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PLANKTON COMPOSITION IN TWO ESTUARIES OF THE KONKAN COAST DURING PREMONSOON SEASON

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ABSTRACT

Plankton composition of the Shastri and the Kajvi estuaries of the Konkan coast were studied during the premonsoon season. Phytoplankton constituents were more abundant at the mid and upper reaches in the former whereas in the latter they were abundant at the mouth region. Zooplankton biomass was relatively high in the Kajvi estuary and all the major groups occurred in high density throughout this estuary. In the Shastri estuary, the zooplankton biomass was relatively lower and all the major groups declined considerably in number towards upstream. The Kajvi estuary was found to be very rich in molluscan resources. The abundance of decapod larvae was also quite high in the Kajvi estuary, but the larvae of commercially important penaeid and sergestid shrimps were poor in both the estuaries during this season.

INTRODUCTION

Estuaries are the breeding and nursery grounds for several species of commercially important fishes and crustaceans. The production potential with particular emphasis on the ecology of estuaries of the west coast of India has been the subject of detailed investigation (Qasim, Wellersheus, Bhattathiri and Abidi, 1969; Qasim, 1973, Haridas Madhupratap and Rao, 1973; Devassy and Bhattathiri, 1974; Rao, Madhupratap and Haridas, 1975; Bhattathiri, Devassy and Bhargava, 1976; Goswami and Selvakumar, 1977). The present paper is the first report of plankton composition in the Shastri and the Kajvi estuaries with reference to their ecological conditions.

MATERIAL AND METHODS

Shastri and Kajvi are the two important estuaries of the Konkan coast (Figs 1*a* and 1*b*). Three tributaries join the Shastri river at about 29 km from its entrance. The mouth of the estuary is about 2.9 km wide and the bed is clayey-sand. Tidal influence is felt in the river as far as 45 km from the mouth. The mouth of the Kajvi estuary is about 4 km wide. The depth at the northern half of the mouth region is about 11 m and that of the southern half is about 9 m. The bottom has fine sand and mud but rocky at the southern half of the lower reaches. Observations were made during March-April, 1979 (premonsoon season) at 6 stations in each estuary. Surface water samples were collected for phytoplankton studies, fixed in lugols iodine and preserved in 3% formaldehyde. The sedimented samples were later analysed. Surface zooplankton samples were collected using a HT net (0.25 m^2

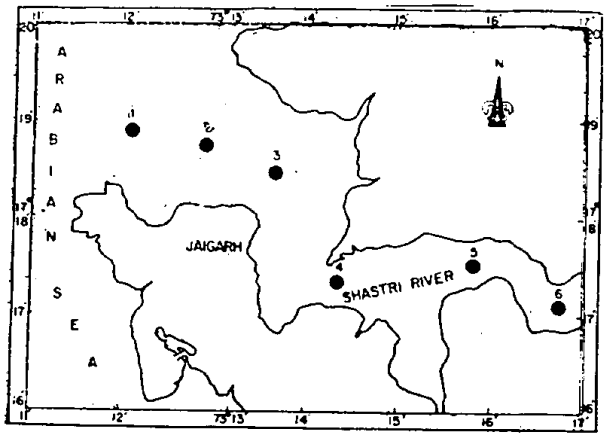
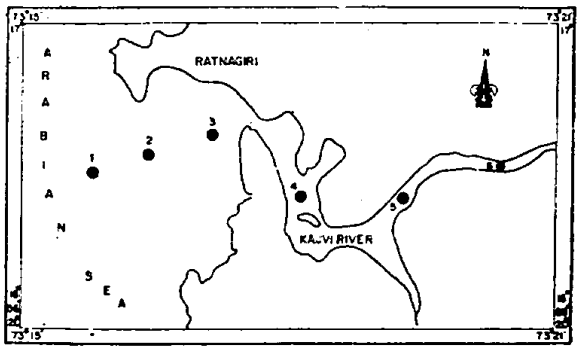


Fig. 1(a). Station position in Shastri estuary.



Flg. 1(b). Station position in Kajvi estuary.

mouth area and 300μm mesh) attached with a flowmeter. Biomass was estimated as displacement volume and aliquots were analysed for zooplankton composition. Temperature, salinity and dissolved oxygen of surface water were estimated from all the stations.

RESULTS

Hydrography

There was very little variation in the environmental parameters at different stations of the same estuary. Temperature, salinity and dissolved oxygen in the Shastri estuary ranged from 27 to 28.5°C, 35.05 to 35.51°/$_{oo}$ and 3.78 to 4.20 ml/l respectively and those in the Kajvi estuary ranged from 31 to 32°C, 36.07 to 36.19°/$_{oo}$ and 5.07 to 5.49 ml/l respectively (Fig. 2).

