tourism operators on the significance of mangrove wetlands and the identification of different species of mangroves and birds. This will help the tour operators to educate the tourists who come from the length and breadth of the country as well as from the overseas.

vii. Creation of an interpretation centre in the Community Reserve for the benefit of students and the general public is an immediate need. The interpretation centre should be planned in such a way that it provides all the general information on mangroves and associated biodiversity.

Fig. 99. A view of the fishing vessels anchored at the barmouth of KVCR

viii. Establishment of a mangrove botanical garden in the Community Reserve, encompassing different species of mangroves would be more informative to the public, students and researchers.

ix. Ranching of fish and shrimp seeds in Kadalundi estuary and coastal waters need to be undertaken for stock enhancement.

x. Awareness programmes need to be regularly organised for the people of the Community Reserve on the wise use of mangrove wetlands and their conservation.

ANNEXURE

Table 1. List of mangrove-associated fauna reported from earlier studies at KVCR and their conservation status

Sl. No.	Common Name	Scientific Name	Order	Family	IWPA, 1972 Schedule	IUCN Status
	AMPHIBIANS					
1.	Common Indian Toad	*Duttaphrynus melanostictus*	Anura	Bufonidae	–	LC
2.	Indian Skittering frog	*Euphlyctis cyanophlyctis*	Anura	Dicroglossidae	IV	LC
3.	Karaavali skittering frog	*Euphlyctis karavali*	Anura	Dicroglossidae	IV	NE
4.	Indian Bull Frog	*Hoplobatrachus tigerinus*	Anura	Dicroglossidae	IV	LC
5.	Painted Frog	*Uperodon taprobanicus*	Anura	Microhylidae	–	LC
6.	Fungoid Frog	*Hydrophylax malabarica*	Anura	Ranidae	–	LC
7.	Urban Golden-backed frog	*Indosylvirana urbis*	Anura	Ranidae	–	NE
8.	Common Indian Tree Frog	*Polypedates maculatus*	Anura	Rhacophoridae	–	LC
9.	Kani Bush Frog	*Pseudophilautus kani*	Anura	Rhacophoridae	–	LC
10.	Red Caecilian	*Uraeotyphlus oxyurus*	Gymnophiona	Icthyophiidae	–	DD
	REPTILES					
1.	Hawksbill Sea Turtle	*Eretmochelys imbricata*	Testudines	Cheloniidae (Marine Turtles)	I (Part II)	CR
2.	Olive Ridley Sea Turtle	*Lepidochelys olivacea*	Testudines	Cheloniidae	I (Part II)	VU
3.	Indian Black Turtle	*Melanochelys trijuga*	Testudines	Geoemydidae (Turtles & Terrapins)	–	LC
4.	Indian Flapshell Turtle	*Lissemys punctata*	Testudines	Trionychidae (Softshell Turtles)	I (Part II)	VU
5.	Indian Garden Lizard	*Calotes versicolor*	Squamata (Suborder: Sauria)	Agamidae (Lizards)	–	NE
6.	Coastal Day Gecko	*Cnemaspis littoralis*	" "	Gekkonidae (Geckoes)	–	DD
7.	Asian House Gecko	*Hemidactylus frenatus*	" "	Gekkonidae	–	LC
8.	Common Keeled Skink	*Eutropis carinata*	" "	Scincidae (Skinks)	–	LC
9.	Spotted Supple Skink (Common Snake Skink)	*Lygosoma punctata*	" "	Scincidae	–	NE
10.	Bengal Monitor	*Varanus bengalensis*	" "	Varanidae (Monitor Lizards)	I (Part II)	LC
11.	Brahminy Worm Snake	*Indotyphlops braminus*	" "	Typhlopidae (Worm or Blind Snakes)	Sch. IV	NE
12.	Common Sand Boa	*Eryx conicus*	" "	Boidae (Sand Boas)	Sch. IV	NE
13.	Indian Rock Python	*Python molurus*	" "	Pythonidae (Pythons)	I (Part II)	NE
14.	Oriental Rat Snake	*Ptyas mucosa*	" "	Colubridae (Colubrid Snakes)	II (Part II)	NE
15.	Colombo Wolf Snake	*Lycodon anamallensis*	" "	Colubridae	Sch. IV	NE
16.	Checkered Keelback	*Fowlea piscator*	" "	Colubridae	II (Part II)	NE
17.	Common Krait	*Bungarus caeruleus*	" "	Elapidae (Cobras, Kraits, Coral Snakes)	Sch. IV	NE
18.	Slender Coral Snake	*Calliophis melanurus*	" "	Elapidae	Sch. IV	NE
19.	Spectacled Cobra	*Naja naja*	" "	Elapidae	II (Part II)	NE
20.	Russell's Viper	*Daboia russelii*	" "	Viperidae (Vipers & Pit Vipers)	II (Part II)	NE

