Uttar Pradesh Journal of Zoology

Volume 44, Issue 9, Page 31-48, 2023; Article no.UPJOZ.2566
ISSN: 0256-971X (P)

Checklist of the Marine and Estuarine Brachyuran Crabs (Crustacea: Decapoda: Brachyura) of Andhra Pradesh, India

J. S. Yogesh Kumar [a*], Arya Sen [a] and Pradip Panda [a]

[a] Zoological Survey of India, Sunderban Regional Centre, Canning – 743329, West Bengal, India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.56557/UPJOZ/2023/v44i93489

Editor(s):
(1) Dr. Angelo Mark P. Walag, University of Science and Technology of Southern Philippines, Philippines.
Reviewers:
(1) P. Subavathy, St. Mary's College, India.
(2) Hadi Hamli, Universiti Putra Malaysia, Malaysia.

Review Article

Received: 13/03/2023
Accepted: 15/05/2023
Published: 22/05/2023

ABSTRACT

An account of the brachyuran crab diversity along the Andhra Pradesh coast of India has been represented in this communication. The checklist of brachyuran crabs has been prepared for the state of Andhra Pradesh based on reviews and compilation of published research works for this particular region. A total of 156 species belonging to 91 genera and 33 families have been listed here from Andhra Pradesh. Visakhapatnam showed the highest diversity with 86 species in all the marine areas and Vizianagaram has the lowest diversity recorded from the state with one species. Although the study on the brachyurans from Andhra Pradesh had been started from early 1800 but recent works on brachyurans from Andhra Pradesh is lacking and with a focused study from the area would help in exploration of brachyuran's diversity from the east coast of India.

**Corresponding author: Email: yogeshkumarzsi16@gmail.com, yogeshkumar.js@zsi.gov.in;*

Keywords: Andhra Pradesh; brachyuran crab; checklist; crustacean diversity; estuary; India; marine.

1. INTRODUCTION

India being a mega-diversity country harbors various kinds of habitats. The southern part of India is characterized by a 7,516.6 km long coastline starting from the state of West Bengal on the east coast and ending in Gujarat on the west coast of India [1]. A total of 2,019 km long coastline covered the east coast of India including four major states starting from West Bengal and then Orissa, Andhra Pradesh, and Tamil Nadu at the western side of the Bay of Bengal [2].

Crustaceans are a diverse group. In particular, the order Decapoda represents a highly diverse order of malacostracan crustaceans. 7620 brachyuran species from 104 genera are present globally [3-5]. In India, 910 marine brachyuran crabs are reported, belonging to 361 genera and 62 families. Family Portunidae, Leucosiidae, Sesarmidae, Parthenopidae, Ocypodidae, Inachidae, Dromiidae, Pinnotheridae, Varunidae, and Macrophthalmidae represent the greatest diversity [6]. From north Andaman, Kumaralingam et al. [7] have reported brachyuran crabs of 47 species belonging to 24 genera, 10 families. Dev Roy & Nandi [8] reported altogether 150 species of brachyuran crabs under 84 genera and 29 families from West Bengal. Pati et al. [9] reported brachyuran crabs account for 82 species in 55 genera from Maharashtra. Dev Roy [10] reported crab diversity in Kerala coasts (93 species) followed by Maharashtra (92 species), Gujarat (66 species), Karnataka (53 species) and Goa (51 species). Jeyabaskaran et al. [11] reported 106 brachyuran species from the Gulf of Mannar. Beleem et al. [12] reported 152 species belonging to 87 genera and 29 families of marine brachyuran crabs from Gujarat. A maximum number of species is reported from Andaman and Nicobar Islands (588 species) followed by Tamil Nadu (451 species), Kerala (183 species), Orissa (161 species), West Bengal (158 species), Lakshadweep Islands (155 species), Gujarat (147 species), Maharashtra (130 species), Andhra Pradesh (121 species), Goa (82 species) and Karnataka (82 species) [6,13].

Andhra Pradesh shows typical habitat heterogeneity with the presence of reef patches, rocky outcrops, and plain interspaces with sandy beaches, which are very peculiar habitats for crustaceans, particularly brachyuran crabs [1]. Thus the crab diversity of Andhra Pradesh is always in the spotlight for researchers and these studies started way back from the monumental work by Alcock in 1894 to 1901, which reported a total of 37 species from Andhra Pradesh [14-21]. 1894, Alcock & Anderson reported four crab species from Andhra Pradesh; in 1895 eight species; in 1896 four species; in 1898 two species; in 1899 seven species; in 1900 eleven species; in 1901 one species [22-24,20,21]. Devi [25] studied the biology and fishery of four crabs from the Kakinada region namely, *Scylla serrata* (Forskal, 1775)*; Portunus pelagicus* (Linnaeus, 1758)*; Portunus sanguinolentus* (Herbst, 1783)*; Charybdis feriata* (Linnaeus, 1758). Devi et al. [26] have done studies on brachyuran crab diversity of Visakhapatnam coast and recorded*Pinnotheres latreillii* Leach, 1815, from Andhra Pradesh for the first time; which has been currently accepted as *Pinnotheres pisum* (Linnaeus, 1767). Galil et al. [27] in their genus revision of *Matuta*, recorded *Matuta victor* (Fabricius, 1781) from Andhra Pradesh. Dev Roy & Bhadra [28,29] respectively reported 20 and 21 species of estuarine and mangrove crabs from the estuaries of Andhra Pradesh. Dev Roy & Bhadra [29] published 103 species in the Fauna of Andhra Pradesh. Dev Dev Roy & Nandi recorded 1 coral reef-associated crab and 106 species of brachyuran crabs belonging to 7 genera and 17 families from Andhra Pradesh in 2005 and 2007 respectively [30,31]. Rath & Dev Roy [32] reported 35 species from Krishna Estuary. Krishnamurthy [33] reported two brachyuran species from the collection of marine biological centre, which were collected from Andhra Pradesh. 17 species of marine estuarine crabs had been recorded from Vamsadhara and Nagavali estuaries, Srikakulam, Andhra Pradesh by Rath & Dev Roy [34]. Dev Roy [35] mentioned five species from AP regarding crustacean faunal conservation aspects. Chakravarty et al. [36] studied the crab diversity of Tekkali Creek and reported 15 crab species. The most recent compilation work on brachyuran crabs has been done by Trivedi et al. [6], which records 121 species under 67 genera and 27 families from the Andhra Pradesh coast. Chakraborty [37] studied the comparative evaluation of *Scylla* species collected from Andhra Pradesh. Sasikala et al. [38] studied the by-catch crustacean diversity of Visakhapatnam harbor and recorded 9 species of trash brachyurans. Most recently, Roy & Chakraborty [2] have done studies on *P. pelagicus; P. sanguinolentus* from

Visakhapatnam, Andhra Pradesh. Mahapatra et al. [39] recorded two new species of brachyuran crab viz. *Liagore rubromaculata* and *Eucrate indicia* from Visakhapatnam fishing harbor, Andhra Pradesh.

The total annual production of Andhra Pradesh was 5000 tonnes (t) of marine crabs in 2019, which is 11% of India's total crab landings [40,41]. Crab is an economically important faunal group for their usage as a human protein supplementary source. Studies on crab diversity and distribution have been important for ecological studies because they are well associated with the benthic food chain and for studying the changes in the benthic community [42,36].

Although there are few recent studies on this faunal group in Andhra Pradesh, it appears from the literature that research on brachyuran diversity began in the early 1800s. Because understanding the current diversity status of brachyurans from the region is crucial for future ecological studies, a comprehensive data set is presented here. It is based on a review of all published data.

