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The Crustacean Zooplankton Diversity from Bhatye Creek of Ratnagiri Coast, Maharashtra State

Dinesh S. Kharate[1], Vijay R. Lakwal[2], Satish S. Mokashe[3]
[1, 2, 3] *Department of Zoology, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad, 431 004,Maharashtra, India.*

Abstract: ***The present study was undertaken to assess crustacean zooplankton diversity. Work was carried out at Bhatye estuary located at latitude 16058'13.57"north and longitude, 73018'28.10"east, Ratnagiri. Samples were collected using simple conical tow plankton net (65 µm bolting nylon).During present observations 23 species of crustacean zooplankton belonging to 18 families 20 genera from Bhatye creek, were recorded. The results clearly show that species like, Scolecithrixdanae, Acrocalanuslongicornis, Euterpinaacutifrons and Microsetellanorvegica were dominated. The present study revealed that the order wise species distribution as in the following manner, Calanoida> Harpacticoida> Cyclopoida> Poecilostomatoida> Diplostraca> Decapoda in Bhatye creek.***
Keywords: Crustacean zooplankton, Diversity, Bhatye creek, Ratnagiri coast.

I. INTRODUCTION

The crustacean zooplankton species are successful and dominated group in the marine as well as estuarine ecosystems; and its tropic relationship. The relationship between livings and their environment is inevitable, continuous and reciprocal. The study of these interactions under the natural conditions constitutes the science of ecology. The physicochemical properties of the ambient marine environment will play a pivotal role in determining the type of ecosystem besides several other parameters like geomorphology, tidal amplitude and sediment composition. The west coast of India has the Arabian Sea. The sea off the Coast appears to be uniform but actually offers a wide range of habitats – both physical and biological. This becomes apparent when the physical geography of the land itself offering various types of habitats like the bay formations, creeks, estuaries, back waters, reefs, sea-grass beds, mangrove swamps, cliffs, rocky or sandy shores etc., each with its own distinctive fauna. The linkages between these wide varieties of diverse habitats and ecosystems are essential for the maintenance of food webs, migration routes and increased productivity.

Creeks along with estuaries are integral part of marine environment and subjected to extensive faunal and floral studies. Aquatic ecosystems are classified on the basis of salinity Miller F. G., (2004). They are fresh water (rivers), brackish water (Mid Creek Islands) and salt water (Islands in mouth of estuaries and creeks). An estuary or tidal creek of a river essentially has salt water, brackish water and fresh water zones with an increasing distance from the mouth of an estuary. The coastal wetlands associated with estuary are creek and estuarine islands, covered with mangrove swamps or other halophytic (salt tolerant) varieties of plants. Islands in the tidal creeks and river channels are unique aquatic ecosystems. The distance from both the banks of the river, their size, tidal velocities, tidal current pattern, quantum of sediment in the tidal water, tidal range, limit of tidal incursion are the factors that influence the geo-environment of creek islands.

Estuary is a high productive area in the coastal zone. It is a partially enclosed, funnel shaped area of coastal water, where seawater mixes with fresh water and nutrients from rivers and runoff from land enriches the area. The length up to which the tidal water penetrates in the estuary or creek is the intertidal zone. This zone or river stretch experiences daily incursion and excursion of sea water. Estuaries are considered as nutrient sinks or traps, where nutrient dynamics are unpredictable and significant, as it make estuary a highly productive ecosystem Odum, (1971). The zooplankton composition influenced by so many factors and they change according to ecological changes. Tropical aquatic ecosystems are the most productive areas with rich zooplankton population, Robertson *et al.*, (1992) and Saravankumar*et al.*, (2007b). Zooplankton is a source of food for many species which themselves serve as a basis for the artisanal fishery well known in west coast of India. To understand the secondary and tertiary productivity, it is desirable that the systematic of the zooplankton is known. Although much work has been done all over the world, the fauna of crustacean zooplankton of Ratnagiri, west coast of India is not well documented. Consequent upon this, there is a need for information on the dynamics of crustacean zooplankton diversity in the Bhatye creek of Ratnagiri coast.

The present study includes the diversity and species wise distribution of crustacean zooplankton from Bhatye creek of Ratnagiri coast, which is situated about 6.5 km north of Ratnagiri. The Bhatye creek is very wide but shallow, and a major part of it gets exposed at low tide. During monsoon, large amount of fresh water influx occurs in the estuary, resulting in considerable salinity fluctuation. This creek in enriched by nutrients from Kajali River. The phyla of zooplankton (Crustacea) were encountered during this investigation with the former being more diverse and abundance. As crustacean zooplanktons are quantitatively important group, research on this taxon is particularly significant.

II. MATERIAL AND METHODS

A. Selection of sampling sites

The present study was carried out in the Bhatye creek of Ratnagiri coast. Eight stations were selected so as the water samples represent the entire creek. The GPS location of all the sampling sites was noted down. The maps of Bhatye creek were digitized using Google Earth professional 6.0 to show the exact location of sampling sites and other features. The sampling site-I, II, VI and VII has taking into account the human activities, the outlets, inlets morphometric features and less growth of aquatic vegetation etc. And the sampling site-III, IV, V and VIII was selected on the basis of undisturbed area. Depth of the water column varied from 3-15 m.

Sr.No.	Sampling sites	Geographic location	Current observations
01	Site- I	N $16^0$58’16.86”E $73^0$18’28.02”	Anthropogenically polluted
02	Site- II	N $16^0$58’09.80”E $73^0$18’29.43”	Anthropogenically polluted
03	Site- VI	N $16^0$58’34.13”E $73^0$18’39.42”	Anthropogenically polluted
04	Site- VII	N $16^0$58’25.47”E $73^0$18’34.37”	Anthropogenically polluted
05	Site- III	N $16^0$58’09.36”E $73^0$18’38.57”	Least or no human interferences
06	Site- IV	N $16^0$58’21.06”E $73^0$18’41.22”	Least or no human interferences
07	Site- V	N $16^0$58’31.58”E $73^0$18’45.63”	Least or no human interferences
08	Site- VIII	N $16^0$58’18.80”E $73^0$18’37.22”	Least or no human interferences

Table-1: Geographic locations of selected sampling sites in Bhatye creek, Ratnagiri coast.

Fig.1 - The Google earth map showing eight sampling sites in Bhatye creek.

B. Collection of samples

Sampling was done from February 2015 to January 2017.The water sample will be collected monthly intervals. Crustacean zooplankton samples were collected by surface hauling by using simple conical tow plankton net (65 µm bolting nylon).A total 100 litres of water was filtered and then transferred in 50ml plastic bottle and later it was preserved in 5% neutralised formaldehyde solution and stain with eosin. Species samples were then sorted out making sub-samples.

