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Fish diversity of the Vatrak stream, Sabarmati River system, Rajasthan

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Abstract

Five species of fishes belonging to order cypriniformes from Vatrak stream of Rajasthan has been described. Taxonomic details along with ecology of the fish fauna and stream morphology are also discussed.

Keywords: Diversity, Fish, Rajasthan, stream morphology, Vatrak

Introduction

Rajasthan, the biggest state in India is well known for its diverse topography. The state of Rajasthan can be divided into the following geographical regions *viz.*: western and north western region, well known for the Thar Desert; the eastern region famous for the Aravalli hills, whereas, the southern part of the state with its stony landscape offers typical sites for water resource development where most of the man-made reservoirs are present. Mahi River basin with its main streams Jakham, Som and Anas drains the southern part of the state.

In general, streams constitute very important aquatic ecosystem. Stream is a natural water channel which contains flowing water, at least part of the year, together with dissolved and suspended material and supports vast floral and faunal diversity within the stream passage and the riparian vegetation zone (Aramantrout, 1999). Vatrak stream, a left bank tributary of Sabarmati River and its branches drains in an area of 8638 sq km. Vatrak stream originates in Panchara hills of Dungarpur district in Rajasthan. It flows in southwesterly direction for a distance of 248 km and joins Sabarmati an important river of Gujarat which also flows through southern region of Rajasthan. Other major tributaries joining the Sabarmati from left are the Wakal and the Hathmati whereas the Sei joins from right. Sabarmati River originates from Aravalli hills near village Tepur in Udaipur district of Rajasthan and flows for 371 km before finally merging with the Arabian Sea. Thus the Basin of Sabarmati River encompasses states of Rajasthan and Gujarat covering an area of 21,674 Sq.km between 70°58' to 73°51' East longitudes and 22°15' to 24°47' North latitudes. The Vatrak stream basin is circumscribed by Aravalli hills on the north and north-east, Rann of Kachchh on the west and Gulf of Khambhat on the south. The main part of basin consists of agricultural activities accounting to 74.68% of the total area. Whereas, 4.19% of the total basin area is covered by water bodies. The basin is coarsely triangular in shape with the Sabarmati River as the base and the source of the Vatrak stream at its top.

Fish faunal diversity is an indicator of overall vigor of an aquatic ecosystem and predicts its ability to sustain biotic potential for the future. Fisheries products have enormous significance to mankind as they contribute significantly to the food security and economy of India. Fish provides a vital and cheapest source of animal protein and minerals. The earth supports huge ichthyofaunal diversity. Half of the total numbers of vertebrates in the world are constituted by fish. Fishes live in almost all conducive aquatic habitats. In most of the developed countries, the studies on streams were highlighted when river restoration programmes were

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initiated. Hence, most of the literature is available from the developed countries; however scattered references are available from the developing and under developed countries. The Indian inland fish fauna is represented by about 2500 species (Jayaram, 1999). Comprehensive and remarkable work on Fish fauna of Rajasthan is done by Hora *et al.,* (1952), Datta *et al,.* (1970), Johal *et al,.* (1993) and Mohan, *et al.,* (2013).

Southern and south east part of Rajasthan particularly drainage basin of river Chambal and the Chambal itself is explored from fish faunal diversity point of view mainly by Dubey and Mehra (1962), Sharma and Johal (1982), Sharma and Johal (1984), Gupta and Kulshreshta (1985), Johal and Sharma (1986), Juyal and Chaudhary (2003), Vyas and Singh (2004), Sharma and Choudhury (2007) and Srivastava (2007). Dubey and Mehra (1962) described 71 species, Ridhi, *et al.* (2012) has recorded 22 species of fish from Madhya Pradesh part of Chambal River whereas, Banyal and Kumar [2015 (I)] have recorded 54 species of fish from Rajasthan part of Chambal River. Banyal and Kumar [2015 (II and III)] have also worked on the ichthyofauna of Mahi River and its basin. No information is available on the Vatrak stream. The Vatrak stream ecosystem did not attract the attention of fresh water biologists till an attempt was made by the authors. Keeping in mind importance of streams present work was carried out during March, 2014 in Vatrak stream near Jethola village (N 23.32.636 E 073.38.645) of Dungarpur district of Rajasthan.

