RESEARCH ARTICLE

Taxonomy, Distribution and Conservation of Molluscs in Kangra District of Himachal Pradesh: Three New Records from the State

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Study Area: Kangra, Himachal Pradesh, India

Coordinates: 31°2 to 32° N and 75° to 77°45 E

Key words: *Physa acuta*, *Macrochlamys indica*, *Ariophanta interrupta*

Abstract

The freshwater and land molluscs inventory survey was conducted in connection with our approved annual programme of research entitled “Species diversity and richness of molluscan fauna of Himachal Pradesh” From April 2012 to March 2015. During survey period we have collected 633 examples of Molluscs (both Land and Freshwater). Total 25 species are recorded from different district of Himachal Pradesh. Among 25 species eight species of molluscs have been recorded from the Kangra district. *Physa acuta*, *Macrochlamys indica* and *Ariophanta interrupta* have been recorded for the first time from Himachal Pradesh. A systematic taxonomic account, distribution and conservation status is discussed in this paper.

Introduction:

The phylum Mollusca is the second largest important invertebrate group in animal kingdom on the basis of their large numbers and occurrences in all possible ecosystems except air. Globally ~85000 different species of molluscs are known out of which ~3400 species are known to Indian region. They are valuable indicators of aquatic and terrestrial ecosystem health (Subba Rao, 1989) and play a vital role in the biochemical cycle, prey-predator relationship to maintain the balance to the aquatic food chain (Tripathy & Mukhopadhyay, 2015). The diverse ranges of habitats in mountain ranges contribute to the high diversity of land and freshwater molluscs in the Himalayas (Ramakrishna *et al.*, 2010).

The current knowledge of molluscs of Himachal Pradesh is based on contribution made by earlier workers viz. Nevill (1878), Godwin-Austen (1899), Hora *et al.*, (1955), Davis *et*

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al., (1986), Rajagopal & Subba Rao (1968; 1972), Agrawal (1975a; 1975b; 1976; 1977; 1979), and Rao & Mitra (2005). The species diversity of land molluscs of Himachal Pradesh is not adequately studied and that of Kangra district is poorly known. District wise, Shimla records the highest number of species (35 species) whereas, from some of the districts viz., Kinnaur, Una the diversity is still unknown. The reasons might be, efforts were not made in those districts on the collection of mollusca (Rao & Mitra, 2005). Thus, the present work is an attempt to survey and inventories molluscs of Kangra district of Himachal Pradesh. The effort is based on collection made by survey team of Zoological Survey of India in Himachal Pradesh as part of the departmental programme on state fauna of Himachal Pradesh conducted during the September 2014. This survey encountered eight species under six genera belonging to four families from Kangra district. All the eight species, six genera and four families are reported for the first time from this district and three species viz. *Physa acuta*, *Macrochlamys indica* and *Ariophanta interrupta* have been recorded for the first time from Himachal Pradesh.

Materials and Methods:

Study Site: the Kangra district of Himachal Pradesh is situated in the western Himalayan ranges (31° 2 to 32° N and 75° to 77° 45 E). The district has a geographical area of 5739 km² and the altitude ranges from 427 to 6401m MSL. The district has considerable divers in term of soil, physiography, land use patterns and cropping system. The district is further divided into five sub geographical regions i.e. Pir Panjal, Dhauladhar, Kangra Shiwalik, Kangra valley and Beas basin.

Methods: field survey was conducted in different part of the Kangra district of Himachal Pradesh in September 2014 by footwalk. Molluscan samples were manually collected from different habitats and preserved in 70% ethanol. The samples were later brought to the ZSI HQ, Kolkata and were properly identified by using hand magnified lens with the help of identification manuals (Vaught, 1989).

Observation and Results:

This survey encounter with, eight species of freshwater mollusca under six genera and four families collected from Kangra district of Himachal Pradesh. All the eight species has been first time reported from this district as there was no earlier documantations, literature or records available for these species from the district and three species viz. *Physa acuta*, *Macrochlamys indica* and *Ariophanta interrupta* have been recorded for the first time from the state of Himachal Pradesh.