Sl. No.	Common Name	Scientific Name	Order	Family	IWPA, 1972 Schedule	IUCN Status
	BIRDS					
1.	Ruddy Shelduck	*Tadorna ferruginea*	Anseriformes	Anatidae	IV	LC
2.	Cotton Teal	*Nettapus coromandelianus*	Anseriformes	Anatidae	IV	LC
3.	Garganey	*Spatula querquedula*	Anseriformes	Anatidae	IV	LC
4.	Northern Shoveler	*Spatula clypeata*	Anseriformes	Anatidae	IV	LC
5.	Indian Spot-billed Duck	*Anas poecilorhyncha*	Anseriformes	Anatidae	IV	LC
6.	Northern Pintail	*Anas acuta*	Anseriformes	Anatidae	IV	LC
7.	Indian Peafowl	*Pavo cristatus*	Galliformes	Phasianidae	I (Part III)	LC
8.	Lesser Flamingo	*Phoeniconaias minor*	Phoenicopteriformes	Phoenicopteridae	IV	NT
9.	Spotted Dove	*Streptopelia chinensis*	Columbiformes	Columbidae	IV	NE
10.	Yellow-footed Green Pigeon	*Treron phoenicopterus*	Columbiformes	Columbidae	IV	LC
11.	Grey-bellied Cuckoo	*Cacomantis passerinus*	Cuculiformes	Cuculidae	IV	LC
12.	Indian Cuckoo	*Cuculus micropterus*	Cuculiformes	Cuculidae	IV	LC
13.	Indian Swiftlet	*Aerodramus unicolor*	Caprimulgiformes	Apodidae	I (Part III)	LC
14.	Alpine Swift	*Tachymarptis melba*	Caprimulgiformes	Apodidae	IV	LC
15.	Indian House Swift	*Apus affinis*	Caprimulgiformes	Apodidae	IV	LC
16.	Asian Palm Swift	*Cypsiurus balasiensis*	Caprimulgiformes	Apodidae	IV	LC
17.	Common Moorhen	*Gallinula chloropus*	Gruiformes	Rallidae	IV	LC
18.	Grey-headed Swamphen	*Porphyrio poliocephalus*	Gruiformes	Rallidae	IV	NE
19.	Ruddy-breasted Crake	*Zapornia fusca*	Gruiformes	Rallidae	IV	LC
20.	Great Thick-knee	*Esacus recurvirostris*	Charadriiformes	Burhinidae	IV	NT
21.	Pied Avocet	*Recurvirostra avosetta*	Charadriiformes	Recurvirostridae	IV	LC
22.	Yellow-wattled Lapwing	*Vanellus malabaricus*	Charadriiformes	Charadriidae	IV	LC
23.	Grey-headed Lapwing	*Vanellus cinereus*	Charadriiformes	Charadriidae	IV	LC
24.	Common Ringed Plover	*Charadrius hiaticula*	Charadriiformes	Charadriidae	IV	LC