C. Identification of samples

Crustacean zooplankton species were then identified by using available keys (J. D. H. Strickland and T. R. Parsons, 1960; Kasturirangan, 1963; Dumont and Tundisi, 1984;Zheng Zhong*et al.*, 1989;Santhanamand Srinivasan, 1994;Perumal*et al.*, 1999 and Conway and White, 2003).

III. RESULTS AND DISCUSSION

In the present study 23 species of crustacean zooplanktons belonging to 18 families and 20 genera from Bhatye creek, Ratnagiri coast were recorded.

Sr. No.	Crustacean zooplankton species	Sampling sites							
		Human interferences				Undisturbed area			
		I	II	VI	VII	III	IV	V	VIII
01	Calonopiaelliptica(Dana, 1849)	-	√	-	-	-	√	-	√
02	Pontellinaplumata(Dana, 1849)	-	√	-	√	√	√	-	√
03	Pontellafera(Dana, 1849)	-	√	√	-	√	√	-	√
04	Calanopia minor(Scott A., 1902)	-	-	-	-	-	-	-	√
05	Scolecithrixdanae(Lubbock, 1856)	-	√	-	-	√	√	√	√
06	Acrocalanuslongicornis(Giesbrecht, 1888)	√	√	√	√	√	√	-	√
07	Eucalanuscrassus(Giesbrecht, 1888)	-	-	-	√	-	-	-	√
08	Haloptilusspiniceps(Giesbrecht, 1892)	√	-	-	√	√	√	-	√
09	Metacalanusaurivilli(Cleve, 1901)	-	-	-	-	√	-	-	√
10	Heliodiaptomusviduus(Gurney, 1916)	-	√	-	-	√	√	-	√
11	Clausocalanus minor(Sewell, 1929)	√	√	-	-	√	-	-	-
12	Euterpinaacutifrons(Dana, 1847)	-	√	-	√	√	√	√	√
13	Clytemnestra scutellata(Dana, 1848)	-	-	-	√	-	√	√	-
14	Miraciaefferata(Dana, 1849)	-	√	-	-	√	√	-	√
15	Longipediacoronata(Claus, 1862)	-	√	-	√	-	√	√	√
16	Longipediaweberi(Scott A., 1909)	-	√	√	-	-	√	-	-
17	Microsetellanorvegica(Boeck, 1864)	√	√	-	-	√	√	√	√
18	Oithonabrevicornis(Giesbrecht, 1891)	-	√	√	-	√	√	-	√
19	Oithonaoculata(Farran, 1913)	-	√	-	-	√	√	-	√
20	Oncaea media(Giesbrecht, 1981)	√	-	√	√	-	√	√	-
21	Sapphirinagastrica(Giesbrecht, 1891)	-	-	-	-	√	-	√	-
22	Leptodorakindtii(Focke, 1844)	-	√	-	-	√	-	-	-
23	Lucifer penicillifer(Hansen 1919)	√	√	-	√	-	-	√	-

[(√) Presence; (-) Absence]

Table- 2: Checklist of crustacean zooplankton species of Bhatyecreek, Ratnagiri.

The crustacean zooplanktons found from 8 sampling sites, which is shown in table 2 and figure 2, 3, 4 and 5 are as follows: Calonopiaelliptica, Pontelllinaplumata, Pontellafera, Calanopia minor, Scolecithrixdanae, Acrocalanuslongicornis, Eucalanuscrassus, Haloptilusspiniceps, Metacalanusaurivilli, Heliodiaptomusviduus, Clausocalanus minor, Euterpinaacutifrons, Clytemnestra scutellata, Miraciaefferata, Longipediacoronata, Longipediaweberi, Microsetellanorvegica, Oithonabrevicornis, Oithonaoculata, Oncaea media, Sapphirinagastrica, Leptodorakindtiiand Lucifer penicillifer.The table 2clearly shows that the

crustacean zooplankton species like Scolecithrixdanae, Acrocalanuslongicornis, Euterpinaacutifrons and Microsetellanorvegica were dominated in Bhatye creek region. Amongst the crustacean zooplankton species, order calanoida show highest order-wise species distribution thanall other species; as well as least species distribution shows order decapodain Bhatye creek. The earlier findings in relation to zooplankton community structure, composition, diversity and dynamics in freshwater ecosystems of India in particular, Andhra Pradesh.

It consistent work done on water pollution along the lakes, creeks and rivers points out to the need of systematic and regular monitoring of pollution level for further improvement in the industrial waste water treatment methods. The investigation carried out by Singareet al.,(2010) on the wetland of Thane creek with special reference to the pollution due to heavy metals and physicochemical characteristics of the soil along the creek area which has attracted much attention of environmental biologists over the last few decades, as the creek has been subjected to a lot of pollution from the Asia's biggest Thane – Belapur Industrial Complex located at the south of Mumbai harbour along the west coast of India. Copepod distribution of a tidal creek in Hoogly estuary was documented by Baidya A. U. and Choudhary A., (1984). Zooplanktons are an important food source for many species of fish and flavour texture of fish is also improved with zooplankton as feed. Goswamiet al.,(1981) studied biochemical contents of marine copepods. Sreepadaet al.,(1992) observed biochemical composition of zooplankton from Arabian Sea.

The density and diversity of the zooplankton are controlled by the several physicochemical factors of water. The pattern of algal distribution and its density is the main biological factor affecting the density and diversity of the zooplankton.The density and diversity of the zooplankton are controlled by the several physicochemical factors of water, Bais and Agrawal, (1990).The observed crustacean zooplankton species are listed below in phylogenetic sequence, along with species specific characteristics:

Taxonomy of crustacean zooplankton species:
Phylum- Arthropoda
Class- Copepoda
Order- Calanoida

1. Calsonopiaelliptica(Dana, 1849)
Family- Pontellidae
Key characters-
a) The5th leg has a 2-jointed exopodite.
b) The exopodite of the right foot is in the form of a claw.
c) Urosome segment 2 right side distal border produced into a well defined tooth.
d) The 5th leg terminal segment of the left exopodite with a pad of fine hairs, pointed at the distal end with three seta on the outer margin; and a seta on the posterior side.
e) The flattened margin of right exopodite segment 1 with 3 blunt teeth.
f) The claw- like third segment has 3 small pointed teeth.
Measurement- 1.80-1.90 mm length

2. Pontelllinaplumata(Dana, 1849)
Family- Pontellidae
Key characters-
a) Posterior metasome segments symmetrical, less pointed than in the female when viewed laterally; one pair of cuticular lenses.
b) Antennule was geniculate.
c) The 5th leg uniramous; right 5th leg ending in a claw, base of claw broad, with a conical tooth- like elevation on inner margin and a seta.
d) Left leg has distal segment with prominent outer marginal spine and 3 terminal subequal spines, inner margin with a tuft of hairs.
Measurement- 1.34-1.92 mm length