Material and Methods

Fishes were collected mostly by using cast nets, hand, scoop and drag net and preservation was done using 10% formalin. The fish species were identified following Talwar and Jhingran (1991), Jayaram (1999) and Froese and Pauly (2014) *i.e. www.fishbase.org*, [version (02/2014)]. Nature of stream flow was adjudged according to the criteria given by Gordon *et al.* (1992). Nature of the stream bottom was determined according to the criteria given by Armontrout (1999).

Systematic List

Phylum : CHORDATA
Class : ACTINOPTERYGII
Order : CYPRINIFORMES
Family : CYPRINIDAE

1. *Pethia ticto* (Hamilton, 1822)
2. *Salmostoma bacaila* (Hamilton, 1822)
3. *Rasbora daniconius* (Hamilton, 1822)
4. *Garra gotyla* (Gray,1830)
5. *Devario devario* (Hamilton, 1822)

Systematic Account

1. *Pethia ticto* (Hamilton, 1822)

1822. *Cyprinus ticto*, Hamilton-Buchannan, *Fishes of Ganges*: 314,398, pl.8, fig.87 (type-locality: south eastern parts of Bengal); Murthy, 1977, *Proc. Indian Acad. Sci.* **85 B** (3): 130 (Identity discussed).

2012. *Pethia ticto*, P.81, Pethiyagoda *et al. A synopsis of the South Asian fishes referred to Puntius (Pisces: Cyprinidae). Ichthyological Exploration of Freshwaters* v. **23** (no. 1): 69-95.

Common name: Two-Spot barb.

Material examined: 1 ex, Vatrak stream near Jethola Village, Dungarpur, Rajasthan, 15.iii.2014, coll. H. S. Banyal, Reg. No. V/ 3177.

Diagnostic characters: D ii 8; A ii 5; P i 12; V i 8 Body elongate, mouth short terminal, barbels absent, dorsal fin inserted posterior to base of pelvic fin with its last unbranched ray osseous, strong and serrated at posterior edge, pectoral fin with a black spot; lateral line complete with 23 scales.

Coloration: Blackish-grey to grassy-green when alive; margins brilliant shining silver; a long transverse black spot above the pectoral fin and another alike but golden-edged is present on caudal peduncle over the end of anal fin.

Geographical distribution: Widely distributed in India in varied aquatic ecosystems.

Remarks: It is a good food for most of the birds and is quite common fish. This fish is a popular barb of the aquaria.

2. *Salmostoma bacaila* (Hamilton, 1822)

1822. *Cyprinus bacaila,* Hamilton-Buchannan**,** *Fishes of Ganges*, pages 265-384 (Type–locality: Gangetic provinces).

2013. *Salmophasia bacaila,* Ahmed *et.al. Biodiversity of hill stream fishes in Bangladesh, Zootaxa,* **3700** (no. 2): 283-292.

Common name: Large razor belly minnow.

Material examined: 6 exs, Vatrak stream near Jethola Village, Dungarpur, Rajasthan, 15.iii.2014, coll. H. S. Banyal, Reg No. V/3178.

Diagnostic characters: D ii-iii 7; A iii 10-13; P i 11-1-2; Vi 8. Body elongate and strongly compressed. Mouth oblique; dorsal fin inserted well in advance of anal fin. Gill rakers 17 to 21 on first arch, Scales very small; lateral line slightly decurved, with 86 to 110, silvery scales.

Coloration: Upper side grey-green in life, generally silvery; a broad, lustrous white-green band along margin. Fins hyaline.

Geographical distribution: Widely distributed in India, inhabits plains and sub-montane regions.

Remarks: This species is a surface feeder and is regarded as a useful larvivorous fish.

3. *Rasbora daniconius* (Hamilton, 1822)

1822. *Cyprinus daniconius,* Hamilton-Buchanan, *Fishes of Ganges*: 327,391, pl.15, fig.89 (type-locality: rivers of southern parts of Bengal).

2013. *Rasbora daniconius,* Kottelat, page no. 152, the fishes of the inland waters of Southeast Asia: a catalogue and core bibliography of the fishes known to occur in freshwaters, mangroves and estuaries. *The Raffles Bulletin of Zoology Supplement* No. **27**: 1-663.

Common name: Blackline rasbora

Material examined: 2 exs., Vatrak stream near Jethola Village, Dungarpur, Rajasthan, 15.iii.2014, coll. H. S. Banyal, Reg No.V/3179.