25.	Bronze-winged Jacana	*Metopidius indicus*	Charadriiformes	Jacanidae	IV	LC
26.	Temminck's Stint	*Calidris temminckii*	Charadriiformes	Scolopacidae	–	LC
27.	Green Sandpiper	*Tringa ochropus*	Charadriiformes	Scolopacidae	IV	LC
28.	Spotted Redshank	*Tringa erythropus*	Charadriiformes	Scolopacidae	IV	LC
29.	Crab-plover	*Dromas ardeola*	Charadriiformes	Dromadidae	IV	LC
30.	Small Pratincole	*Glareola lactea*	Charadriiformes	Glareolidae	IV	LC
31.	Pomarine Skua	*Stercorarius pomarinus*	Charadriiformes	Stercorariidae	IV	LC
32.	Arctic Skua	*Stercorarius parasiticus*	Charadriiformes	Stercorariidae	IV	LC
33.	Black-legged Kittiwake	*Rissa tridactyla*	Charadriiformes	Laridae	IV	VU
34.	Sooty Tern	*Onychoprion fuscatus*	Charadriiformes	Laridae	IV	LC
35.	Bridled Tern	*Onychoprion anaethetus*	Charadriiformes	Laridae	IV	LC
36.	Whiskered Tern	*Chlidonias hybrida*	Charadriiformes	Laridae	IV	LC
37.	Common Tern	*Sterna hirundo*	Charadriiformes	Laridae	IV	LC
38.	River Tern	*Sterna aurantia*	Charadriiformes	Laridae	IV	VU
39.	Flesh-footed Shearwater	*Ardenna carneipes*	Procellariiformes	Procellariidae	IV	NT
40.	Painted Stork	*Mycteria leucocephala*	Ciconiiformes	Ciconiidae	IV	NT
41.	Lesser Frigatebird	*Fregata ariel*	Suliformes	Fregatidae	IV	LC
42.	Masked Booby	*Sula dactylatra*	Suliformes	Sulidae	IV	LC
43.	Great Cormorant	*Phalacrocorax carbo*	Suliformes	Phalacrocoracidae	IV	LC
44.	Spot-billed Pelican	*Pelecanus philippensis*	Pelecaniformes	Pelecanidae	IV	NT
45.	Cinnamon Bittern	*Ixobrychus cinnamomeus*	Pelecaniformes	Ardeidae	IV	LC
46.	Black Bittern	*Ixobrychus flavicollis*	Pelecaniformes	Ardeidae	IV	LC
47.	Oriental Honey Buzzard	*Pernis ptilorhynchus*	Accipitriformes	Accipitridae	I (Part III)	LC
48.	Crested Serpent Eagle	*Spilornis cheela*	Accipitriformes	Accipitridae	I (Part III)	LC
49.	Greater Spotted Eagle	*Clanga clanga*	Accipitriformes	Accipitridae	I (Part III)	VU

