Studies on molluscan diversity in Kaveri river system (Tiruchirappalli, India) with special reference to vector snails of trematode parasites

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A monthly collection of molluscan animals was carried out from 11 sampling stations (K1–K11) of Kaveri river stretch from Karur to Grand Anicut (95 km) for a period of two years (April 1991–March 1993). 13 species of molluscs were recorded, of which 8 species were gastropods and 5 species bivalves. The gastropod species were grouped under 5 different families (Viviparidae, Thiaridae, Pilidae, Lymnaeidae and Planorbidae) and the family Thiaridae was the most dominant group representing 50% of the total gastropod population. Five species of bivalve molluscs were classed under 2 different families namely Unionidae and Corbiculidae. The mean density of molluscs was higher (96/m^2) in sector I (K1–K4) than in sector II (39/m^2) which include stations K5–K11. Five gastropod species were identified as carriers of the disease causing parasite cercarial larvae. The pulmonate snails were preferred most by trematode cercaria.

SEVERAL investigations were undertaken on major benthic animal groups of freshwater system. Notable contributions to our knowledge of molluscan fauna have been made by several authors[1–5]. Hoagland and Brown[6,7] made an extensive investigation exclusively on gastropods. Relationship between gastropod density and vegetation has been reported by many authors[8–10]. Similarly bivalve species density has been studied by several workers[11–13]. Srinivasan[14] has reported three species of freshwater mussels in the Kaveri river system, namely *Lamellidens marginalis* (Lamarck), *L. consobrinus* (Lea) and *Parreysia favidens* (Benson). However, an intensive study on molluscan fauna of the Kaveri river has not been made in recent times.

Freshwater snails are preferred intermediate hosts for cercaria larvae of trematode parasites[13]. A number of trematodes of horse, goat, sheep, camel, dog, buffalo and other cattle develop to cercarial stage in certain gastropod molluscs. They cause diseases and mortality in cattle. About 57 types of cercariae were recorded from the snail *Indoplanorbis exustus*[5]. The distribution of this snail was reported throughout the plains of India, Pakistan, Persia, Srilanka, Burma, Malaya, Indochina, Thailand, Sumatra, Java and Celebes[5]. Burch[13] has also reported cercarial larvae in the two distinctly different freshwater snails in the Eastern African regions. Since these parasites caused considerable damage to the cattle wealth of the river basin[15], the parasitology of these trematode worms assumed economic importance. Studies on the snails acting as vectors of disease causing trematode parasites in the Kaveri river are very limited[16]. Hence, an attempt has been made to identify the snail vectors of trematode parasites inhabiting the Kaveri river.