The systematic taxonomic account of all the eight species reported and described here as follows. The classification for the purpose is as per Vaught (1989).

Systematicaccounts:

Family BITHYNIIDAE; Genus *Bithynia* Leach, 1818

1818. *Bithynia* Leach, In: *Abel's, Narrative of journey into interior of China*: 362.

Type Species: *Helix tentaculata* Linnaeus, 1758

Bithynia (Digoniostoma) pulchella (Benson, 1836)
2005. *Digoniostoma pulchella* Mitra, Dey and Ramkrishna, Fauna of Andhra Pradesh, State fauna series, Zool. Surv. India, 5 (Part 5), p. 193.

Material Examined: Dist: Kangra, Loc: Pong Dam Lake, Lat. N 32° 02.467' Long. E 076° 03.533' Alt. 1396ft., Date: 13.9.2014,

Coll: Dr. K. Valarmathi and party, Number of specimens examined: 3

Diagnostic characters: Shell small, conically elongate, spire longer than body whorl, whorls rounded, Sutures depressed, aperture oval, outer lip slightly thickened, not produced of the columellar base.

Distribution: India- common throughout India; Elsewhere- Myanmar, Malay Archipelago and Pakistan.

Conservation Status: Least Concern

Remarks: recorded for the first time from Kangra district, Himachal Pradesh.

Family THIARIDAE; Genus *Melanoides* Olivier, 1808
1804. *Melanoides* Olivier, Voyage a l'Emp. Ottoman, 2:40.

Type Species: *Melanoides fasciolata* Olivier =
Nerita tuberculata Mueller, 1774

Melanoides tuberculata (Muller, 1774)

2005. *Melanoides tuberculata* Mitra, Dey and Ramkrishna, Fauna of Andhra Pradesh, State Fauna series, Zool. Surv. India, 5 (Part 5), p. 198.

Material Examined: Dist: Kangra, Loc: near Bajjrath temple, Lat. N 32° 03.100' Long. E 076° 38.678' Alt. 3236 ft., Date: 15.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 1

Diagnostic characters: shell elongated with 8-10 rounded whorls, thick with strong spiral suture and axial ribs, dark red brown dots and flame present on the surface; aperture pyriform pointed above and rounded below.

Distribution: India- throughout India except Kashmir; Elsewhere- North and South Africa, Eastern Mediterranean countries; Japan; South east Asia; Southern China; Malaysia; Malay Archipelago; North Australia; Various pacific islands and north to Ryukyu of Japan.

Conservation Status: Least Concern

Remarks: worldwide distributed with no specific threats affecting the population. This species has two synonyms one is *Nerita tuberculata* Muller, 1774 and *Thiara tuberculata* (Muller, 1774). Recorded for the first time from Kangra district, Himachal Pradesh.

Family LYMNAEIDAE; Genus *Lymnaea* Lamarck, 1799
1799. *Lymnaea* Lamarck, Prodr. Nouv. Clas. Coq.: 75

Bithynia (Digoniostoma) pulchella

Melanoides tuberculata

TypeSpecies: *Lymnaea stagnalis* Linnaeus

Lymnaea (Pseudosuccinea) acuminata form *typica* Lamarck, 1822

2005. *Lymnaea (Pseudosuccinea) acuminata* & *typica* Mitra, Dey and Ramkrishna, Fauna of Andhra Pradesh, *State Fauna series, Zool. Surv. India*. 5 (Part 5), p. 203.

Material Examined: (i) Dist: Kangra, Loc: Rajoy river and road, Lat. N 32° 10.350' Long. E 076° 14.915' Alt. 3236 ft., Date: 14.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 10

(ii) Dist: Kangra, Loc: Pong Dam Lake, Lat. N 32 ° 02.046' Long. E 076° 03.533' Alt. 1396 ft., Date: 13.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 3

(iii) Dist: Kangra, Loc: Small road side Nala near Chamlei Bridge, Lat. N 32° 11.243' Long. E 076° 13.092' Alt. 2160 ft., Date: 14.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 3

Diagnostic characters: shell thin, oblong ovates, smooth, body whorl greatly inflated, spire short and acuminate; aperture wide, columella twisted.