Phytoplankton components

Diatoms, dinoflagellates, green and blue-green algae were encountered in these estuaries. Diatoms were represented by a number of species whereas the rest of the phytoplankton were relatively less abundant. In the Shastri estuary, they were present at all stations having maximum density at mid and upper reaches whereas in the Kajvi estuary they were abundantly occurring at the mouth region. Distribution of the dominant species of phytoplankton is shown in Fig. 3. *Chaetoceros* spp., *Coscinodiscus* spp., *Navicula* spp., *Nitzschia* spp., *Rhizosolenia* spp., and *Thalassiothrix* sp. were the major diatoms present. Dinoflagellates were represented mainly by *Peridinium* spp. and *Prorocentrum* spp. and blue-green algae by *Trichodesmium* spp. Flagellates were present throughout these estuaries and were more abundant in the Kajvi (3,750–17,250 cells/l). *Trichodesmium* spp. were observed in large numbers in the Kajvi and the diatom *Thalassiothrix* sp. was present only in the Shastri. The dinoflagellates *Peridinium* spp. and *Prorocentrum* spp. had an uneven distribution in both the estuaries but their abundance was more in the Kajvi estuary.

Zooplankton biomass and composition

Zooplankton biomass in the Shastri estuary ranged from 1.7 to 23.5 ml/100 m^3 (average 10.43 ml/100 m^3) while in the Kajvi estuary it ranged between 9.5 and 28.9

ml/100 m³ (average 15·85 ml/100 m³) (Fig. 2). Copepods, chaetognaths, decapods, molluscs, fish eggs and larvae, tunicates and polychaetes were the important constituents.

Copepoda

This was the most dominant group contributing between 55·05 and 98·95% of the total counts at different stations in the Shastri estuary. Their maximum density was recorded at st. 3 (2, 15, 341/100 m³) and minimum at st. 6 (313/100 m³) (Fig. 4). Although this was the numerically dominant group at all the stations (75,980–2,56,649/100 m³) except at st. 3 (13,167/100 m³) in the Kajvi estuary also, their percentage contribution was reduced (25·74 at st. 3 to 85·7 at st. 4) due to the abundance of molluscs and decapods (Fig. 4).

Chaetognatha

Chaetognaths were abundant at st. 1 (12, 838/100 m³) forming 13·71% of the total count of this station followed by st. 3 (1,705/100 m³, 0·75%) (Fig. 4) in the Shastri estuary. In the Kajvi estuary their maximum density was recorded at st. 6 (6,757/100 m³). *Sagitta enflata* and *S. bedoti* were the only species recorded in these estuaries,

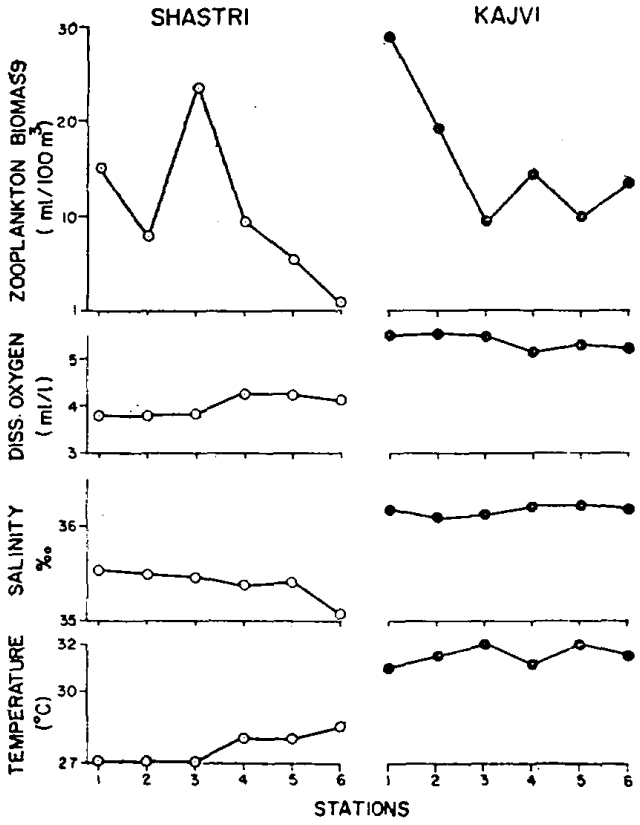


Fig. 2. Surface water temperature, salinity, dissolved oxygen content and zooplankton biomass at different stations in the Shastri and the Kajvi estuaries.