2. MATERIALS AND METHODS

The checklist was prepared based on information collected from available published and reported research like articles, short communication of new records, previous review works, books, species checklist, monographs, and Ph.D. thesis available from Sodhganga: a reservoir of Indian thesis (http://hdl.handle.net/10603/364063) books, species checklist, monographs. The scientific names were first verified from WoRMS (World Register of Marine Species) and from the checklist of Ng et al. [3] on the brachyuran diversity of the world for validation of the present taxonomic status of the species [43,3]. Finally, the checklist was updated with the globally accepted brachyuran species. Revisionary studies of the families, genera, and species groups cause changes in taxonomical classification. Present conservation status of the reported species has been verified from the IUCN and a graphical comparison of the reported species and genus has been discussed. During the study, it has been observed that, the family Ocypodidae and Portunidae have been revised. Genus *Portunus* has been revised based on both morphometric analysis and genetic marker (COI, 16S, H3) analysis. The analysis shows that *Monomia*, *Portunus* and *Xiphonectes* are polyphyletic and *Achelous* is paraphyletic. Currently, the subfamily Portuninae from the family Portunidae, comprises 11 genera: *Arenaeus* Dana, 1851; *Allomonomia* Koch Spiridonov & Ďuriš, 2022; *Cavoportunus* T.S. Nguyen & P.K.L. Ng, 2010; *Callinectes* Stimpson, 1860; *Cycloachelous* Ward, 1942; *Eodemus* Koch, Spiridonov & Ďuriš, 2022; *Incultus* Koch, Spiridonov & Ďuriš, 2022; *Monomia* Gistel, 1848; *Portunus* Weber, 1795; *Trionectes* Koch, Spiridonov & Ďuriš, 2022; *Xiphonectes* A. Milne-Edwards, 1873. For this reason, *Portunus* (*Xiphonectes*) *hastatoides* Fabricius, 1798 has been changed into *Eodemus hastatoides* (Fabricius, 1798), *Portunus* (*Xiphonectes*) *spinipes* (Miers, 1886) has been changed into *Alionectes spinipes* (Miers, 1886) [44].

In this article, all the data have been collected and compiled from old literature and currently worked literature for preparing this regional checklist. All families with marine and estuarine representatives are included in the list; freshwater crabs are excluded from the list.

3. RESULTS

A checklist of 156 species, belonging to 91 genera and 33 families from Andhra Pradesh, India is given in Table 1. The family Portunidae comprises of highest species diversity (Genera 7, Species 27) followed by Leucosiidae (Genera 11, species 18), Ocypodidae (Genera 6, Species 12), Xanthidae (Genera 6, Species 12), Sesarmidae (Genera 9 Species 10), Varunidae (Genera 4, species 9) Pilumnidae (Genera 5, Species 6), Epialtidae (Genera 3, Species 6), Grapsidae (Genera 3, Species 5), Parthenopidae (Genera 5, Species 5), Pinnotheridae (Genera 3, Species 4), Dotillidae (Genera 2, Species 4), Matutidae (Genera 2, Species 4), Macrophthalmidae (Genera 1, Species 4), Calappidae (Genera 1, Species 4), Dorippidae (Genera 3, Species 3), Dromiidae (Genera 2, Species 2), Raninidae (Genera 2, Species 2), Menippidae (Genera 2, Species 2), Plagusiidae (Genera 1, Species 2), Goneplacidae (Genera 1, Species 2), Iphiculidae (Genera 1, Species 2), Camptandriidae (Genera 1, Species 1), Chasmocarcinidae (Genera 1, Species 1), Galenidae (Genera 1, Species 1), Gecarcinidae (Genera 1, Species 1), Inachidae (Genera 1, Species 1), Polybiidae (Genera 1, Species 1), Retroplumidae (Genera 1, Species 1), Thiidae (Genera 1, Species 1), Carpiliidae (Genera 1, Species 1), Corystidae (Genera 1, Species 1) and Euryplacidae (Genera 1, Species 1) (Table 1 and Fig 2).

Table 1. Annotated checklist of marine and estuarine brachyuran crabs of Andhra Pradesh

Family and Species Name		Distributions & References
Family 1: CALAPPIDAE De Haan, 1833		
Genus 1: *Calappa* Weber, 1795		
1	*Calappa exanthematosa* Alcock & Anderson, 1894	Andhra Coast [22]
s	*Calappa pustulosa* Alcock, 1896	Prakasam, Visakhapatnam [31]
3	*Calappa japonica* Ortmann, 1892	Visakhapatnam [52]
4	*Calappa lophos* (Herbst, 1782)	East Godavari, Nellore, Prakasam, Visakhapatnam [52]
Family 2: CAMPTANDRIIDAE Stimpson, 1858		
Genus 2: *Baruna* Stebbing, 1904		
5	*Baruna socialis* Stebbing, 1904	Visakhapatnam [31,8]
Family 3: CHASMOCARCINIDAE Serène, 1964		
Genus 3: *Chasmocarcinops* Alcock, 1900		
6	*Chasmocarcinops gelasimoides* Alcock, 1900	Godavari Coast [31]
Family 4: DORIPPIDAE MacLeay, 1838		
Genus 4: *Dorippoides* Serène & Romimohtarto, 1969		
7	*Dorippoides facchino* (Herbst, 1785)	Krishna, Nellore, Visakhapatnam [15,31]
Genus 5: *Neodorippe* Serène & Romimohtarto, 1969		
8	*Neodorippe callida* (Fabricius, 1798)	Krishna, Guntur, East Godavari [31,8,32]
Genus 6: *Dorippe* Weber, 1795		
9	*Dorippe quadridens* (J. C. Fabricius, 1793)	Visakhapatnam [52]
Family 5: DOTILLIDAE Stimpson, 1858		
Genus 7: *Dotilla* Stimpson, 1858		
10	*Dotilla blanfordi* Alcock, 1900	Visakhapatnam [31,8]
11	*Dotilla intermedia* De Man, 1888	Prakasam, Srikakulam, Visakhapatnam [31,8,32, 34]
12	*Dotilla myctiroides* H. Milne Edwards, 1852	Visakhapatnam [20,31,32]
Genus 8: *Scopimera* De Haan, 1833		
13	*Scopimera globosa* (De Haan, 1835)	Vamsadhara [34]
Family 6: DROMIIDAE De Haan, 1833		
Genus 9: *Lauridromia* McLay, 1993		
14	*Lauridromia dehaani* (Rathbun, 1923)	Nellore, Visakhapatnam [31,8]
Genus 10: *Sphaerodromia* Alcock 1899		
15	*Sphaerodromia kendalli* (Alcock & Anderson, 1894)	Nellore [22,18, 20, 21,31,35]