3. Pontellafera(Dana, 1849)
Family- Pontellidae

Key characters-
a) Antennule has geniculate; urosome 5-segmented, genital segment with a small lateral bulge on right side, furca asymmetrical slightly broader on right.
b) The right 5th leg had claw.
c) Base of claw had large projecting thumb with a small process at its base.
d) Terminal segment initially almost straight, but the distal half curves backwards, the tip bearing a small seta.
e) The left 5th leg terminating in 3 unequal processes
Measurement- 2.33-2.67 mm length

4. Calanopia minor (Scott A., 1902)
Family- Pontellidae
Key characters-
a) The second urosome segment has no spiny process.
b) Antennule extends to the end of the third thoracic segment; the right Antennule is geniculate.
c) The basis of the left 5th leg is swollen towards the proximal end of the inner margin, the swollen part produced into a small tooth- like spine.
d) The basis of the right exopodite is also swollen.
e) Flattened joint of the first exopodite segment, with a seta on the inner margin; outer thumb is short and naked.
f) The claw-like second segment is spoon shaped and without any teeth, but with 2 inner marginal seta.
Measurement- 1.11-1.18 mm length

5. Scolecithrixdanae(Lubbock, 1856)
Family- Scolecitrichidae
Key characters-
a) The but posterior metasome segment not produced into points which extend close to the urosome, reaching half way down the genital segment.
b) The Antennule extends beyond the prosome.
c) The urosome had 5 segments.
d) The setae on the furca are of similar length.
e) The 5th leg asymmetrical and right foot uniramous with 2-segments.
f) Exopodite has short terminal segment; left foot biramous, the exopodite with 3 segments, the simple endopodite with 1 segment.
Measurement- 1.92-2.25 mm length

6. Acrocalanuslongicornis(Giesbrecht, 1888)
Family- Paracalanidae
Key characters-
a) The antennule only extends just beyond the posterior metasome.
b) Cephalosome partially separated from the first pedigerous segment.
c) The 5th leg only present on the left had 5-segmentes.
Measurement- 0.90-1.25 mm length

7. Eucalanuscrassus(Giesbrecht, 1888)
Family- Eucalanidae
Key characters-
a) The antennule reaches around the end of the furca.
b) They do not have distinct secondary sexual characters.
c) Genital segment longer than wide.

d) The 5th leg of right foot was absent, left foot uniramous, 4-segmented, with terminal spine.
Measurement- 2.40-3.10 mm length

8. Haloptilusspiniceps(Giesbrecht, 1893)
Family- Augaptilidae
Key characters-
a) The antennule reaches slightly beyond the furca.
b) Cephalosome was rounded without point.
c) The 5th leg has slightly asymmetric, the third segment of the right exopodite terminating in 2 quite strong short spines and with a median transverse spine.
Measurement- 2.30-2.55 mm length

9. Metacalanusaurivilli(Cleve, 1901)
Family- Arietellidae
Key characters-
a) The urosome was 5-segmented.
b) Antennule was short, only reaching to around the third metasomesegment, proximal segments short, distal segments much longer.
c) Left antennule was geniculate.
d) The 5th leg has almost symmetrical, 5-segmented, uniramous, distal segment in the form of a thick spine.
e) Segments 3 and 4 had thick spines on outer distal ends.
Measurement- 0.53-0.56 mm length

10. Heliodiaptomusviduus(Gurney, 1916)
Family- Diaptomidae
Key characters-
a) 4th and 5th thoracic-segments fused, but indended laterally; no dorsal spicules.
b) Posterior-lateral angles of last thoracic segment small, each with an apical spine.
c) Endopodite into very short stick-shaped or seed-shaped.
d) Lateral spine of 2ndexopodite of right 5th leg situated near base.
e) Genital spine small.
f) Caudal rami longer than in female; inner margins hairy.
g) Right 5th leg coxa with moderate spine mounted on a lobe at outer distal corner.
Measurement- 2 mm length

11. Clausocalanus minor (Sewell, 1929)
Family- Clausocalanidae
Key characters-
a) Prosome posterior margins somewhat angular in lateral view.
b) The 5th leg has longer ramus and genital pore on left side.
c) Left 5th leg longer than urosome; armed distally with slender, straight setae.
d) Right 5th leg has 2-segmented.
Measurement- 0.8-1.0 mm

12. Euterpinaacutifrons(Dana, 1847)
Order- Harpacticoida
Family- Euterpinidae
Key characters-

a)	The rostrum is stout.
b)	The anterior of cephalosome is sharply pointed.
c)	Body widens to the posterior of the cephalosome then narrows posteriorly.
d)	Both sides of antennules are geniculate; the 4th and 5th segments are fused and much thickened; 6th and 7th segments are fused and make up the last segment.
e)	The 5th leg is symmetrical and rudimentary.
Measurement- female: 0.50-0.75 mm; males: 0.50-0.56 mm length	

13.	Clytemnestra scutellata(Dana, 1847)
Family- Peltidiidae	
Key characters-	
a)	Body shape as for the family.
b)	Antennule is 8-segmented; 4th, 5th and 8th segments with long sensory hairs.
c)	The last segment is twice as long as the preceding one.
d)	The furca is approximately twice as long as it is wide, and the 2 longest setae are plumose.
Measurement- 1.05-1.20 mm length	

14.	Miraciaefferata(Dana, 1849)
Family- Miraciidae	
Key characters-	
a)	The front of the head is rounded.
b)	The large pair of cuticular lenses touch middorsally.
c)	The cephalosome is wider than the following segment and there are distinct constrictions between each of the prosome and urosome segments.
d)	Rostrum is very small.
e)	Antennule is 10-segmented with the geniculation between segments 7 and 8.
f)	5th leg fused medially.
g)	6th leg was symmetrical.
Measurement- 1.30-1.65 mm length	

15.	Longipediacoronata(Claus, 1862)
Family- Longipediidae	
Key characters-	
a)	Body is usually broad, disc-shaped and dorsoventrally quite flattened ventrally.
b)	Posterior body usually hardly protrudes beyond the cephalic shield.
c)	Caudal region is bilaterally symmetrical, as is the caudal armature, centrally located, unpaired, strong caudal spine.
d)	The central spine has a conspicuous, curving forward projection of the cephalic shield ventrally.
e)	The endopod of the mandible has only one segment.
f)	The maxillae and maxillipeds do not generally develop, when the full set of appendages may be present, although some may be very rudimentary.
Measurement-	

16.	Longipediaweberi(Scott A., 1909)
Family- Longipediidae	
Key characters-	
a)	Body, rostrum rounded and furcal setae long, semitransparent and faintly tinctured with brown.
b)	Cephalothoracic integument fringed with long hairlikespinules.
c)	First abdominal somite forming a small spiniform process on both outer sides of 6th leg. Penultimate abdominal somite short.

d) Exopodite segment, as inner seta of first segment dwarf; second segment with three spinules on anterior side.
e) Endopodite has no hair on posterior face near the middle of inner edge.
f) 5th legs represented by a wide common plate; each outer seta arising from a subcylindrical process which is accompanied with a secretory pore near its base.