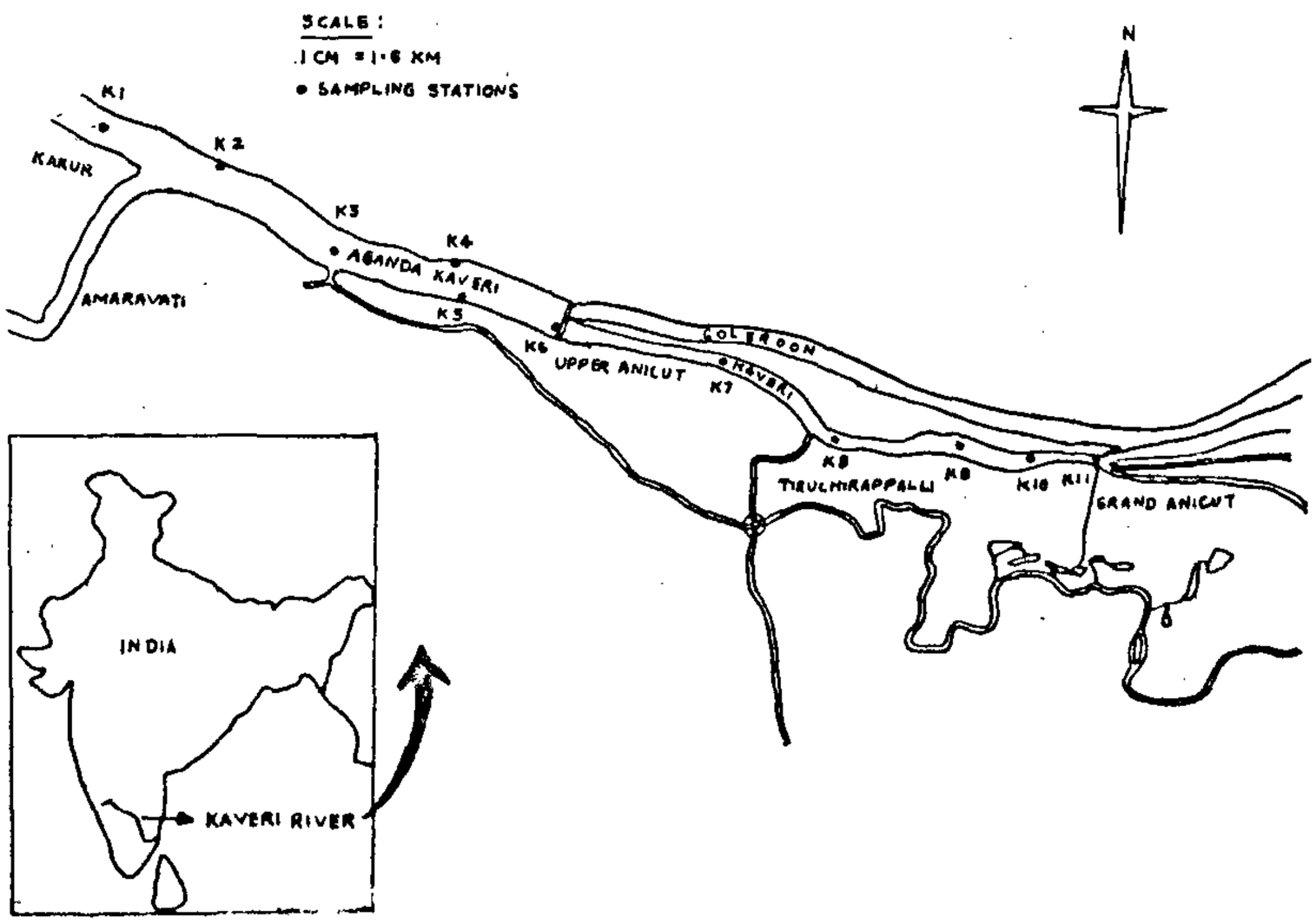

Figure 1. Location of the Kaveri river and sampling sites.

A study on the molluscan fauna of the Kaveri river stretching from Karur to Grand Anicut at Tiruchirappalli (10°48′N and 78°42′E) was carried out for a period of 2 years from April 1991 to March 1993. The river stretch under study is a fifth order stream and broadest after receiving several tributaries. Eleven sampling stations (K1–K11) were fixed in the river stretch (Figure 1). The river stretch under study is divided into two sectors based on the degree of human interference, i.e. sector I (K1–K4) and sector II (K5–K11). The urban agglomeration of Tiruchirappalli is centred around sector II and hence, it is found to have higher human interference than sector I.

The molluscan animals were collected from 11 sampling stations of the Kaveri river system. Larger molluscan species were collected by hand picking and also sieving the river sediments by using coarse sieves. The bottom substrate and macro-vegetations were explored for collecting the most representative diversity of molluscs and they were identified. Snails associated with vegetation were collected by using hand net (150 μm). The hand net was dragged over the aquatic vegetation. When the net was filled with aquatic weeds, the contents were poured out on a spread out cloth piece. The population density of molluscs in a given area was studied using quadrate method as described by Subbarao[5]. The number of animals in the samples collected from wooden quadrant (0.5 × 0.5 m) was counted and value expressed as the number of molluscs per square meter (number/m^2).