Family and Species Name		Distributions & References
Family 7: EPIALTIDAE MacLeay, 1838		
Genus 11: *Doclea* Leach, 1815		
16	*Doclea muricata* (Fabricius, 1788)	Visakhapatnam, Nagavali, Srikakulam [31, 34]
17	*Doclea ovis* (Fabricius, 1787)	East Godavari, Krishna, Nellore, Visakhapatnam [31,8]
18	*Doclea canalifera* Stimpson, 1857	Visakhapatnam [52]
Genus 12: *Phalangipus* Latreille, 1828		
19	*Phalangipus indicus* (Leach, 1815)	Visakhapatnam [31,8]
20	*Phalangipus longipes* (Linnaeus, 1758)	Visakhapatnam [31]
Genus 13: *Crocydocinus* B.Y. Lee, Richer de Forges & P.K.L. Ng, 2019		
21	*Crocydocinus beauchampi* (Alcock & Anderson, 1894)	Andhra Coast [23,20,35]
Family 8: GALENIDAE Alcock 1898		
Genus 14: *Galene* De Haan, 1833		
22	*Galene bispinosa* (Herbst, 1783)	East Godavari, Guntur,Krishna, Nellore, Prakasam, Visakhapatnam [17,31,8]
Family 9: GECARCINIDAE MacLeay, 1838		
Genus 15: *Cardisoma* Latreille in Latreille, Le Peletier, Serville & Guérin, 1828		
23	*Cardisoma carnifex* (Herbst, 1796)	Krishna [20,8,32]
Family 10: GONEPLACIDAE MacLeay, 1838		
Genus 16: *Carcinoplax* H. Milne Edwards, 1852		
24	*Carcinoplax longipes* (Wood-Mason, in Wood-Mason & Alcock, 1891)	Prakasam, Visakhapatnam [31,8]
25	*Carcinoplax longimanus* (De Haan, 1833)	Prakasam, Visakhapatnam [31,8]
Family 11: GRAPSIDAE MacLeay, 1838		
Genus 17: *Grapsus* Lamarck, 1801		
26	*Grapsus albolineatus* Latreille, in Milbert, 1812	Visakhapatnam [20,53,31]
27	*Grapsus grapsus* (Linnaeus, 1758)	Srikakulam [36]
Genus 18: *Metopograpsus* H. Milne Edwards, 1853		
28	*Metopograpsus latifrons* (White, 1847)	Visakhapatnam [31, 8]
29	*Metopograpsus messor* (Forskål, 1775)	Vamsadhara, West Godavari, Krishna, East Godavari, Visakhapatnam [31,8,34]
Genus 19: *Pachygrapsus* Randall, 1840		
30	*Pachygrapsus minutus* A. Milne-Edwards, 1873	Visakhapatnam [31,8]
Family 12: INACHIDAE MacLeay, 1838		
Genus 20: *Encephaloides* Wood-Mason in Wood-Mason & Alcock, 1891		

Family and Species Name		Distributions & References
31	*Encephaloides armstrongi* Wood-Mason, in Wood-Mason & Alcock, 1891	Godavari Coast [31]
Family 13: IPHICULIDAE Alcock 1896		
Genus 21: *Pariphiculus* Alcock 1896		
32	*Pariphiculus coronatus* (Alcock & Anderson, 1894)	Andhra Coast [22,20]
33	*Pariphiculus mariannae* (Herklots, 1852)	Andhra Coast [15]
Family 14: LEUCOSIIDAE Samouelle, 1819		
Genus 22: *Arcania* Leach, 1817		
34	*Arcania cornuta* (MacGilchrist, 1905)	Prakasam, Visakhapatnam (Devi et al. 1988)
35	*Arcania erinacea* (Fabricius, 1787)	Visakhapatnam [26]
36	*Arcania gracilis* Henderson, 1893	Visakhapatnam [16,31,35]
37	*Arcania septemspinosa* (Fabricius, 1787)	East Godavari, Krishna, Nellore, Prakasam, Visakhapatnam [31,8]
38	*Arcania undecimspinosa* De Haan, 1841	Prakasam [31,8]
Genus 23: *Euclosiana* Galil & P.K.L. Ng, 2010		
39	*Euclosiana obtusifrons* (De Haan, 1841)	Andhra coast [16]
Genus 24: *Ixa* Leach, 1816		
40	*Ixa cylindrus* (Fabricius, 1777)	Visakhapatnam [31]
Genus 25: *Leucosia* Weber, 1795		
41	*Leucosia craniolaris (*Linnaeus, 1758)	East Godavari [31]
Genus 26: *Nursia* Leach, 1817		
42	*Nursia lar* (Fabricius, 1793)	Andhra coast [16]
Genus 27: *Parilia* Wood-Mason in Wood-Mason & Alcock, 1891		
43	*Parilia Alcocki* Wood-Mason, in Wood-Mason & Alcock, 1891	East Godavari, West Godavari [28,31]
Genus 28: *Philyra* Leach, 1817		
44	*Philyra globus* (Fabricius,1775)	Visakhapatnam, Srikakulam, Krishna, East Godavari, Guntur [15,31,8,32]
45	*Philyra sagittifera* (Alcock, 1896)	Visakhapatnam [31]
46	*Philyra scabriuscula* (Fabricius, 1798)	Visakhapatnam [31]
47	*Philyra sexangula* Alcock, 1896	East Godavari, West Godavari, Krishna [15,28,31,32]
Genus 29: *Ryphila* Galil, 2009		
48	*Ryphila cancellus* (Herbst, 1783)	Visakhapatnam [26]
Genus 30: *Seulocia* Galil, 2005		
49	*Seulocia rhomboidalis* (De Haan, 1841)	Andhra Coast [15, 16]
Genus 31: *Urnalana* Galil, 2005		

Family and Species Name		Distributions & References
50	*Urnalana margaritata* (A. Milne-Edwards, 1873)	Andhra Coast [15, 54]
Genus 32: *Myra* Leach, 1817		
51	*Myra fugax* (J. C. Fabricius, 1798)	Visakhapatnam [52]
Family 15: MACROPHTHALMIDAE Dana, 1851		
Genus 33: *Macrophthalmus* Desmarest, 1823		
Sub Genus 1: *Macrophthalmus (Macrophthalmus)* Desmarest, 1823		
52	*Macrophthalmus (Macrophthalmus) brevis* (Herbst, 1804)	Visakhapatnam [31,8]
Sub Genus 2: *Macrophthalmus (Mareotis)* Barnes, 1967		
53	*Macrophthalmus (Mareotis) crinitus* Rathbun, 1913	Visakhapatnam [53]
54	*Macrophthalmus (Mareotis) depressus* Rüppell, 1830	Visakhapatnam [31,8]
55	*Macrophthalmus (Mareotis) tomentosus* Eydoux & Souleyet, 1842	Visakhapatnam [31,8]
Family 16: MATUTIDAE De Haan, 1835		
Genus 34: *Ashtoret* Galil & P.F. Clark, 1994		
56	*Ashtoret lunaris* (Forskål, 1775)	East Godavari, West Godavari, Krishna [16,28,31,32,34]
57	*Ashtoret miersii* (Henderson, 1887)	East Godavari, Srikakulam, Visakhapatnam [31]
Genus 35: *Matuta* Weber, 1795		
58	*Matuta planipes* Fabricius, 1798	Nellore, Krishna, Kakinada [31]
59	*Matuta victor* (Fabricius, 1781)	East Godavari, Guntur, Nellore, Prakasam, Srikakulam, Visakhapatnam [27,31]
Family 17: MENIPPIDAE Ortmann, 1893		
Genus 36: *Menippe* De Haan, 1833		
60	*Menippe rumphii* (Fabricius, 1798)	Visakhapatnam [31,8]
Genus 37: *Myomenippe* Hilgendorf, 1879		
61	*Myomenippe hardwickii* (Gray, 1831)	East Godavari, Guntur, Visakhapatnam [31,8,32]
Family 18: OCYPODIDAE Rafinesque, 1815		
Genus 38: *Austruca* Bott, 1973		
62	*Austruca lactea* (De Haan, 1835)	East Godavari, Guntur, Nellore, Vizianagaram [28,31,8,32, 34]
63	*Austruca triangularis* (A. Milne-Edwards, 1873)	East Godavari, Guntur [29,31,32]
64	*Austruca annulipes* (H. Milne Edwards, 1837)	Srikakulam [36]
Genus 39: *Gelasimus* Latreille, 1817		
65	*Gelasimus vocans* (Linnaeus, 1758)	Andhra Coast [20]
Genus 40: *Ocypode* Weber, 1795		
66	*Ocypode brevicornis* H. Milne Edwards, 1837	Andhra Coast [8,32, 34]