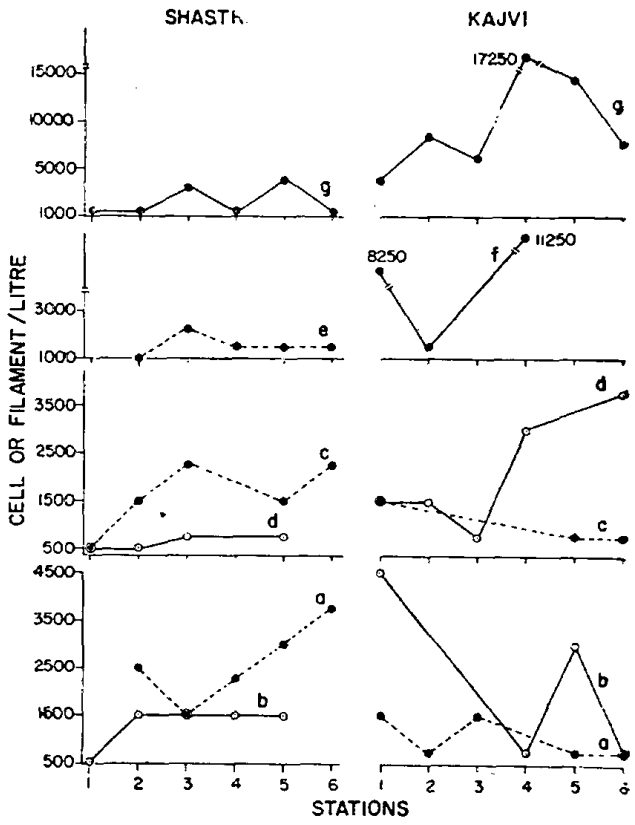


Fig. 3. Distribution of major phytoplankton constituents in the Shastri and the Kajvi estuaries:
(a) *Coscinodiscus* spp., (b) *Navicula* spp.,
(c) *Nitzschia* spp., (d) *Peridinium* spp.,
(e) *Thalassiothrix* spp., (f) *Trichodesmium* spp.,
(g) Flagellates.

the former being abundant in the lower reaches. *S. bedoti*, on the other hand, showed an increase in trend towards the upstream in the Kajvi while the trend was reversed in the Shastri (Table I).

Decapoda

They were the second abundant group in the Shastri estuary except at st. 1. At st. 6, their percentage contribution was as high as 34.54 although their maximum number was recorded at st. 3 (5,303/100 m^3) (Fig. 4). In Kajvi, they formed the third largest group after copepods and molluscs. Their density was quite high up to st. 4 (12,083–18, 245/100 m^3) (Fig 4.). At st. 3 they contributed to 23.62% of the total zooplankton.

Species-wise distribution of decapod larvae is tabulated in Table I. Penaeid larvae were poorly distributed in these estuaries during this season. Larvae of sergestid shrimps such as *Acetes indicus, A. erythraeus, Acetes* spp., were well represented at the mouth region of the Shastri estuary. *Lucifer hanseni* was collected from all stations but occurred in large numbers in the Kajvi estuary. Palaemonids, mainly constituted by *Leptocarpus potamiscus*, alphaeids and brachyuran zoeae were fairly abundant but enjoyed a wide distribution in the Shastri estuary.

Mollusca

This group was largely constituted by the juveniles of bivalves and a few gastropods. Their maximum number was recorded at st. 1 (4,459/100 m^3) and were

Table I. Distribution of Chaetognatha and Decapoda in the estuaries. All values indicate No./100 m^3.

	SHASTRI ESTUARY						KAJVI ESTUARY					
	1	2	3	4	5	6	1	2	3	4	5	6
Chaetognatha												
S. bedoti	3446	468	1327	174	14	8	790	1010	655	2262	3676	6757
S. enflata	9393	36	379	47	5	—	1118	1330	297	416	—	—
Decapoda												
P. merguiensis	—	—	—	12	—	—	—	—	—	60	—	—
P. indicus	—	107	—	—	—	—	—	—	—	—	—	—
M. dobsoni	236	71	—	12	5	—	—	—	—	—	—	—
A. indicus	135	714	—	12	14	—	—	53	—	—	—	—
A. erythraeus	270	107	—	—	10	—	—	—	—	—	—	—
A. orientalis	—	—	568	—	—	—	—	—	—	—	—	—
Acetes spp.	541	250	—	48	14	4	4	—	—	—	—	—
Sergestes sp.	—	—	—	—	—	—	66	—	—	—	—	—
L. hanseni	305	143	189	23	14	4	11512	17287	11905	14480	3431	2973
L. potamiscus	67	179	758	58	125	21	132	585	—	—	49	68
Other palaemonids	—	215	568	360	120	12	—	—	—	—	—	—
Alpheids	102	107	189	16	82	42	856	214	60	—	—	—
Other carideans	236	—	379	—	173	17	—	53	—	—	—	—
Macrura larvae	169	—	758	—	—	—	66	53	—	—	—	—
Brachyura larvae	439	107	1894	70	92	100	—	—	120	—	343	1081