Measurement- 0.75 mm length

17. Microsetellanorvegica(Boeck, 1865)

Family- Ectinosomatidae

Key characters-

a) Body was slender and laterally compressed.
b) Rostrum short and turned downwards.
c) Transverse rows of minute spicules on the urosome segments.
d) Furca has about as long as wide, and divergent.
e) The longest furcal seta is nearly as long as the body.
f) The second furcal seta is about ¾ the length of the body.
g) 5th leg with the two inner setae of very different lengths, the outermost seta is twice as long as the neighboring seta.

Measurement- 0.35-0.53 mm

18. Oithonabrevicornis(Giesbrecht, 1891)

Class- Copepoda

Order-Cyclopoida

Family- Oithonidae

Key characters-

a) Prosome short, oval to fusiform, 5 segmented.
b) Anterior cephalosome rounded or with 1 rostrum
c) Antennule slender, 2 geniculations in males.
d) Greatest width generally at posterior margin of cephalosome.
e) Posterior prosome margin rounded.
f) 5th leg represented by 2 lateral processes on pedigerous segment 5.
g) The 6th leg reduced to lateral process on genital somite.
h) Urosome slender, 6 segmented, genital somite longest, anterior section more or less swollen laterally.
i) Caudal rami with 1 dorsal, 4 apical and 1 outer marginal setae.

Measurement- 0.58-0.62mm length

19. Oithonaoculata(Farran, 1913)

Family- Oithonidae

Key characters-

a) Pair of dark eyes is visible through the anterior section of the cephalosome.
b) Anterior section of cephalosome has truncate.
c) Rostrum present and blunt, not visible dorsally.
d) In dorsal view, the prosome was oblong, more than twice as long as wide.
e) The genital segment just longer than wide.
f) Anal segment shorter than wide, posterior ventral margin serrated.
g) Furca twice as long as wide.
h) 1-4th legs, had terminal spine on the exopods is very long.

Measurement- 0.62-0.65 mm length

20. Oncaea media (Giesbrecht, 1891)

Class- Copepoda
Order- Poecilostomatoida
Family- Oncaeidae
Key characters-
a) The widest part of the prosome is at the base of the cephalosome.
b) Genital segment is 3 times longer than the rest of the urosome.
c) The lappets are large, rounded with a pointed projection directed outwards.
d) The terminal claw on the maxilliped is not as long as the preceding segment.
e) The apical setae on P5 are unequal in length. The furca are approximately twice as long as wide.
Measurement- 0.60-0.80 mm length

21. Sapphirinagastrica(Giesbrecht, 1891)
Family- Sapphirinidae
Key characters-
a) The cephalosome has wider than long having cuticular lenses only just visible dorsally.
b) Furca was more than twice as long as wide.
c) Antennule is 6-segmented.
d) Antenna and 4th leg resemble female.
e) Endopod of 2nd leg has 3 foliacious spines off the 3rd segment.
Measurement- 2.20-2.65 mm length

22. Leptodorakindtii(Focke, 1844)
Class- Branchiopoda
Order- Diplostraca
Family- Leptodoridae
Key characters-
a) Antennae drew branches of 2nd antennae schematically like feathers, with short, fine lines on bristles occurring at more or less regular intervals.
b) Abdomen and the furca show groups of fine, light spines.
c) On furca, the thorns are large and point backwards; They occur in rows of up to 12 units, parallel to the body axis.
d) On dorsal side of the furca the thorns are much longer and thicker.
e) The thorns on furca as well as on the abdomen point backwards at acute angles to the surface of the carapace.
f) The mouth is situated slightly behind the mid-point between the first antennae and the front of the head.

23. Lucifer penicillifer(Hansen, 1919)
Class- Eumalacostraca
Order- Decapoda
Family- Luciferidae
Key characters-
a) The length of ‘neck’ is greater than twice the length of the eye and stalk.
b) There are two large hook- like processes on the ventral surface of the 6th abdominal segment, the second one is larger than the first and tapers to a point.
c) The swollen section on the ventral surface on the telson is smallerand is situated further away from the tip of the telson.
d) The last pair of lateral spines on the telsonare close to the tip, they are large and have spinules off them on the first half of their length.
e) The centre pair of spines at the tip of the telsonare very short.
f) The outer pair of spines are as long as the width of the tip of the telson, or slightly longer, and have between 5 and 8 spinules on either side.

g)	Only one species in this family.
Measurement- 9.5-10 mm length	

In Konkan, at majority of places these islands and bars are reduced in size or totally swept away in monsoon. They have started showing tendencies of shifting within inlets since last decade or so. Reduction in size, change in shape and elongated growth in upstream or downstream direction are some of the features of this change. Now a day these changes can be easily detected on IRS images of tidal inlets. Creek is valuable resource for the aquaculture, salt and fishery for the local people. Bhunia A. B. and Choudhary A., (1983) observed some ecological aspects of zooplankton production in Chemagiri creek, Sunderbans.