Family and Species Name		Distributions & References
67	*Ocypode ceratophthalmus* (Pallas, 1772)	Visakhapatnam, West Godavari [28,31,8]
68	*Ocypode cordimana* Latreille, 1818	Nellore, Visakhapatnam [31, 8]
69	*Ocypode macrocera* H. Milne Edwards, 1852	East Godavari, Nellore, Prakasam, Srikakulam, Visakhapatnam [31,8, 32, 34]
70	*Ocypode platytarsis* H. Milne Edwards, 1852	Visakhapatnam, East Godavari, Prakasam, Vamsadhara, Nagavali, Nellore, Srikakulam, East Godavari [36]
Genus 41: *Tubuca* Bott, 1973		
71	*Tubuca dussumieri* (H. Milne Edwards, 1852)	Visakhapatnam [28, 31]
Genus 42: *Leptuca* Bott, 1973		
72	*Leptuca pugilator* (Bosc, 1801)	Srikakulam [36]
Genus 43: *Paraleptuca* Bott, 1973		
73	*Paraleptuca chlorophthalmus* (H. Milne Edwards, 1837)	Srikakulam [36]
Family 19: PARTHENOPIDAE MacLeay, 1838		
Genus 44: *Cryptopodia* H. Milne Edwards, 1834		
74	*Cryptopodia angulata* H. Milne Edwards & Lucas, 1841	Prakasam [31]
Genus 45: *Enoplolambrus* A. Milne-Edwards, 1878		
75	*Enoplolambrus echinatus* (Herbst, 1790)	Andhra Coast [15]
76	*Enoplolambrus carenatus* (H. Milne Edwards, 1834)	Visakhapatnam [52]
Genus 46: *Parthenope* Weber, 1795		
77	*Parthenope longimanus* (Linnaeus, 1758)	East Godavari, West Godavari [28,31,8]
Genus 47: *Patulambrus* S.H. Tan & P.K.L. Ng, 2007		
78	*Patulambrus petalophorus* (Alcock, 1895)	Visakhapatnam [52]
Family 20: PILUMNIDAE Samouelle, 1819		
Genus 48: *Actumnus* Dana, 1851		
79	*Actumnus setifer* (De Haan, 1835)	Andhra Coast [17]
Genus 49: *Benthopanope* Davie, 1989		
80	*Benthopanope indica* (De Man, 1887)	East Godavari [31, 8]
Genus 50: *Eurycarcinus* A. Milne-Edwards, 1867		
81	*Eurycarcinus natalensis* (Krauss, 1843)	Visakhapatnam [31, 8]
82	*Eurycarcinus orientalis* A. Milne-Edwards, 1867	Visakhapatnam, Krishna [31,8,32]
Genus 51: *Typhlocarcinus* Stimpson, 1858		
83	*Typhlocarcinus rubidus* Alcock, 1900	East Godavari [31]
Genus 52: *Xenophthalmodes* Richters, 1880		

Family and Species Name		Distributions & References
84	*Xenophthalmodes moebii* Richters, 1880	Visakhapatnam [20,31]
Family 21: PINNOTHERIDAE De Haan, 1833		
Genus 53: *Arcotheres* R.B. Manning, 1993		
85	*Arcotheres Alcocki* (Rathbun, 1909)	East Godavari [31]
86	*Arcotheres placunae* (Hornell & Southwell, 1909)	East Godavari [31]
Genus 54: *Viridotheres* R.B. Manning, 1996		
87	*Viridotheres gracilis* (Bürger, 1895)	East Godavari [31]
Genus 55: *Pinnotheres* Bosc, 1801		
88	*Pinnotheres pisum* (Linnaeus, 1767)	Visakhapatnam [26]
Family 22: PLAGUSIIDAE Dana, 1851		
Genus 56: *Plagusia* Latreille, 1804		
89	*Plagusia depressa* (J. C. Fabricius, 1775)	Andhra Coast [31, 8]
90	*Plagusia squamosa* (Herbst, 1790)	Visakhapatnam [8]
Family 23: PORTUNIDAE Rafinesque, 1815		
Genus 57: *Charybdis* De Haan, 1833		
Sub Genus 3: *Charybdis (Charybdis)* De Haan, 1833		
91	*Charybdis (Charybdis) affinis* Dana, 1852	Krishna, Guntur, Nellore [31]
92	*Charybdis (Charybdis) annulata* Fabricius, 1798	Kakinada, Visakhapatnam [19,28,31]
93	*Charybdis (Charybdis) callianassa* (Herbst, 1798)	Visakhapatnam, Guntur, East Godavari, Krishna [31,32]
94	*Charybdis (Charybdis) feriata* (Linnaeus, 1758)	Krishna, East Godavari, Guntur, Nellore [28,31,8,32]
95	*Charybdis (Charybdis) hellerii* (A. Milne-Edwards, 1867)	Visakhapatnam, Krishna [31,32]
96	*Charybdis (Charybdis) lucifera* (Fabricius, 1798)	Guntur, Kakinada, Visakhapatnam [31]
97	*Charybdis (Charybdis) natator* (Herbst, 1794)	Visakhapatnam, East Godavari [31]
98	*Charybdis (Charybdis) rostrata* (A. Milne-Edwards, 1861)	West Godavari [28,31,8,32, 34]
Sub Genus 4: *Charybdis (Archias)* Paulson, 1875		
99	*Charybdis (Archias) hoplites* (Wood-Mason, 1877)	Visakhapatnam, Nellore, Krishna, Prakasam [19,20,31,32]
10	*Charybdis (Archias) ornata* (A. Milne-Edwards, 1861)	Andhra Coast [19]
101	*Charybdis (Archias) truncata* (Fabricius, 1798)	Visakhapatnam, Srikakulam [31, 8]
102	*Charybdis (Archias) vadorum* Alcock, 1899	Visakhapatnam [31]
Genus 58: *Podophthalmus* Lamarck, 1801		
103	*Podophthalmus vigil* (Fabricius, 1798)	Nellore, Prakasam, Visakhapatnam, West Godavari [28,31,8]
Genus 59: *Portunus* Weber, 1795		
104	*Portunus reticulatus* (Herbst, 1799)	Andhra Coast [19,55,32, 34]

Family and Species Name		Distributions & References
105	*Portunus sanguinolentus* (Herbst, 1783)	West Godavari, Vamsadhara, Guntur, Nellore, Kakinada, Nagavali, Srikakulam, Visakhapatnam [28,31,8,32, 34]
106	*Portunus pelagicus* (Linnaeus, 1758)	East Godavari, West Godavari, Krishna, Vamsadhara, Guntur, Nellore, Kakinada, Nagavali, Srikakulam, Visakhapatnam [33, 31]
Genus 60: *Monomia* Gistel, 1848		
107	*Monomia gladiator* (Fabricius, 1798)	Visakhapatnam [33]
108	*Monomia haani* (Stimpson, 1858)	Visakhapatnam [38]
Genus 61: *Scylla* De Haan, 1833		
109	*Scylla serrata* (Forskål, 1775)	East Godavari, West Godavari, Srikakulam, Nellore, Guntur, Vamsadhara, Nagavali [53, 28,32, 34]
110	*Scylla tranquebarica* (Fabricius, 1798)	Krishna, Nellore, Visakhapatnam [31, 8]
111	*Scylla olivacea* (Herbst, 1796)	Visakhapatnam [37]
Genus 62: *Thalamita* Latreille, 1829		
112	*Thalamita admete* (Herbst, 1803)	Visakhapatnam [31, 8]
113	*Thalamita chaptali* (Audouin & Savigny, 1817)	Srikakulam, Visakhapatnam [31, 8]
114	*Thalamita crenata* (Latreille, 1829)	Visakhapatnam, Vamsadhara, Nagavali [31,8,32, 34]
115	*Thalamita prymna* (Herbst, 1803)	Visakhapatnam [34]
Genus 63: *Eodemus* Koch, Spiridonov & Ďuriš, 2022		
116	*Eodemus hastatoides* (Fabricius, 1798)	Nellore, Krishna [31]
Genus 64: *Alionectes* Koch, Spiridonov & Ďuriš, 2022		
117	*Alionectes spinipes* (Miers, 1886)	Nellore, Krishna [31]
Family 24: POLYBIIDAE Ortmann, 1893		
Genus 65: *Parathranites* Miers, 1886		
118	*Parathranites orientalis* (Miers, 1886)	Andhra Coast [19]
Family 25: RANINIDAE De Haan, 1839		
Genus 66: *Notopus* De Haan, 1841		
119	*Notopus dorsipes* (Linnaeus, 1758)	Andhra Coast [15]
Genus 67: *Raninoides* H. Milne Edwards, 1837		
120	*Raninoides personatus* Henderson, 1888	Vamsadhara [31]
Family 26: RETROPLUMIDAE Gill, 1894		
Genus 68: *Retropluma* Gill, 1894		
121	*Retropluma notopus* (Alcock & Anderson, 1894)	Andhra Pradesh [20]
Family 27: SESARMIDAE Dana, 1851		