Sl. No.	Common Name	Scientific Name	Order	Family	IWPA, 1972 Schedule	IUCN Status
50.	Western Marsh Harrier	*Circus aeruginosus*	Accipitriformes	Accipitridae	I (Part III)	LC
51.	White-bellied Sea Eagle	*Haliaeetus leucogaster*	Accipitriformes	Accipitridae	I (Part III)	LC
52.	Jungle Owlet	*Glaucidium radiatum*	Strigiformes	Strigidae	IV	LC
53.	Spotted Owlet	*Athene brama*	Strigiformes	Strigidae	IV	LC
54.	Common Hoopoe	*Upupa epops*	Bucerotiformes	Upupidae	IV	LC
55.	Indian Grey Hornbill	*Ocyceros birostris*	Bucerotiformes	Bucerotidae	IV	LC
56.	Black-capped Kingfisher	*Halcyon pileata*	Coraciiformes	Alcedinidae	IV	LC
57.	Green Bee-eater	*Merops orientalis*	Coraciiformes	Meropidae	IV	LC
58.	Indian Roller	*Coracias benghalensis*	Coraciiformes	Coraciidae	IV	LC
59.	Coppersmith Barbet	*Psilopogon haemacephalus*	Piciformes	Megalaimidae	IV	LC
60.	Rufous Woodpecker	*Micropternus brachyurus*	Piciformes	Picidae	IV	LC
61.	Large Cuckooshrike	*Coracina macei*	Passeriformes	Campephagidae	IV	LC
62.	Eurasian Golden Oriole	*Oriolus oriolus*	Passeriformes	Oriolidae	IV	LC
63.	Ashy Woodswallow	*Artamus fuscus*	Passeriformes	Artamidae	IV	LC
64.	Common Woodshrike	*Tephrodornis pondicerianus*	Passeriformes	Vangidae	IV	LC
65.	Common Iora	*Aegithina tiphia*	Passeriformes	Aegithinidae	IV	LC
66.	Black Drongo	*Dicrurus macrocercus*	Passeriformes	Dicruridae	IV	LC
67.	Ashy Drongo	*Dicrurus leucophaeus*	Passeriformes	Dicruridae	IV	LC
68.	Brown Shrike	*Lanius cristatus*	Passeriformes	Laniidae	IV	LC
69.	Oriental Skylark	*Alauda gulgula*	Passeriformes	Alaudidae	IV	LC
70.	Plain Prinia	*Prinia inornata*	Passeriformes	Cisticolidae	IV	LC
71.	Zitting Cisticola	*Cisticola juncidis*	Passeriformes	Cisticolidae	IV	LC
72.	Red-vented Bulbul	*Pycnonotus cafer*	Passeriformes	Pycnonotidae	IV	LC
73.	Green Warbler	*Phylloscopus nitidus*	Passeriformes	Phylloscopidae	IV	LC
74.	Greenish Warbler	*Phylloscopus trochiloides*	Passeriformes	Phylloscopidae	IV	LC
75.	Jungle Babbler	*Argya striata*	Passeriformes	Leiothrichidae	IV	NE
76.	Yellow-billed Babbler	*Argya affinis*	Passeriformes	Leiothrichidae	IV	NE
77.	Chestnut-tailed Starling	*Sturnia malabarica*	Passeriformes	Sturnidae	IV	LC
78.	Indian Robin	*Copsychus fulicatus*	Passeriformes	Muscicapidae	IV	NE
79.	Pied Bushchat	*Saxicola caprata*	Passeriformes	Muscicapidae	IV	LC
80.	Loten's Sunbird	*Cinnyris lotenius*	Passeriformes	Nectariniidae	IV	LC
81.	White-rumped Munia	*Lonchura striata*	Passeriformes	Estrildidae	IV	LC
82.	Tricoloured Munia	*Lonchura malacca*	Passeriformes	Estrildidae	IV	LC
83.	House Sparrow	*Passer domesticus*	Passeriformes	Passeridae	IV	LC
84.	Grey Wagtail	*Motacilla cinerea*	Passeriformes	Motacillidae	IV	LC
85.	Western Yellow Wagtail	*Motacilla flava*	Passeriformes	Motacillidae	IV	LC
86.	White-browed Wagtail	*Motacilla maderaspatensis*	Passeriformes	Motacillidae	IV	LC
87.	White Wagtail	*Motacilla alba*	Passeriformes	Motacillidae	IV	LC
	MAMMALS					
1.	Bonnet Macaque	*Macaca radiata*	Primates	Cercopithecidae (Old World Monkeys)	II (Part I)	VU
2.	Indian Giant Flying Squirrel	*Petaurista philippensis*	Rodentia	Sciuridae (Squirrels)	II (Part I)	LC
3.	Jungle Palm Squirrel	*Funambulus tristriatus*	Rodentia	Sciuridae	V	LC
4.	Greater Bandicoot-rat	*Bandicota indica*	Rodentia	Muridae (Rats and Mice)	V	LC
5.	House Mouse	*Mus musculus*	Rodentia	Muridae	V	LC
6.	House Rat	*Rattus rattus*	Rodentia	Muridae	V	LC
7.	Indian Crested Porcupine	*Hystrix indica*	Rodentia	Hystricidae (Porcupines)	IV	LC
8.	Greater Short-nosed Fruit Bat	*Cynopterus sphinx*	Chiroptera	Pteropodidae (Fruit Bats)	V	LC
9.	Indian Flying Fox	*Pteropus giganteus*	Chiroptera	Pteropodidae	V	LC