Diagnostic Characters: D ii 7; A ii 5; P i 14; V i 8 Body oblong and compressed, mouth small, a fairly distinct blue black mid-lateral stripe is present from eye to base of caudal fin, fins hyaline, origin of dorsal fin is nearer to the caudal fin base, pectoral fins shorter than head, lateral line complete with 31-34 scales, barbels are absent.

Coloration: Blackish-olive in life, margins and belly silvery; a clear blue black mid-lateral stripe is present from eye to base of caudal fin. Fins are hyaline, and yellow marked.

Geographical Distribution: Widely distributed in India. Inhabits pools, ditches and streams.

Remarks: It is a surface feeder. Popularly known as 'Rasbora'.

4. *Garra gotyla* (Gray, 1830)

1832. *Cyprinus gotyla* Gray, *Illustr. Indian Zool*., 1: pl. 88, figs 3, 3a, (type-locality: Northern India); Hora, 1921, *Rec. Indian M*us., **22**(5): 653 (Status discussed).

1964. *Garra gotyla gotyla*, Menon, *Mem. Indian Mus.,* **14**(4): 233, pl. 13, figs 1-4.

Common Names: Sucker head

Material examined: 1 ex., Vatrak stream near Jethola Village, Dungarpur, Rajasthan, 15.iii.2014, coll. H. S. Banyal, Reg No. V/3176.

Diagnostic characters: D iii 7-8; A ii 5; P i14; V i 8 Body elongated its depth 3.7 to 4.5 times in standard length. Snout consists of a well-built median proboscis and an oblique lobe at tip; free edge of proboscis, diagonal lobe and adjacent sides of head in front of nostrils is covered with numerous big prickly tubercles. Mouth arched; mental disc well-developed. Barbels two pairs; lateral line with 34 scales.

Geographical Distribution: India: all along the Himalaya, Chota Nagpur plateau and the Vindhya-Satpura mountains of the Indian peninsula.

Coloration: In live specimen back is dark brown & flanks & belly are light pink, a dark spot is present behind upper angle of gill-opening & dark spots are present along base of dorsal fin.

Remarks: This species can be easily distinguished by the presence of a well-developed median proboscis without any lateral lobes on the snout. This species is of minor interest to fisheries.

5. *Devario devario* (Hamilton, 1822)

1822. *Cyprinus devario,* Hamilton-Buchanan, *Fishes of Ganges*: 341, 393, pl. 6, fig.94 (type-locality: rivers and ponds of Bengal).

2001. *Devario devario,* Kullander, *Phylogeny and species diversity of the South and Southeast Asian cyprinid genus Danio* Hamilton (Teleostei: Cyprinidae). Dept. Zool. Stockholm University, Sweden, **16**: 1-26

Common Names: Devario danio

Material examined: 1 ex., Vatrak stream near Jethola Village, Dungarpur, Rajasthan, 15.iii.2014, coll. H. S. Banyal, Reg No.V/3180.

Diagnostic characters: D ii 15; A ii 16; P i 11; V i 7 Body rhomboidal and compressed. Mouth small, obliquely directed upwards; barbels absent. Dorsal fin inserted slightly anterior to anal fin, lateral line with 36 scales, a pair of blue marks at base of caudal fin often present.

Coloration: Back greenish in life, edges and belly are silvery; three bluish lines separated by yellow ones prolong backwards up to caudal fin.

Geographical distribution: Widely distributed in India. Inhabits pools, ditches and streams.

Remarks: The species is pretty in appearance and a fairly popular aquarium fish. It is least important from commercial fisheries point of view.

Results and Discussion

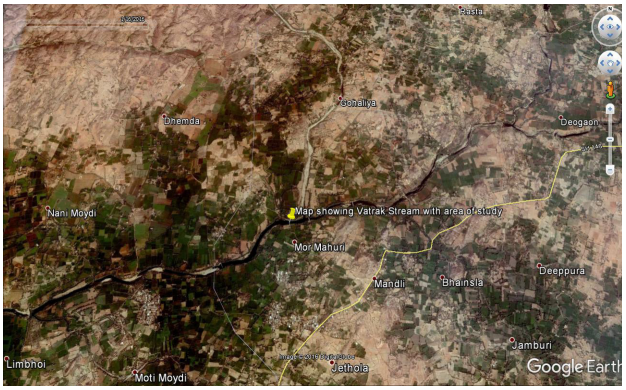
Majority of the southern, south east and south west part of the Rajasthan state encompasses of Mahi, Chambal and Sabarmati River catchment. The eastern portion of Rajasthan is broadly drained by the Banas River and its branches and consists of a large number of water impoundments. The Chambal catchment area alongside the Chambal River forming a boundary between Rajasthan and the adjacent Madhya Pradesh state also lies in the eastern region. Chambal River catchment area covers the southern, eastern and north-eastern part of the state with branches like Bedach, Banas, Parbati and Kalisindh.