Family and Species Name		Distributions & References
Genus 69: *Armases* Abele, 1992		
122	*Armases cinereum* (Bosc, 1801)	Srikakulam [37]
Genus 70: *Episesarma* De Man, 1895		
123	*Episesarma mederi* (H. Milne Edwards, 1854)	East Godavari, West Godavari [28,32]
124	*Episesarma versicolor* (Tweedie, 1940)	Srikakulam [37]
Genus 71:*Circulium* Naruse & PKL Ng, 2020		
125	*Circulium vitatum* (PKL Ng & Davie, 2011)	Andhra Pradesh [8]
Genus 72: *Metasesarma* H. Milne Edwards, 1853		
126	*Metasesarma obesum* (Dana, 1851)	Visakhapatnam [20,8]
Genus 73: *Muradium* Serène & Soh, 1970		
127	*Muradium tetragonum* (Fabricius, 1798)	Vamsadhara [14,8,32,34]
Genus 74: *Neosarmatium* Serène & Soh, 1970		
128	*Neosarmatium asiaticum* Ragionieri, Fratini & Schubart, 2012	Andhra Coast [20]
Genus 75: *Parasesarma* De Man, 1895		
129	*Parasesarma plicatum* (Latreille, 1803)	Guntur, Nellore, West Godavari [53,28, 31,32]
Genus 76: *Parasesarma* De Man, 1895		
130	*Perisesarma bidens* (De Haan, 1835)	Srikakulam [32]
Genus 77: *Sesarma* Say, 1817		
131	*Sesarma reticulatum* (Say, 1817)	Srikakulam [37]
Family 28: THIIDAE Dana, 1852		
Genus 78: *Nautilocorystes* H. Milne Edwards, 1837		
132	*Nautilocorystes investigatoris* Alcock, 1899	Visakhapatnam [19,31,35]
Family 29: VARUNIDAE H. Milne Edwards, 1853		
Genus 79: *Hemigrapsus* Dana, 1851		
133	*Hemigrapsus oregonensis* (Dana, 1851)	Srikakulam [37]
Genus 80: *Metaplax* H. Milne Edwards, 1852		
134	*Metaplax crenulata* (Gerstaecker, 1856)	West Godavari [28, 31,8]
135	*Metaplax distincta* H. Milne Edwards, 1852	Krishna, West Godavari, Nellore [29,31,32]
136	*Metaplax elegans* De Man, 1888	East Godavari [20,29,31,8,32]
137	*Metaplax indica* H. Milne Edwards, 1852	Visakhapatnam, Guntur [31,8,32]
138	*Metaplax intermedia* De Man, 1888	East Godavari [28,31,8,32]
Genus 81: *Ptychognathus* Stimpson, 1858		
139	*Ptychognathus barbatus* (A. Milne-Edwards, 1873)	Visakhapatnam [31]

Family and Species Name		Distributions & References
140	*Ptychognathus onyx* Alcock, 1900	Andhra Pradesh [8]
Genus 82: *Varuna* H. Milne Edwards in Bory de Saint Vincent (ed.), 1830		
141	*Varuna litterata* (Fabricius, 1798)	East Godavari, Nagavali, Vamsadhara [53, 28,32,34]
Family 30: XANTHIDAE MacLeay, 1838		
Genus 83: *Banareia* A. Milne-Edwards, 1869		
142	*Banareia banareias* (Rathbun, 1911)	Visakhapatnam [31]
Genus 84: *Demania* Laurie, 1906		
143	*Demania splendida* Laurie, 1906	Visakhapatnam [31]
144	*Demania toxica* Garth, 1971	Visakhapatnam [30,31]
145	*Demania armadillus* (Herbst, 1790)	Visakhapatnam, Kakinada [52]
146	*Demania baccalipes* (Alcock 1898)	Visakhapatnam, Kakinada [52]
147	*Demania reynaudii* (H. Milne Edwards, 1834)	Visakhapatnam, kakinada [52]
Genus 85: *Liagore* De Haan, 1833		
148	*Liagore erythematica* Guinot, 1971	Prakasam, Visakhapatnam [31]
149	*Liagore rubromaculata* (De Haan, 1983)	Visakhapatnam [39]
Genus 86: *Nectopanope* Wood-Mason in Wood-Mason &Alcock 1891		
150	*Nectopanope rhodobaphes* Wood-Mason, in Wood-Mason & Alcock, 1891	East Godavari [18, 20,28,31, 35]
Genus 87: *Neoxanthias* Ward, 1932		
151	*Neoxanthias michelae* Serène & Vadon, 1981	Visakhapatnam [52]
Genus 88: *Atergatis* De Haan, 1833		
152	*Atergatis floridus* (Linnaeus, 1767)	Visakhapatnam, Kakinada [52]
153	*Atergatis integerrimus* (Lamarck, 1818)	Visakhapatnam, Kakinada [52]
Family 31: CARPILIIDAE Ortmann, 1893		
Genus 89: *Carpilius* Desmarest, 1823		
154	*Carpilius maculatus* (Linnaeus, 1758)	Visakhapatnam [52]
Family 32: CORYSTIDAE Samouelle, 1819		
Genus 90: *Jonas* Hombron & Jacquinot, 1846		
155	*Jonas indicus* (Chopra, 1935)	Visakhapatnam [52]
Family 33: Euryplacidae Stimpson, 1871		
Genus 90: *Eucrate De Haan, 1835*		
156	*Eucrate indica* Castro & Ng, 2010	Visakhapatnam [39]