Sl. No.	Common Name	Scientific Name	Order	Family	IWPA, 1972 Schedule	IUCN Status
10.	Pipistrelle	*Pipistrellus spp.*	Chiroptera	Vespertilionidae (Evening Bats)	V	-
11.	Golden Jackal	*Canis aureus*	Carnivora	Canidae (Dogs)	II (Part I)	LC
12.	Common Palm Civet	*Paradoxurus hermaphroditus*	Carnivora	Viverridae (Civets)	II (Part I)	LC
13.	Indian Grey Mongoose	*Herpestes edwardsii*	Carnivora	Herpestidae (Mongooses)	II (Part I)	LC
14.	Jungle Cat	*Felis chaus*	Carnivora	Felidae (Cats)	I	LC

BUTTERFLIES

S.No.	Scientific name	Common name	Family
1	*Pachliopta hector*	Crimson Rose	Papilionidae
2	*Pachliopta aristolochiae*	Common Rose	Papilionidae
3	*Papilio polytes*	Common Mormon	Papilionidae
4	*Papilio demoleus*	Lime Butterfly	Papilionidae
5	*Catopsilia pomona*	Common Emigrant	Pieridae
6	*Catopsilia pyranthe*	Mottled Emigrant	Pieridae
7	*Eurema hecabe*	Common Grass Yellow	Pieridae
8	*Delias eucharis*	Common Jezebel	Pieridae
9	*Leptosia nina*	Psyche	Pieridae
10	*Melanitis leda*	Common Evening Brown	Nymphalidae
11	*Elymnias caudata*	Tailed Palmfly	Nymphalidae
12	*Mycalesis mineus*	Dark Branded Bushbrown	Nymphalidae
13	*Orsotriaena medus*	Medus Brown	Nymphalidae
14	*Acraea terpsicore*	Tawny Coster	Nymphalidae
15	*Neptis hylas*	Common Sailer	Nymphalidae
16	*Euthalia aconthea*	Common Baron	Nymphalidae
17	*Ariadne merione*	Common Castor	Nymphalidae
18	*Junonia lemonias*	Lemon Pansy	Nymphalidae
19	*Junonia almana*	Peacock Pansy	Nymphalidae
20	*Junonia atlites*	Grey Pansy	Nymphalidae
21	*Hypolimnas bolina*	Great Eggfly	Nymphalidae
22	*Tirumala limniace*	Blue Tiger	Nymphalidae
23	*Danaus chrysippus*	Plain Tiger	Nymphalidae
24	*Danaus genutia*	Striped Tiger	Nymphalidae
25	*Euploea core*	Common Crow	Nymphalidae
26	*Castalius rosimon*	Common Pierrot	Lycaenidae
27	*Zizeeria karsandra*	Dark Grass Blue	Lycaenidae
28	*Chilades pandava*	Plains Cupid	Lycaenidae
29	*Lampides boeticus*	Pea Blue	Lycaenidae
30	*Jamides celeno*	Common Cerulean	Lycaenidae
31	*Curetis thetis*	Indian Sunbeam	Lycaenidae
32	*Hasora badra*	Common Awl	Hesperiideae
33	*Borbo cinnara*	Rice Swift	Hesperiideae
34	*Ampittia discorides*	Bush Hopper	Hesperiideae