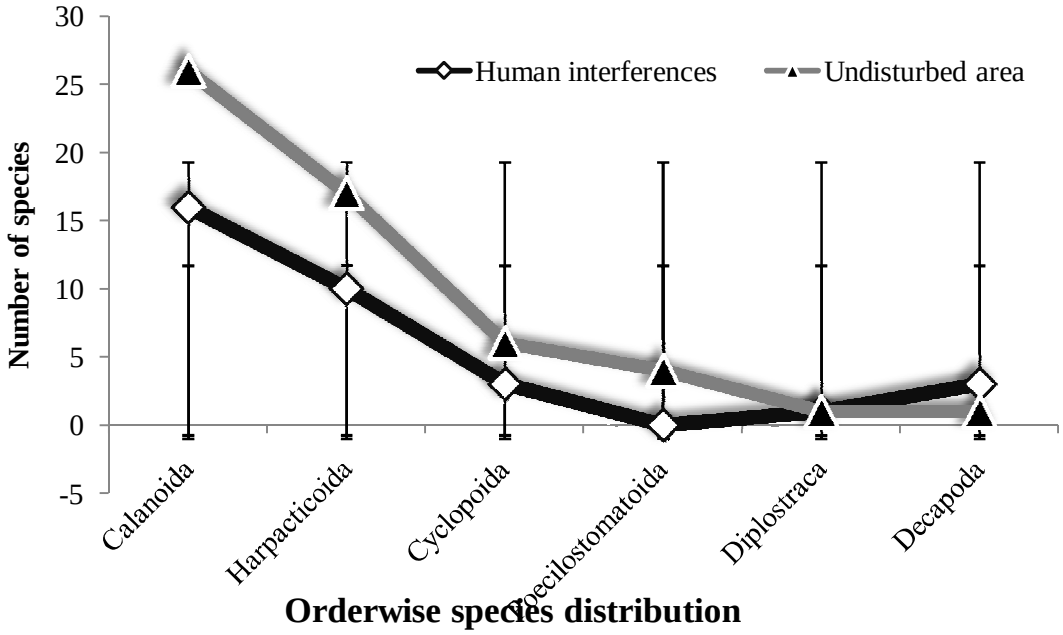

Fig.6 - Showing order wise species distribution of crustacean zooplanktons along error bars with S.D.

The zooplankton was assessed quantitatively and qualitatively with regard to their abundance in creek waters at three sites along the western mangrove of Kutch, west coast of India by Saravana kumar *et al.*, (2007a) and they reported a total of 69 species of which Copepods formed the dominant group. The present study revealed that the order wise species distribution shown in figure 6 as in the following manner, Calanoida>Harpacticoida>Cyclopoida>Poecilostomatoida>Diplostraca>Decapoda in Bhatye creek.

IV. CONCLUSION

The study revealed that order decapoda has low distribution compared with other crustacean zooplankton species and might be scarce in sampling sites or high invertebrate predation, as well as because of large abundance of copepods in the Bhatyecreek. The study directly addressed the assessment of large seasonal and inter annual variability affects met zooplankton abundance. Differences were found between the sampling regions in the proportion of species in the largest taxonomic groups, which could confirm the existence of a biotic threshold. Temporal variability of environmental conditions may be the main regulatory factor of crustacean zooplankton species richness in the systems selected, irrespective of the geographical region. We selected abiotic factors that are well known as factors controlling population dynamics and, probably for this reason, relationship between fluctuation index and zooplankton richness for future work.

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REFERENCES

[1] Baidya, A. U. and Choudhary, A. (1984) Distribution and abundance of zooplankton in a tidal creek of Sagar Island, Sundarbans, West Bengal, Environ. Ecol., 2(4): 333-337.
[2] Bais, V. S. and Agarwal, N. C. (1990) Seasonal variations of nitrogen contents in the sediment and water of the Sagarlake, Bull. Environ. Sci., 8: 21-24.

[3] Bhunia, A. B. and Choudhary, A. (1983) Primary production of estuarine water around Sagar Island, Sunderbans(Presented at second International Symposia on Biology and Management of Mangrove and Tropical shallow water communities), Papua New Guinea., Indian J. Mar. Sci., 11(1): 87-89.
[4] Conway,D. V.P. and White, R. G. (2003) Guide to the coastal waters and surface zooplankton of the South-western Indian ocean. Plymouth Laboratories,Marine biological association of the united kingdom occasional publication No-15.
[5] Day,J. W., Hall, C. A., Kemp, W. M. andA. Yanez-Arancibia, A. (1989) Estuarine Ecology. John Wiley and Sons, New York, USA.
[6] Dumont, H. J., and Tundisi, J. G. (1984) Tropical Zooplankton. Dr. W. Junk Publishers, Boston.
[7] Goswami, S. C., Rao, T. S. S. and Matondkar, S. G. P. (1981) Biochemical studies on some zooplankton of the west cost of India, Mahasagar-Bull Nath, Inst, Oceanoagr, 143: 13-16.
[8] Harris, E.(1959)Thenitrogen cycle in Long Island Sound. Bull Bingham Oceanogr Collect 17: 31-42.
[9] Kasturirangan, L. R. (1963) A Key for Identification of the more common planktonic copepoda in the Indian Coastal waters. CSIR, New Delhi.
[10] Miller, F. G.(2004)Research Ethics and Misguided Moral Intuition, Vol. 32, Issue 1, Pg 111–116, DOI: 10.1111/j.1748-720X.tb00455.
[11] Odum, E. P. (1971) Fundamentals of Ecology, 3rd ed. W.B. Saunders Co., Philadelphia.
[12] Omori, M. and Ikeda, T.(1984) Methods in Marine Zooplankton Ecology. John Wiley and Sons, New York.
[13] Perumal, P., Sampathkumar, P., Karuppasamy, P. K.(1999) Studies on the bloom forming species of phytoplankton in the Vellar estuary, southeast coast of India.Ind J Mar Sci 28: 400-403.
[14] Rajasegar, M., Srinivasan, M. andRajaram, R.(2000) Phytoplankton diversity associated with the shrimp farm development in Vellar estuary, south India. Seaweed Res. Utiln 22: 125-131.
[15] Robertson, A. I. and Blabber, S. J. M.(1992) Plankton, Epibenthos and Fish Communities. Tropical Mangrove Ecosystems, American Geophysical Union, Washington, DC, USA 173-224.
[16] Santhanam, R. and Srinivasan, A. (1994) A Manual of Marine Zooplankton. Oxford and IBH Publishing Company, New Delhi.
[17] Saravanakumar, A., Rajkumar, M., Seshserebiah, J. and Thivakaran, G. A. (2007) Abundance and seasonal variations of zooplankton in the arid zone mangroves of Gulf of Kachchh-Gujarat, West coast of India. Pak. J. Biol. Sci., 10: 3525-3532.
[18] Sreepada, R. A., Rivonkar, C. U. and Parulekar, A. H. (1992) Biochemical Composition and Caloric potential of zooplankton from Bay of Bengal, Indian J Marci, 21: 70-73.
[19] Varadharajan, D., Soundarapandian, P., Dinakaran, G. K. and Vijakumar, G.(2009) Crab Fishery Resources fromArukkattuthurai to Aiyammpattinam, South East Coast of India. CurrRes J BiolSci 1: 118-122.
[20] Zheng Z., Shaojing, L., Zhou, Q.,Zhanzu, X. and Qiwen Y. (1989) Marine Planktology. China Ocean Press, Beijing, China.