Fig. 1. Map of coastal parts of Andhra Pradesh

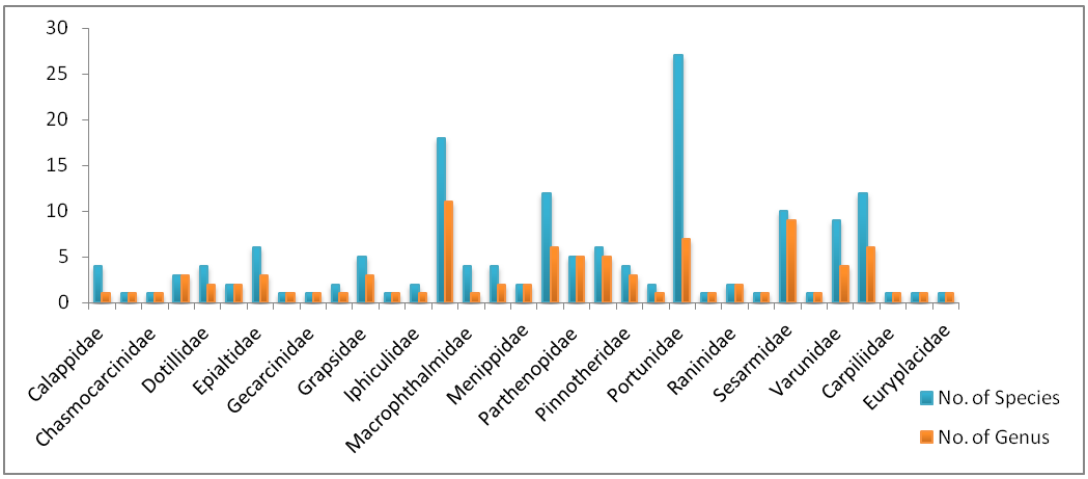

Fig. 2. Composition of families of brachyuran crabs in Andhra Pradesh

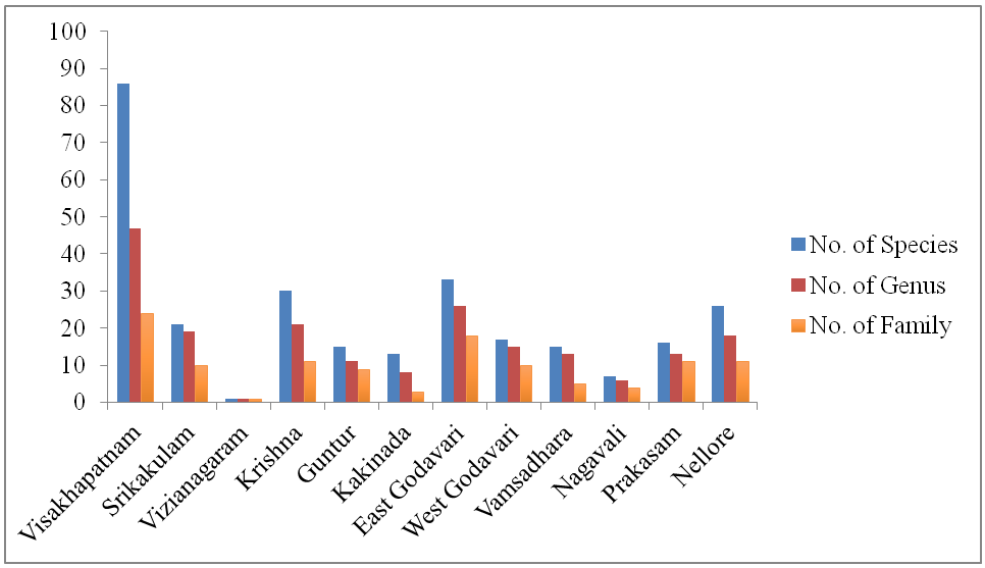

Fig. 3. Availability of marine and estuarine brachyuran crabs in major places of Andhra Pradesh

In Andhra Pradesh, a maximum number of genera and species reported from Visakhapatnam > East Godavari > Krishna > Nellore > Srikakulam > West Godavari > Guntur > Vamsadhara > Prakasam > Kakinada > Nagavali > Vizianagaram respectively. Family wise highest diversity is seen in Visakhapatnam > East Godavari > Krishna = Prakasam = Nellore > Srikakulam = West Godavari > Guntur > Vamsadhara > Nagavali > Kakinada > Vizianagaram respectively (Fig. 1 and Fig. 3).

4. DISCUSSION

Andhra coast displays different types of coastal habitats like the sandy shore, estuaries, backwaters, creek, mud flat, and rocky shore [45]. As a fact of these, habitat distributions among the brachyuran crabs in this region are wide. As per the present communication a list of 156 species of brachyuran crab under 91 genera and 33 families have been recorded from the State of Andhra Pradesh, covering all the coastal and estuarine habitats, i.e. coral reef, mangrove, mudflats, sandy beach, rocky intertidal area etc. (Table 1). The species under the family Calappidae, Dorippidae, Dromiidae, Epialtidae, Goneplacidae, and Matutidae are mainly found in sub-tidal and sandy regions. Crabs from the family Portunidae can be found in both intertidal rocky regions, shallow sandy substrate, and mud and mangrove regions. There are some crabs from the family Xanthidae, Carpiliidae, and Leucosiidae which are coral reef-associated crabs. Family Xanthidae represents mainly coral reef-associated crabs but some species can also be found in sandy bottoms up to 30 m depth. Crabs from the family Varunidae, and Sesarmidae are mostly seen in the muddy substrate, marsh banks, river banks, and mangrove regions [46,3,47].

The taxonomical work on the marine brachyuran crabs of Andhra Pradesh is still going on since Alcock [14]. Srikakulam, Vizianagaram, Bhimunipatnam, Waltair, Elamanchilli, Pithapuram, Kakinada, Sekhinetipalli, Maginipudi, Machilipatnam, Nizampatnam, Vadarevu, Chirala, Ongole, Kottapatnam, Malipadu, Nellore, Muthukur, Krishnapatnam, East Godavari, West Godavari, areas had been studied to explore the brachyuran crab diversity [31]. There are some crabs landing centres like Chollangi, Tallarevu, Bhairavapalem, Puddimadaka, and Vishakhapatnam fishing harbor, which are crucial sites for the collection of trawled crabs according to Prasanthi et al. [48]. Literature survey revealed that some of the places of Andhra Pradesh are reported with major brachyuran diversity like Visakhapatnam with 84 species, Srikakulam with 21 species, Krishna estuary with 35 species, Guntur with 15 species, East Godavari with 33 species, West Godavari with 17 species, Nagavali estuary with 7 species, Vamsadhara estuary with 15 species, and Prakasam with 16 species. Krishna, Nellore, Kakinada with 30 species, 26 species, and 13 species, respectively (Fig. 2).

Visakhapatnam showed the highest diversity of brachyuran crabs (86 species) and Vizianagaram showed the lowest diversity with only 1 species. Visakhapatnam is the highest diverse area since most of the studies have been carried out in this area well as it is the largest landing centre of Andhra Pradesh. The habitat diversity of Visakhapatnam district also draws toward species diversity due to its rocky, and sandy beach, and the presence of a patchy coral reef ecosystem. Kakinada is an important landing center for commercial crabs as it represents 13 species. East Godavari (Genera 26, species 33), Krishna (Genera 21, Species 30), Nellore (Genera 18, Species 26), Srikakulam (Genera 19, Species 21), West Godavari (Genera 15, Species 17), Prakasam (Genera 13, Species 16), Vamsadhara (Genera 13, Species 15), Guntur (Genera 11, Species 15), Kakinada (Genera 8, Species 13), Nagavali (Genera 6, Species 7), Vizianagaram (1 species) showed lowest brachyuran crab diversity probably due to its coastal geography and less exploration of these regions. Vamsadhara, Nagavali, and Krishna estuaries are enriched with mud crabs from the family Portunidae. Family Portunidae showed the highest number of species (27 species, 7 genera), and Leucosiidae was in the second position with 18 species (Fig. 1). Family leucosiidae (11 genera, 18 species), sesarmidae (9 genera, 10 species), Parthenopidae (5 genera, 5 species), and Pilumnidae (5 genera, 6 species) families seem to appear with high genus diversity of brachyuran crabs in this region.

Ng et al. [3] reported the existence of 6,793 brachyuran species from 1, 271 genera and 93 families in the World. After seven years, Davie et al. [5] reported a total of 7260 species from, 1401 genera and 104 families all over the world. Trivedi et al. [6] compiled the Indian checklist of crabs and reported 910 species belonging to 361 genera and 62 families. From Andhra Pradesh, they reported 121 species, 67 genera and 27 families of brachyuran crabs. The present review work reports 156 species of brachyuran crabs belonging to 91 genera and 33 families in Andhra Pradesh. The increase in brachyuran species number in these regions is perhaps due to the extensive survey and increasing interest in the classical taxonomical work on brachyuran. As so many researchers are doing taxonomic revision over the years, many species' names have been changed. As example, Ng. et al. [3] depicted *Goniohellenus* Subgenus in *Charybdis (Goniohellenus) hoplites, Charybdis (Goniohellenus) ornata, Charybdis (Goniohellenus) truncata, Charybdis (Goniohellenus) vadorum,* where Trivedi et al. [6] presented these species as *Charybdis (Archias) hoplites*, *Charybdis (Archias) ornata*, *Charybdis (Archias) truncata*, *Charybdis (Archias) vadorum*. Trivedi et al. [6] reported *Monomia* gladiator; which in Systema Brachyurorum Part I has been depicted as *Portunus (Monomia) gladiator.* According to Ng et al. [3], genus *Uca*is a major problem despite the revision. Subgeneric grouping is confusing. In this case, we followed WoRMS [43] and Trivedi et al. [6] during enlisting of species from the family Ocypodidae.