DRAGONFLIES (ORDER: ODONATA, SUBORDER: ANISOPTERA)			
S.No	Scientific name	Common name	Family
1	*Anax guttatus*	Blue-Tailed Green Darner	Aeshnidae
2	*Gynacantha dravida*	Brown Darner	Aeshnidae
3	*Ictinogomphus rapax*	Indian Common Clubtail	Gomphidae
4	*Brachydiplax chalybea*	Rufous-Backed Marsh Hawk	Libellulidae
5	*Brachythemis contaminata*	Ditch Jewel	Libellulidae
6	*Bradinopyga geminata*	Granite Ghost	Libellulidae
7	*Crocothemis servilia*	Scarlet Skimmer	Libellulidae
8	*Diplacodes trivialis*	Blue Ground Skimmer	Libellulidae
9	*Neurothemis fulvia*	Fulvous Forest Skimmer	Libellulidae
10	*Neurothemis tullia*	Pied Paddy Skimmer	Libellulidae
11	*Orthetrum chrysis*	Brown-Backed Marsh Hawk	Libellulidae
12	*Orthetrum sabina*	Green Marsh Hawk	Libellulidae
13	*Pantala flavescens*	Wandering Glider	Libellulidae
14	*Potamarcha congener*	Yellow-tailed Ashy Skimmer	Libellulidae
15	*Rhyothemis variegata*	Common Picturewing	Libellulidae
16	*Tramea limbata*	Black Marsh Trotter	Libellulidae
17	*Trithemis pallidinervis*	Long-Legged Marsh Glider	Libellulidae
18	*Urothemis signata*	Greater Crimson Glider	Libellulidae
19	*Zyxomma petiolatum*	Brown Dusk Hawk	Libellulidae
20	*Aethriamanta brevipennis*	Scarlet Marsh Hawk	Libellulidae
21	*Acisoma panorpoides*	Trumpet-Tail	Libellulidae
22	*Macrodiplax cora*	Estuarine Skimmer	Libellulidae
23	*Rhodothemis rufa*	Rufous Marsh Glider	Libellulidae
24	*Tholymis tillarga*	Coral-Tailed Cloudwing	Libellulidae
DAMSELFLIES (ORDER: ODONATA ,SUBORDER: ZYGOPTERA)			
25	*Agriocnemis pygmaea*	Pygmy Dartlet	Coenagrionidae
26	*Ceriagrion cerinorubellum*	Orange-tailed Marsh Dart	Coenagrionidae
27	*Ceriagrion coromandelianum*	Coromandel Marsh Dart	Coenagrionidae
28	*Pseudagrion microcephalum*	Blue Grass Dart	Coenagrionidae
29	*Agriocnemis pygmaea*	Pygmy Dartlet	Coenagrionidae

POLYCHAETES		
Sl.No	Scientific name	Family
1	*Perinereis cavifrons*	Nereididae
2	*Perinereis nuntia*	Nereididae
3	*Perinereis vancaurica*	Nereididae
4	*Neanthes chilkaensis*	Nereididae
5	*Nerine capensis*	Spionidae
6	*Nereis cricognatha*	Nereididae
7	*Dendronereis aestuarina*	Nereididae
8	*Dendronereis arborifera*	Nereididae
9	*Sigambra constricta*	Pilargidae
10	*Marphysa gravelyi*	Eunicidae
11	*Marphysa macintoshi*	Eunicidae
12	*Paucibranchia stragulum*	Eunicidae
13	*Glycera alba*	Glyceridae
14	*Glycera tridactyla*	Glyceridae
15	*Glycera longipinnis*	Glyceridae
16	*Parheteromastus tenuis*	Capitellidae
17	*Diopatra neapolitana*	Onuphidae
18	*Nephtys polybranchia*	Nephtyidae
19	*Prionospio polybranchiata*	Spionidae

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The Kadalundi-Vallikunnu Community Reserve (KVCR) assumes significance in being the first Community Reserve in the state of Kerala. This Reserve is known for its rich mangrove forests, mudflats, diversity of birds, fishes and other invertebrates, besides serving as breeding and nursery ground for a large number of animals. However, the Community Reserve faces many challenges. The wise use of mangrove wetlands through scientific planning, would not only help in enhancing the livelihood options of the local people but also ensures the protection of mangroves and the associated biodiversity. Proper planning and implementation of livelihood and conservation programmes will make KVCR emerge as a model Community Reserve in the country.

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