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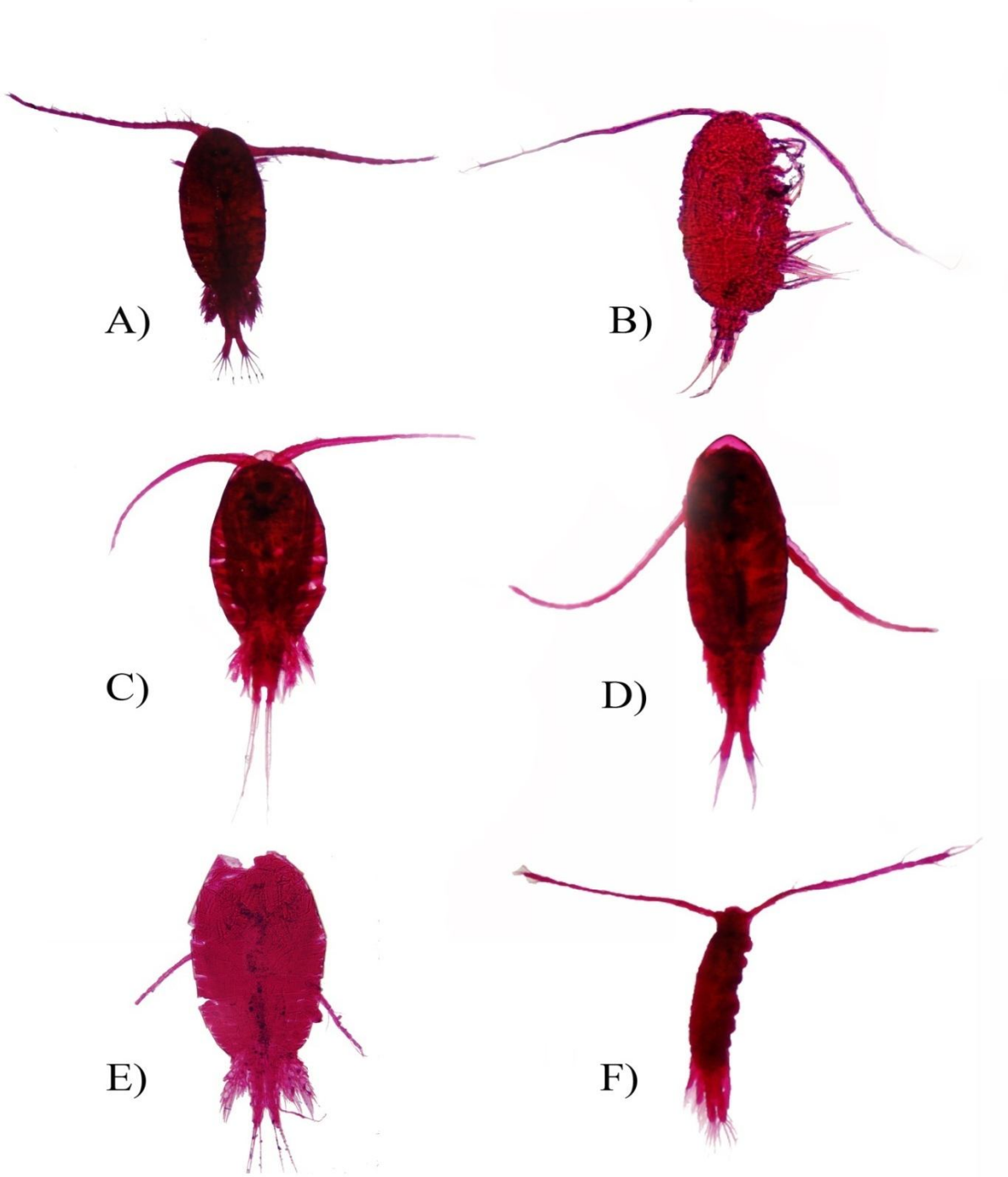

Fig.2 - Showing diversity of crustacean zooplanktons from Bhatye creek, Ratnagiri coast, *A) Calonopia elliptica; B)Pontellina plumata; C)Pontella fera; D) Calanopia minor; E) Scolecithrix danae; F) Acrocalanus longicornis;*

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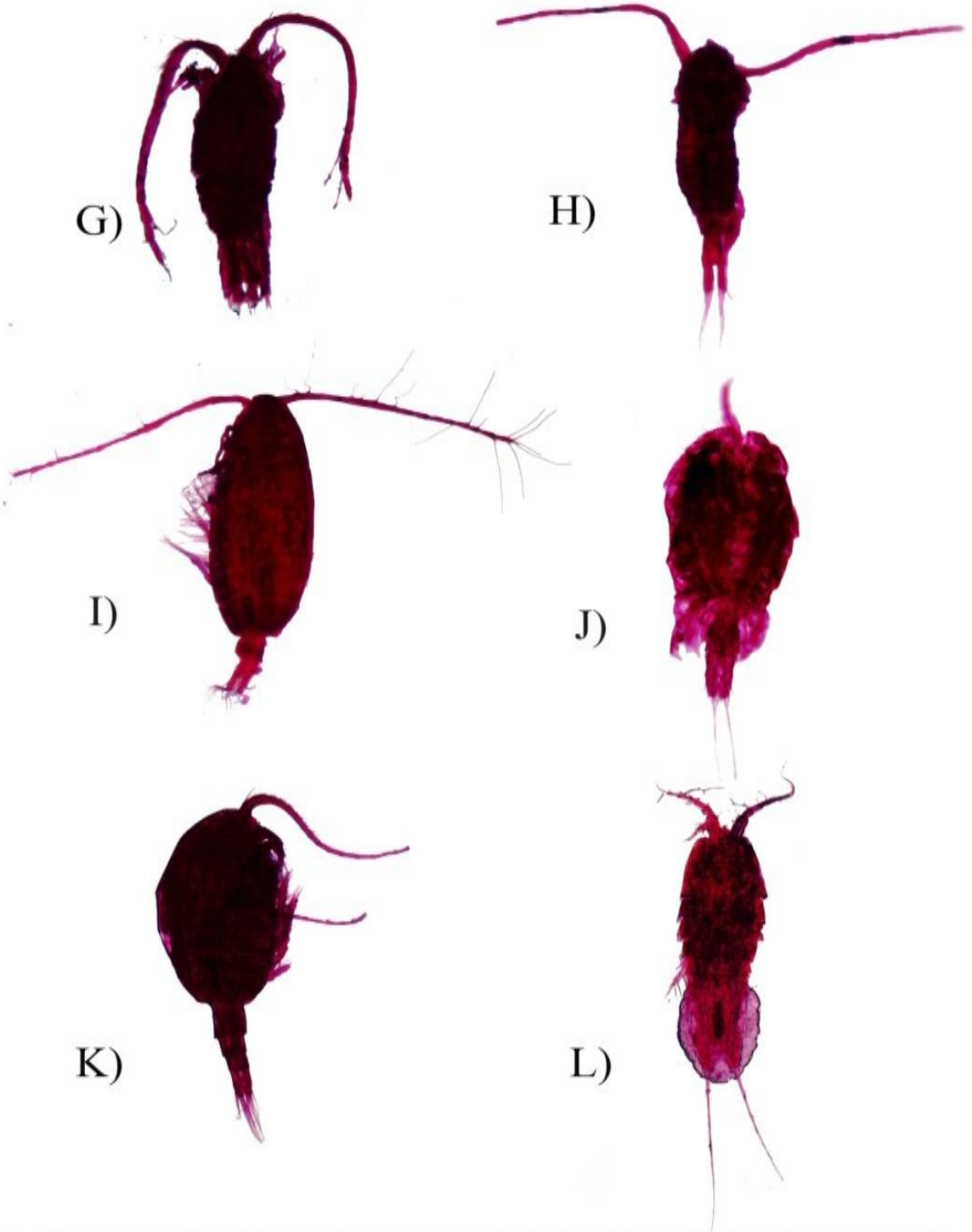