5. CONCLUSION

Brachyuran crabs also play an important role in the maintenance of equilibrium of the ecosystem, by holding a crucial position in the food chain. They collect nutrition from the algae, muscles, debris, and small organisms [49]. Sometimes the shape of their cheliped defines their food habit [47]. Among all these families, some species of the family Portunidae are edible and commercially valuable. *S. serrata, S. olivacea, P. pelagicus, P. sanguinolentus, C. feriatus* are considered good food resources and good sources of income for many people [50]. In addition, mud crab farming is fast growing to provide sufficient production for both local and export markets. Also, larviculture shows that crab seed hatchery is successful in tropical regions with high salinity and temperature [51]. Crab farming has great potential in India. The Kakinada area of Andhra Pradesh represents a lucrative crab fishery as a good income source for the local people. Although the diversity of brachyuran crabs is facing a serious threat as both commercial and non-commercial, adult and juvenile crabs are being trawled along with the fish. Most of the species are dumped like trash in the fish-landing centres. Even some new records and new species have been described from the crab specimens collected from the trash from the fish landing centres [52]. Though it was shocking when checking the IUCN status of the reported species, as all the 156 species are not evaluated by IUCN, which needs attention by the researchers as the present diversity as well as the distributional status of this group is unknown creating a question for the conservation of biodiversity. Although studies on the brachyuran fauna of the Andhra coast made their stepping stone in the 1800s, it seems that further study on brachyuran crabs in this region may open up unexplored brachyuran crab diversity in Andhra

Pradesh, which will be ultimately helpful for understanding the marine benthic ecosystem.

ACKNOWLEDGEMENTS

The work was carried out as part of the In-house project entitled “Coral reef-associated fauna of east coast of India”. The authors wish to thank the Director, Zoological Survey of India, Kolkata and the Ministry of Environment, Forest and Climate Change, Government of India for providing the necessary facilities and financial support. The authors also extended our thanks to the Principal Chief Conservator of Forest (Andhra Pradesh), Chief Conservator of Forest (Visakhapatnam), and Divisional Forest Officer (Visakhapatnam and Vizianagaram) for their support and permission for this study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Chandra K, Raghunathan C, Mondal T. Faunal Diversity of Biogeographic Zones: Coasts of India. Published by the Director, Zoological Survey of India, Kolkata.2020; 807.
2. Roy T, Chakrabarti K. A brief report on marine faunal diversity of Vishakhapatnam –representing the east coast of India. International Journal of Current Research in Life Sciences. 2020;9(10):3342-3348.
3. Ng PK, Guinot D, Davie PJ. Systema Brachyurorum: Part I, An annotated checklist of extant brachyuran crabs of the world. The Raffles Bulletin of Zoology. 2008;17(1):1-286.
4. De Grave S, Pentcheff ND, Ahyong ST, Chan TY, Crandall KA, Dworschak PC, Wetzer R. A classification of living and fossil genera of decapod crustaceans. Raffles Bulletin of Zoology. 2009;21:1–109.
5. Davie PJ, Guinot D, Ng PK. Systematics and classification of Brachyura. In: Treatise on Zoology-Anatomy, Taxonomy, Biology, The Crustacea. 2015;9(2):1049-1130.
6. Trivedi JN, Trivedi DJ, Vachhrajani KD, Ng PK. An annotated checklist of the marine brachyuran crabs (Crustacea: Decapoda: Brachyura) of India. Zootaxa. 2018; 4502(1):1-83.
7. Kumaralingam S, Sivaperuman C, Raghunathan C. Diversity and community structure of brachyuran crabs in North Andaman. In: Ecology and Conservation of Tropical Marine Faunal Communities. Springer, Berlin, Heidelberg. 2013;171-181.
8. Dev Roy MK, Nandi NC. Checklist and distribution of Brachyuran crabs of West Bengal, India. Journal of Environment and Sociobiology Social Environmental and Biological Association. 2008;5(2):191-214.
9. Pati SK, Sahu KC, Swain D, Baliarsingh SK, Sharma RM, Venkatraman K. Marine crabs (Decapoda: Anomura and Brachyura). In: Fauna of Maharashtra, State Fauna Series. 2012; 20(2):381-385.
10. Dev Roy MK. Diversity and distribution of marine brachyuran crab communities inhabiting West Coast of India. In: Ecology and conservation of tropical marine faunal communities. Springer, Berlin, Heidelberg. 2013;147-169.
11. Jeyabaskaran R, Khan S, Ramaiyan V. Brachyuran crabs of Gulf of Mannar. Annamalai University, Parangipettai, Tamil Nadu. 2000;184.
12. Beleem I, Poriya P, Gohil B. An annotated checklist of marine brachyuran crabs of Gujarat waters, India. Iranian Journal of Animal Biosystematics. 2019;15(1):9-45.
13. Valarmathi K. Arthropoda: Crustacea: Brachyura. In: Faunal Diversity of Biogeographic Zones: Coasts of India: Zoological Survey of India, Kolkata. 2020;419-458.
14. Alcock A. XXV.—Natural history notes from HM Indian marine survey steamer ‘Investigator,’ Commander RF Hoskyn, RN, Commanding.—Series II, No 1, On the results of deep-sea dredging during the season 1890–91 (continued). Journal of Natural History. 1894;13(75):225-245.
15. Alcock A. Materials for a carcinological fauna of India, No 1, The Brachyura Oxyrhyncha. Journal of the Asiatic Society of Bengal. 1895;64(2):157–291.
16. Alcock A. Materials for a carcinological fauna of India, No 2, The Brachyura Oxystoma. Journal of the Asiatic Society of Bengal. 1896;65:134–296.
17. Alcock A. Materials for a carcinological fauna of India, No 3, The Brachyura Cyclometopa, Part 1, The family Xanthidae. Journal of the Asiatic Society of Bengal. 1898;67(2):67–233.