Distribution: India- throughout India except Kashmir; Elsewhere- Bangladesh, Myanmar, Pakistan.

Conservation Status: Least Concern

Remarks: occurs in permanent water bodies with abundant vegetations. It also grows in polluted water. The larval form of some important parasites of sheep, cattle and man are recorded from this snail. It is the intermediate host of different fluke's viz. *Fasciola gigantica*, *Fasciola hepatica*, *Schistosoma indica*. Recorded for the first time from Kangra district, Himachal Pradesh.

Family PHYSIDAE; Genus *Physa* Draparnaud
1801. *Physa* Draparnaud, *Tal. Moll. France*, 31: 52

TypeSpecies: *Bulla fontinalis* Linnaeus, 1758

Physa acuta Draparnaud, 1805

1997. *Physa acuta* Surya Rao, Fauna of Delhi, *State Fauna series, Zool. Surv. India*. 6 P.121.

Material Examined: Dist: Kangra, Loc: Rajoy river and road, Lat. N 2° 10.350' Long. E 076° 14.915' Alt. 3236 ft., Date: 14.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 10

Diagnostic characters: shell sinistral, ovate, transparent, 4-6 whorls without deep suture; apex thick and sharply pointed, body whorl large and around; sculpture smooth; aperture ovate.

Distribution: India- Delhi, Maharashtra; Elsewhere- North America, Europe, Africa and Southeast Asia: Pakistan

Conservation Status: Least Concern

Remarks: already recorded from Delhi, Maharashtra (In Pune), and recently recorded from

Lymnaea (Pseudosuccinea) acuminata

Physa acuta

Andhra Pradesh (Karuthapandi *et al.*, 2013) and for the first time from Himachal Pradesh. Details population study for this species is still needed.

Family ARIOPHANTIDAE; Genus *Macrochlamys* Benson
1832. *Macrochlamys* Benson *J. Asiat. Soc. Beng.*, 1:13 and 76.
Type Species: *Macrochlamys petrosa*, Hutton

Macrochlamys indica Godwin-Austen, 1908
2005. *Macrochlamys indica* Mitra Dey and Ramkrishna,
Fauna of Andhra Pradesh, *State Fauna Series, Zool. Surv. of India*, 5 (Part 5): 237.

Macrochlamys indica

- Material Examined:** (i) Dist: Kangra, Loc: a small road side Nala near Chambi Bridge, Chambi, Lat. N 32° 11. 243' Long. E 076° 13. 092' Alt. 2168 ft., Date: 14.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 10
(ii) Dist: Kangra, Loc: Rojal river and road, Lat. N 32° 10.350' Long. E 076° 14. 915' Alt. 1396 ft., Date: 14.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 3
(iii) Dist: Kangra, Loc: A small pond side Nala near Chambi Bridge, Lat. N 32° 11.243' Long. E 076° 13.092' Alt. 2168 ft., Date: 14.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 3

Diagnostic characters: shell conoidly depressed, perforate, spire raised, smooth with fine microscopic spiral striae, suture impressed, whorls 5-6, last whorl rounded at the periphery; aperture a little oblique, lunate, peristoma thin, columellar margin cracked, reflected over the umbilicus.

Distribution: India- except the drier part of North West region; Elsewhere- North America, Europe, Africa and Southeast Asia: Pakistan

Conservation Status: This species is not yet been assessed by IUCN.

Remarks: recorded for the first time from Himachal Pradesh. Details population study needed for ascertaining exact status and for conservation of the species.