Fig.3 - Showing diversity of crustacean zooplanktons from Bhatye creek, Ratnagiri coast, *G) Eucalanus crassus; H) Haloptilus spiniceps; I) Metacalanus aurivilli; J) Heliodiaptomus viduus; K) Clausocalanus minor; L) Euterpina acutifrons*

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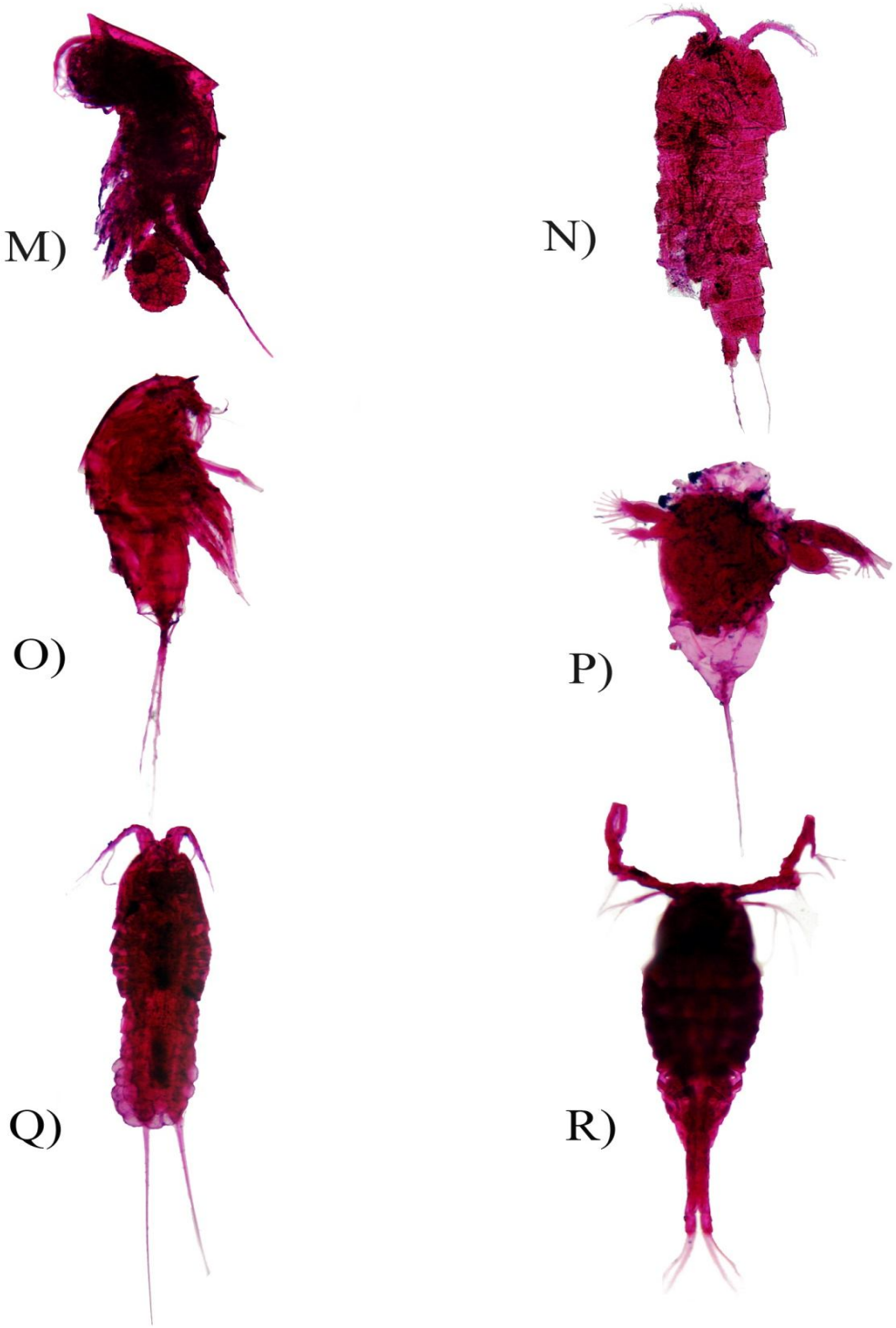

Fig.4 - Showing diversity of crustacean zooplanktons from Bhatye creek, Ratnagiri coast, *M) Clytemnestra scutellata; N) Miracia efferata; O) Longipedia coronata; P) Longipedia webri; Q) Microsetella norvegica; R) Oithona brevicornis*