Snails were collected manually, using gloves to prevent cercarial infection. The collected snails were then transported to the laboratory in polythene bags along with weeds and water. Then the live snails were individually transferred to clean glass test tubes half filled with tap water and exposed to sunlight for discharge of cercaria from the snails[17]. The cercaria were transferred onto glass slides with fine pipette and observed under microscope. Some of the cercariae were fixed in 10% formalin stained with eosin or methylene blue mounted in DPX, and identified.

The present study revealed that the molluscan fauna of the Kaveri river were represented by 8 species of gastropod and 5 species of bivalves. The gastropod species are classed under 5 different families, viz. Viviparidae, Thiaridae, Pilidae, Lymnaeidae and Planorbidae; the family Thiaridae being more dominant and representing nearly 50% of the total gastropod population recorded in the Kaveri river (Figure 2). The identification of species was confirmed by the Zoological Survey of India, Calcutta. Certain species of gastropods such as *Bellamya dissimilis, Paludomus tanschauricus, Thiara* sp., were found predominant in the Kaveri river throughout the year. Gastropod species such as *I. exustus, Lymnaea ovalis, P. virens* and *B. dissimilis* were associated with aquatic macrophytes.

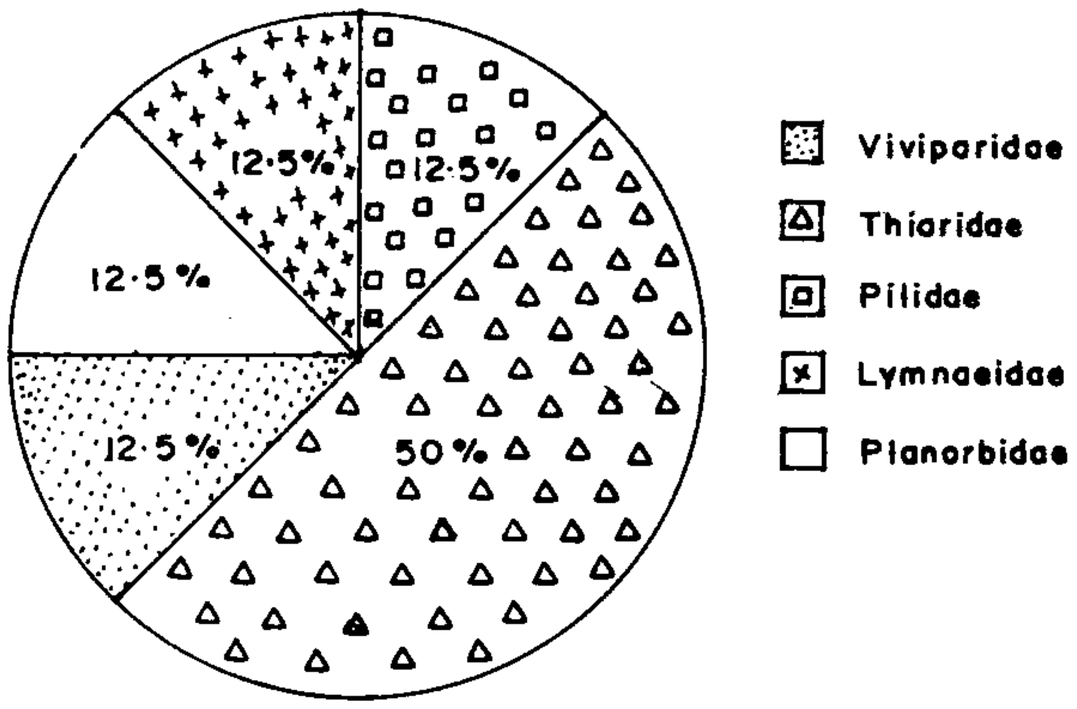

Figure 2. Percentage of species composition of gastropod molluscs in Kaveri river stretch from Karur to Grand Anicut.