Due to good vegetal cover and presence of Aravalli hills this region has lot of water bodies including streams. Intermittent streams are those watercourses which flow seasonally during certain times of the year, when they receive water from some of the springs in the region or surface run off. They are either influent or effluent depending on the season. Ephemeral stream are influent, having channels which are above the water table at all times (Gorden, *et al.*, 1992). Vatrak stream is an intermittent stream with deep pools, riffles and run habitat. Bed material of this stream mainly comprises of gravels, cobbles, boulders and sand during March, 2014.

Stream ecology includes day to day ecology and behavior of fish and their dependence on the events and processes occurring in the streams (Matthews, 1998). The river continuum concept is one expression of the continuation of the development of most of the river systems from the headwater to the mouth. The continuum presupposes a gradual variability from head waters to the mouth waters (Vannote *et al.,* 1980) and is strongly influenced by the tributaries (Welcomme, 1985). Fish habitat at a stream site refers to the contemporary physico-chemical and biological features that constitute the diurnal environs of fish (Milner *et al.,* 1985). Physical habitat features of streams, in conjunction with biological habitat features, are particularly important in determining the occurrence and abundance of fish species in a stream segment (Gorman and Karr, 1978; Binns and Eiserman, 1979; Rankin, 1995). Depth has important influence on the fish assemblages in streams. Gerking (1949) showed correlation between fish biomass and volume of deep water in pools of small streams and allows vertical separation of micro-habitats of species (Baker and Ross, 1981; Gorman, 1988a, 1988b).

Present findings are in conformity of aforesaid research conclusions. Since, the point of study is nearer to the origin of Vatrak stream and according to river continuum concept variability and faunal multiplicity of species increases from head waters to the mouth waters in a stream. So, only five species of fishes belonging to order Cypriniformes and family Cyprinidae are reported from this stream. These fishes are well adapted to live in the stream conditions. Out of the five species recorded *Garra gotyla* was found to be the best adapted for this ecosystem with well-developed adhesives apparatus on the ventral side, near lower lip and dorsoventrally flattened body. The other four fish species were comparatively small

size fishes popularly known as minnows but also well adapted to relish the stream conditions. Deep pools seem to be an important part of the stream ecosystem. This habitat ensures continuation of life during dearth period. Maximum fish diversity was recorded from the Vatrak stream from pool habitat. Two species *viz. Salmostoma bacaila* and *Rasbora daniconius* were surface feeders. *Pethia ticto* was found among gravels and birds were observed feeding on it. *Garra* gotyla was found mainly attached to the boulders with its well-developed adhesive structures whereas *Devario devario* was found mostly free flowing with at time attached to pebbles. *Pethia ticto* and *Devario devario* are popular aquarium fishes.



(Source: Google Earth)

Figure 1. Area of Study.

Summary

Five species of fishes belonging to one order and one family were recorded from the Vatrak stream near Jethola village, Dungarpur district. This is the first attempt to describe fish diversity of Vatrak stream from Rajasthan state.

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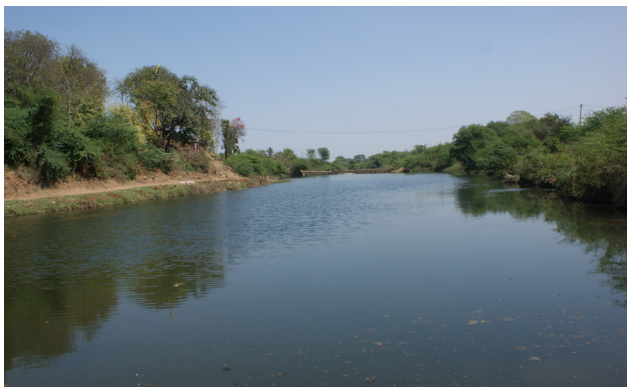

Figure 2. A view of area of study.

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PLATE 1

Pethia ticto (Hamilton, (1822)

Salmostoma bacaila (Hamilton, (1822)

Rasbora daniconius (Hamilton, (1822)

Garra gotyla (Gray, (1830)

Devario devario (Hamilton, (1822)