18. Alcock A. An Account of the Deep-Sea Brachyura collected by the Royal Indian Marine Survey Ship Investigator. Calcutta: Trustees of the Indian Museum. 1899;4:85.
19. Alcock A. Materials for a carcinological fauna of India, No 4, The Brachyura Cyclometopa. Part II. A revision of the Cyclometopa with an account of the families Portunidae, Cancridae and Corystidae. Journal of the Asiatic Society of Bengal.1899;68:1–104.
20. Alcock A. Materials for a carcinological fauna of India, No 6, Brachyura Catometopa or Grapsoidea. Journal of the Asiatic Society of Bengal. 1900;69(3):279–486.
21. Alcock A. Catalogue of the Indian Decapod Crustacea in the collection of the Indian Museum, Part I, Brachyura: Fasciculus I. In: Introduction and Dromides or Dromiacea (Brachyura Primigenia). Published by Indian Museum, Calcutta. 1901;1–80.
22. Alcock A, Anderson ARS. Natural history notes from H. M. Indian Marine Survey Steamer Investigator, Commander C. F. Oldham, R. N., commanding, Series II, No 14, An account of a recent collection of deep-sea Crustacea from the Bay of Bengal and Laccadive Sea. Journal of the Asiatic Society of Bengal. 1894; 63(2):141–185.
23. Alcock A, Anderson ARS. Natural history notes from H. M. Indian Marine Survey Steamer Investigator, Ser II, No 17, List of the shore and shallow-water Brachyura collected during the season 1893-1894. Journal of the Asiatic Society of Bengal.1894;63(2):197-209.
24. Alcock A, Anderson ARS. I—Natural history notes from HM Royal Indian Marine survey ship 'investigator,'Commander TH Heming, RN, Commanding—Series III, No 2, An account of the deep-sea Crustacea dredged during the surveying-season of 1897–98. Journal of Natural History. 1899;3(13):1-27.
25. Devi SL. The fishery and biology of crabs of Kakinada region. Indian Journal of Fisheries. 1985;32(1):18-32.
26. Devi KN, Shyamasundari K, Rao KH. Brachyuran crabs of Visakhapatnam. Biological Bulletin of India.1988;10:20-27.
27. Galil BS, Clark PF, Fransen CHJM. A revision of the genus Matuta WEBER, 1795 (Crustacea: Brachyura: Calappidae). Zool. Verh. Leiden, Nationaal Natuur historisch Museum.1994;294:1-55.
28. Dev Roy MK, Bhadra S. Brachyuran crabs (Crustacea: Decapoda: Brachyura). Fauna of Godavari Estuary. In: Estuarine Ecosystem Series. Zoological Survey of India. 2001;4:35-54.
29. Dev Roy MK, Bhadra S. Marine and estuarine crabs (Crustacea: Decapoda: Brachyura). In: Fauna of Andhra Pradesh, State Fauna Series. Zoological Survey of India. 2005;5:357–535.
30. Dev Roy MK, Nandi NC. Brachyuran diversity of Coral Reef Ecosystems in India. In: Proceedings of National Seminar on Reef Ecosystem Remediation. SDMRI Research Publication part 9, Suganthi Devadason Marine Research Institute, Tamilnadu. 2005;220-231.
31. Dev Roy MK, Nandi NC. Brachyuran bioresources (Crustacea: Decapoda: Crabs) of coastal Andhra Pradesh. In: National symposium on Conservation and Validation of Marine Biodiversity, Zoological Survey of India, Kolkata. 2007;53-66.
32. Rath S, Dev Roy MK. Crab (crustacea: decapoda: brachyura). In: Fauna of Krishna Estuary part 5, Estuarine Ecosystem Series 5, Zoological Survey of India, Kolkata. 2009;43-81.
33. Krishnamoorthy P. Brachyuran crabs from the collections of Marine Biological Centre. Records of the Zoological Survey India. 2009; Occasional Paper No 304:1-46.
34. Rath S, Dev Roy MK. Brachyuran crabs (Crustacea: Decapoda: Brachyura). In: Estuarine Ecosystem Series, Vamsadhara and Nagavali Estuary, Srikakulam, Andhra Pradesh. Zoological Survey of India, Kolkata. 2010;6:23-45.
35. Dev Roy MK. Conservation concerns on crustacean fauna of India. Journal of Environment and Sociobiology. 2015; 12(1):77–98.
36. Chakravarty MS, Ganesh PRC, Amarnath D, Sudha BS, Vivek V. Diversity of crabs in Tekkali creek, Srikakulam district, Andhra Pradesh. International Journal of Fisheries and Aquatic Studies. 2016;4:414-418
37. Chakraborty P. Comparative Evaluation of Scylla species from two fishery conservation areas of East coast of Andhra Pradesh, India. International Journal of Bio-Pharma Research. 2019;8(5):2593-2601.

38. Sasikala T, Manjulatha C, Raju DVSN. Diversity of by catch at Visakhapatnam fishing Harbour. International Journal of Fauna and Biological Studies. 2020;7(1):118-123.
39. Mahapatra P, Sen A, Panda P, Yogesh Kumar JS. New record of brachyuran crabs from the Visakhapatnam coast, Andhra Pradesh.Journal of Scientific Research & Reports. 2022;28(10):117-124.
40. Handbook on fisheries statistics. Department of Fisheries, Ministry of Fisheries, Animal Husbandry & Dairying, Government of India, New Delhi. 2020;196.
41. Josileen J, Dineshbabu AP, Sarada PT, Dash G, Divipala I, Kumar R. Sathianandan TV. Trends in marine crab fishery of India. Marine Fisheries Information Service, Technical and Extension Series. 2021;249:7-19.
42. Ahyong ST, Lowry JK, Alonso M, Bamber RN, Boxshall GA, Castro P, Svavarsson J. Subphylum Crustacea Brünnich, 1772. In: Zhang, Z.-Q.(Ed.) Animal biodiversity: An outline of higher-level classification and survey of taxonomic richness. Zootaxa. 2011;3148(1):165-191.
43. WoRMS. World Register of Marine Species; 2022.
Available: https://www.marinespecies.org at VLIZ. Accessed 2022-08-15.
DOI:10.14284/170
44. Koch M, Spiridonov VA, Duris Z. Revision of the generic system for the swimming crab subfamily Portuninae (Decapoda: Brachyura: Portunidae) based on molecular and morphological analyses. Zoological Journal of the Linnean Society. 2022;197(1):127-175.
45. Pramod G, Maruthi CS. A survey of bivalve molluscs along north Andhra coast.Journal of Indian Ocean Studies. 2004;12(1):145.
46. Naderloo R. Atlas of crabs of the Persian Gulf. Springer. 2017;427.
Available: 10.1007/978-3-319-49374-9.
47. Wisespongpand P. Guideline to Identification of Deep-Sea Crabs. In: Training Workshop on Identification of Deep-Sea Benthic Macro invertebrate Vulnerable to fishing Gear, SEAFDEC, and Thailand; 2011.
Available:http://hdl.handle.net/20.500.12067/667 on 24.06.2022.
48. Prasanthi C, Babu KR, Rani CJ. Protein Content Variations in the Crude Haemolymph of Male and Female Crab Scylla olivacea from the Coast of Visakhapatnam, Andhra Pradesh, India. Studia Rosenthaliana (Journal for the Study of Research). 2020;12(9): 93 – 97.
49. Shet GN, Chandran MS, Ramachandra TV. Brachyuran Crabs of Aghanashini Estuary, South Indian West Coast, Karnataka. In: Proceeding of Conference on Lake. 2016;1-17.
50. Maheswarudu G. Diversity and exploitation status of Crustacean Fishery Resources in India. In: e-TRAINING MANUAL Recent advances in marine fisheries and taxonomic research in India. ICAR-Central Marine Fisheries Research Institute, Kochi. 2018;1-10.
51. Marichamy R. Crab farming potential in India. In: Proceedings of the Seminar on Fisheries-A Multibillion Dollar Industry, Madras, Aquaculture Foundation of India & The Fisheries Technocrats Forum. 1996;115-122.
52. Ponnada VK. Studies on the diversity and systematics of Brachyuran crabs (crustacea; Decapoda) Off Andhra Pradesh coast, Bay of Bengal, India. Ph.D. thesis submitted to Andhra University, Andhra Pradesh, India; 2019.
Available:http://hdl.handle.net/10603/364063
53. Ramana Murthy KV, Rao BK. UNESCO Curriculum Workshop on Management of Mangrove Ecosystem and Coastal Protection. Andhra University, Visakhapatnam.1993;6–12.
54. Dev Roy MK, Nandi NC. Brachyuran crabs (Crustacea). In: Fauna of Andaman and Nicobar islands, part 10, State Fauna Series 1. Zoological Survey of India, Kolkata. 2012; 185-236.
55. Deb M. Crustacea: Decapoda: Crabs. In: Fauna of West Bengal, State Fauna Series, Zoological Survey of India, Calcutta. 1999;3(10):345–403.