Table 1. Classification of molluscan fauna in Kaveri river stretch in Tiruchirappalli

Phylum	:	Mollusca
Class	:	Gastropoda
Subclass	:	Prosobranchia
Order	:	Mesogastropoda
Family	:	Viviparidae
Genus	:	Bellamya
		B. dissimilis
Family	:	Thiaridae
Genus	:	Thiara
		T. (Thiara) scabra
		T. (Tarebia) lineata
		Paludomus tanschauricus
Family	:	Pilidae
Genus	:	Pila
		P. virens
Subclass	:	Pulmonata
Order	:	Linophila
Family	:	Lymnaeidae
Genus	:	Lymnaea
		L. ovalis Gray
Family	:	Planorbidae
		Indoplanorbis exustus (Deshayes)
Class	:	Bivalvia (Linnaeaus, 1758)
		Pelecypoda (Gold fuss, 1820)
Subclass	:	Lamellibranchia
Order	:	Eulamellibranchia
Family	:	Unionidae
Genus	:	Lamellidens (Lamarck)
		L. consobrinus (Lea)
		L. marginalis (Lamarck)
Genus	:	Parreysia
		Parreysia favidens (Benson)
Family	:	Corbiculidae
Genus	:	Corbicula
		C. regularis
		C. striatella

Table 2. Seasonal variation in the molluscan faunal density in two sectors of the Kaveri river

Seasons	Sector I (no./m^2)	Sector II (no./m^2)
Premonsoon (April–July)		
1991–1992	242 ± 18	67 ± 14
1992–1993	88 ± 14	25 ± 8
Mean	126 ± 28	45 ± 23
Range	72 – 267	20 – 98
Monsoon (August–November)		
1991–1992	44 ± 12	23 ± 13
1992–1993	60 ± 17	25 ± 16
Mean	53 ± 13	23 ± 18
Range	24 – 92	14 – 42
Postmonsoon (December–March)		
1991–1992	139 ± 15	44 ± 13
1992–1993	77 ± 14	23 ± 8
Mean	110 ± 19	33 ± 15
Range	68 – 157	16 – 68
I year mean	115 ± 23	45 ± 12
II year mean	76 ± 24	33 ± 13
Annual mean	96 ± 29	39 ± 18
Range	24 – 267	14 – 117

Five species of bivalve molluscs belonging to 2 different families such as Unionidae and Corbiculidae were recorded (Table 1). The abundance of molluscan species was quantified at two sectors of the Kaveri river. The mean density of molluscs at sector I was 96/m^2 and it ranged from 24 to 267/m^2 and in sector II, the mean density of molluscs was 39/m^2 and it ranged from 41 to 117/m^2 (Table 2). The abundance of molluscs was significantly different between the sectors (ANOVA: $F = 21.45$; $P < 1\%$) whereas it was not significantly different within the sector (ANOVA: $F = 1.96$; $df = 23$; $P > 1\%$).

Eight species of gastropods recorded in the present study were tested for the presence of cercaria larvae. Five species namely, *Indoplanorbis exustus, Lymnae ovalis, Thiara tuberculata, T. scabra* and *Paludomus tanschauricus* were carriers of the cercarial larvae. Cercarial infection was more acute in *I. exustus* and *L. ovalis* than in other snail vectors of the Kaveri river. Since these parasites caused considerable damage to the cattle wealth of the Kaveri river basin, the parasitology of these trematode worms assumed economic importance. Identification of such intermediate snail host and effective control of snail population would be the best preventive measure[15].

The present study also indicated that species of the Thiaridae such as *T. scabra* and *T. lineata* were found to prefer the pollution-free water and sandy bottom, which provide soft substratum for their easy penetration. Therefore, they were predominantly recorded in sector I than sector II. Among the gastropod species, *I. exustus, L. ovalis, P. virens* and *B. dissimilis* were associated with aquatic weeds which provided food and shelter for those organisms. A similar study on correlation between aquatic weeds and molluscan abundance was made by Upatham[18] in Thailand. Anwar and Siddiqui[19] recorded 7 species of gastropods and 3 species of pelecypods in Kali river.

Molluscan groups such as gastropods and bivalves were found to be quantitatively most important groups and represented throughout the year[20,21]. Kaul *et al.*[9] reported that distribution of freshwater gastropods in Haigam, a typical wetland in Kashmir, had bearing on density of aquatic weeds.

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