either absent or poorly distributed in the upper reaches in the Shastri estuary (Fig. 4). They formed the second largest group in the Kajvi estuary and sustained very high density at stations 1 and 2 (49,539 and 55,851/100 m^3 respectively) (Fig. 4). At stations 1 and 3, their contribution was 32·15 and 26·3% respectively.

Fish eggs and larvae

They occurred in all the samples in small numbers. Their maximum number was observed at st. 3 (568/100 m^3) in the Shastri and at st. 2 (904/100 m^3) in the Kajvi estuary. (Fig. 4).

Other groups

Tunicates (salps, doliolids and copelates), polychaetes, cladocerans, amphipods isopods, ctenophores, hydromedusae, scyphomedusae and brachiopod larvae were the other groups present in the samples. Of these, tunicates were moderately abundant in the upper reaches and cladocerans were distributed in fairly high number in the middle and upper reaches of the Kajvi estuary. The contribution of other groups in the total zooplankton count was negligible.

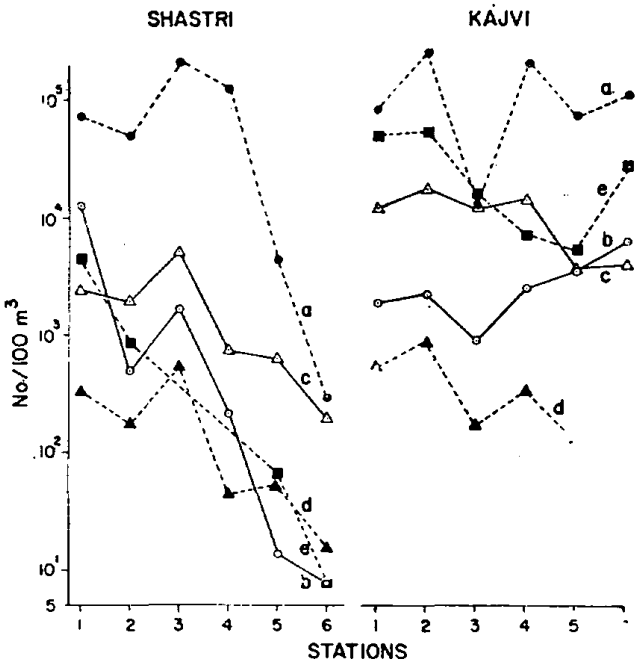


Fig. 4. Distribution of major zooplankton constituents in the Shastri and the Kajvi estuaries: (a) Copepoda; (b) Chaetognatha; (c) Decapoda; (d) Fish eggs and larvae; (e) Mollusca.

DISCUSSION

Zooplankton biomass and density of all the major groups showed that the Kajvi estuary is more productive than the Shastri estuary. The abundance of some of the groups in the upstream stations of the former is even higher than that in the mouth region of the latter. Zooplankton production in the tropical estuaries is mainly influenced by high salinity (Rao, Madhupratap and Haridas, 1975; Madhupratap, Rao and Iyer, 1977; Madhupratap, 1978) followed by high dissolved oxygen content and temperature (Madhupratap, Rao and Iyer, 1977). This may be true in the present case also.

Fish eggs and larvae, decapod and molluscan larvae and juveniles form the commercially important zooplankton components. The density of the fish eggs and larvae were less in these estuaries during the period of investigation. Decapods were very abundant in the Kajvi estuary but larvae of commercially important penaeid and sergestid shrimps were few in the samples. It has been reported that penaeid larvae enter the estuaries in large numbers during the premonsoon season in other regions of the west coast of India (George, 1962;

Rao, 1968; Achuthankutty, George and Goswami, 1977). Hence their poor representation in the estuaries under investigation during this period may be attributed to their lack of spawning activity. The rich molluscan fishery resources especially bivalves in the Kajvi estuary is reflected by their juvenile abundance in zooplankton.

It could be deduced from the present study that although the plankton constituents of these two major estuaries of the Konkan coast are the same their distribution pattern is different and that the Kajvi estuary is more productive. The Meroplanktonic groups such as decapod crustacea and mollusca form a large share of zooplankton in this estuary which is indicative of the fishery potential of these groups around this region.

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