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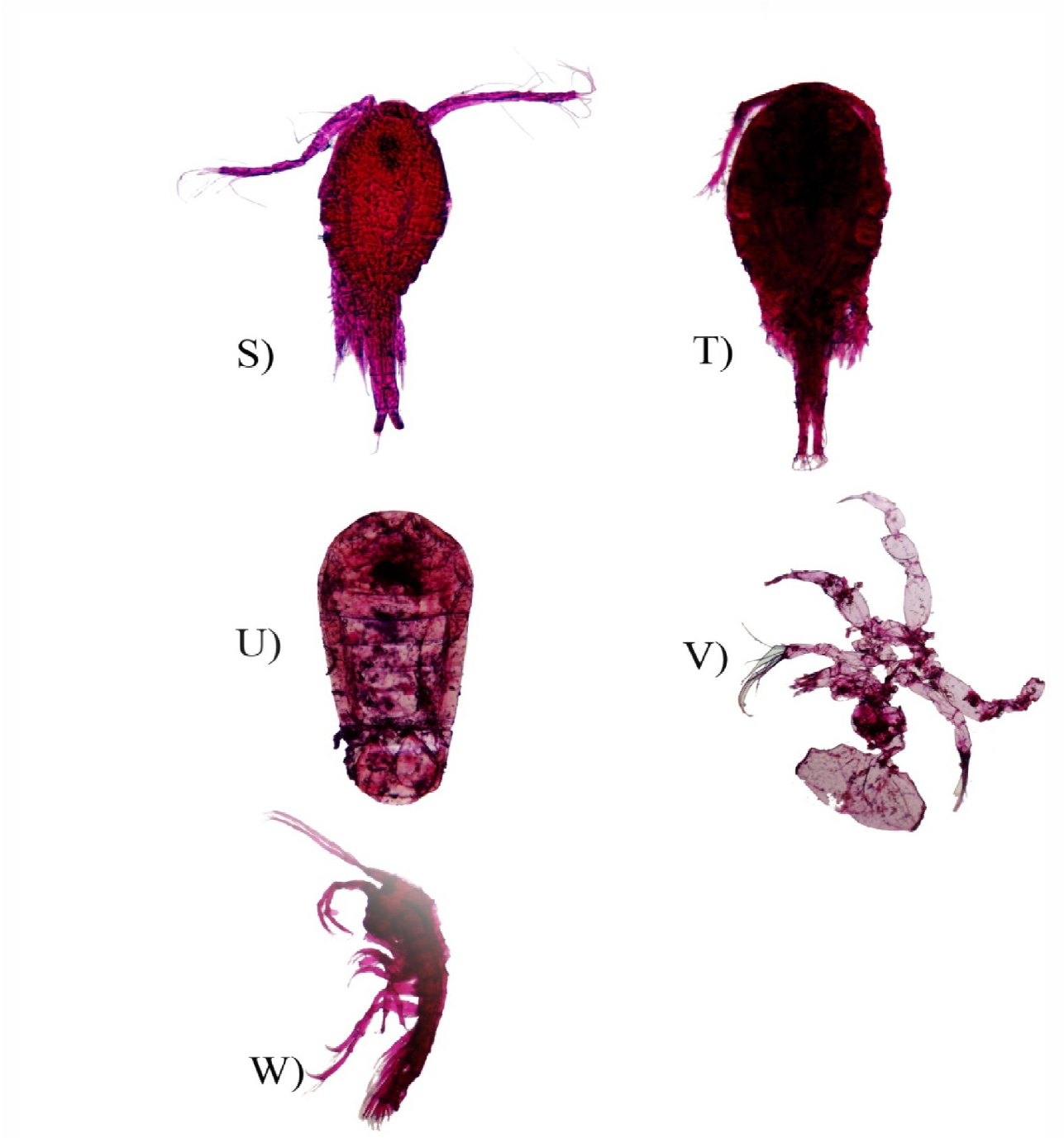
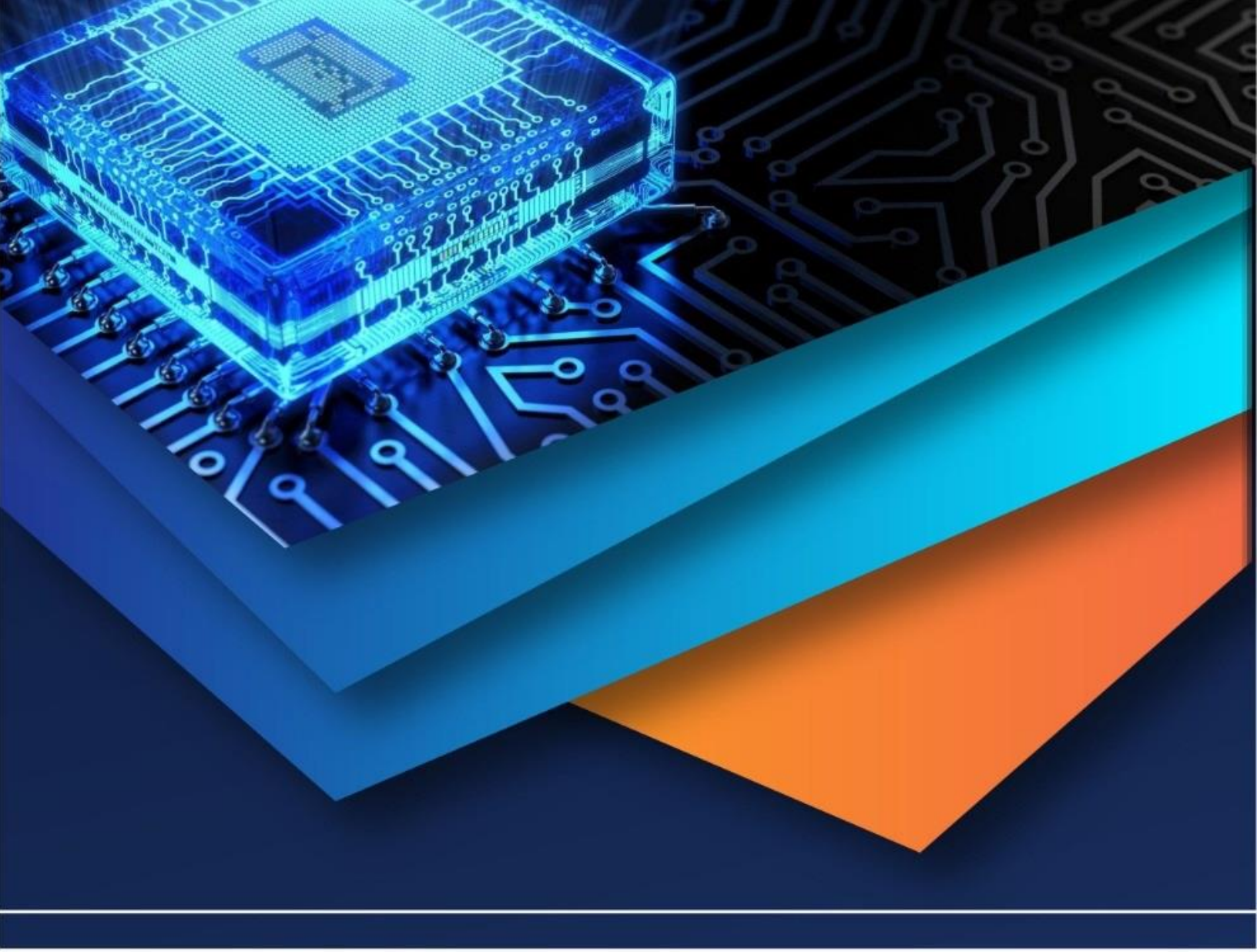


Fig.5 - Showing diversity of crustacean zooplanktons from Bhatye creek, Ratnagiri coast, *S) Oiphona oculata; T) Oncaea media; U) Sapphirina gastrica; V) Leptodora kindtii; W) Lucifer penicillifer*



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