Family ARIOPHANTIDAE; Genus *Macrochlamys* Benson,
1832

1832. *Macrochlamys* Benson *J. Asiat. Soc. Beng.*, 1:13 and 76.
Macrochlamys (*Euaustenia*) *cassida* (Hutton, 1838)
2005. *Euaustenia cassida* Surya Rao and Mitra, *Fauna of Western Himalayas (Part 2) (Himachal Pradesh)*

Macrochlamys (Euaustenia) cassida

Material Examined: Dist: Kangra, Loc: Kangra fort Purana Kangra, Himachal Pradesh, Lat. N 32° 05. 274' Long. E 076° 15. 384' Alt. 2154 ft., Date: 13.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 5

Diagnostic characters: shell large, ovately depressed, very thin and fragile, whole rapidly increasing in size, last whorl large and broad; Aperture strongly oblique.

Distribution: India- Western Himalaya, Himachal Pradesh, Kashmir, Punjab, Uttaranchal;

Elsewhere- North America, Europe, Africa and Southeast Asia: Pakistan

Conservation Status: this species is not yet been assessed by IUCN.

Remarks: recorded for the first time from Himachal Pradesh.

Sub Family ARIOPHANTINAE

Genus *Ariophanta* Deesmoulim, 1829

1829. *Ariophanta* Deesmoulim, *Bull. Soc. Bordeau*, 3: 235.

Type Species: *Ariophanta laevipes* (Muller)

Ariophanta interrupta (Benson, 1834)

2005. *Ariophanta interrupta* Mitra, Dey and Ramkrishna, Fauna of Andhra Pradesh, *State Fauna series, Zool. Surv. India*. 5 (Part 5): 240.

Material Examined: Dist: Kangra, Loc: Kangra fort Purana Kangra, Himachal Pradesh, Lat. N 32° 05. 274' Long. E 076° 15. 384' Alt. 2154 ft., Date: 13.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 5

Diagnostic characters: shell depressed convex with a blunt apex, thick, sinistral, coarsely and obliquely often become obsolete; body whorl angulate at periphery smooth and fumed below; aperture widely crescent shaped.

Distribution: India-Andhra Pradesh, Jharkhand, Odisha, West Bengal; Elsewhere- Bangladesh

Conservation Status: not yet been assessed by IUCN.

Remarks: recorded for the first time from Himachal Pradesh.

Family BULLINIDAE; Genus *Indoplanorbis* Annandale & Prashad, 1921

1921. *Indoplanorbis* Annandale and Prashad, *Rec. Indian. Mus.*, 22(4): 578.

Type Species: *Planorbis exustus* Deshayes

Indoplanorbis exustus (Deshayes, 1834)

2005. *Indoplanorbis exustus* Mitra, Dey and Ramkrishna, Fauna of Andhra Pradesh, *State Fauna series, Zool. Surv. India*. 5 (Part 5): 208.

Material Examined: Dist: Kangra, Loc: Pong Dam lake, Lat. N 32° 02. 467' Long. E 076° 03.533' Alt. 1396 ft., Date: 13.9.2014, Coll: Dr. K. Valarmathi and party, No of specimens examined: 5

Diagnostic characters: shell moderately large, thick, discoidal, sinistral, rounded at the periphery, aperture ear-shaped, Suture deeply impressed.

Distribution: India- Widely distributed Elsewhere- Bangladesh, Iran, Pakistan, China, Tibet, Thailand, Vietnam, Sumatra and Java.

Conservation Status: Least Concern

Remarks: This species is recorded for the first time from Himachal Pradesh.

Ariophanta interrupta

Indoplanorbis exustus

Discussion:

According to Ramakrishna *et al.*, (2010) in the state of Himachal Pradesh in India, Una district has 32 species, Bilapur (22 sp.), Chamba (12 sp.), Hamipur (7 sp.), Kullu (5 sp.), Lahaul and Spiti (4 sp.), Madi (2 sp.) and Kangra having 2 species viz. *Caecilioides balanus* and *Coilostele scalaris* reported. The present study recorded eight species of land and freshwater molluscs and of which *Physa acuta*, *Macrochlamys indica* and *Ariophanta interrupta* have been recorded for the first time from Himachal Pradesh. More field surveys are required for in depth studies on the diversity and distribution of freshwater and land mollusca many of which could be endemic to India and to the region also.

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