Fossil bug from the late Pleistocene–Holocene sediments of Uttarkashi district, Uttarakhand, India

Insects dominate the present-day biodiversity. In geological history, wings of insects are well documented from all over the world, ranging in age from Devonian to Holocene. Complete fossil insects usually preserved in amber are also known from different geological horizons. But records of well-preserved isolated wingless fossil insects are rare. The present note reports a wingless fossil insect from the Quaternary succession of the Himalaya. The insect recorded here occurs in association with thecanomoebs in the late Pleistocene–Holocene sediments near Netal (30°44'35"N; 78°29'15"E), Uttarkashi district, Uttarakhand, India (Figure 1). The insect — a bug (Figure 2a, b) — is very small in size (length 1.62 mm; width 0.44 mm), complete with its dorso-ventrally flattened body divisible in three parts, head (h: 0.11 mm), thorax (t: 0.85 mm) and abdomen (ad: 0.66 mm). The head has two projecting, well-preserved, three-segmented short antennae (an), below which lie two distinct, only slightly protruding eyespots (e). The piercing and sucking beak i.e. rostrum (r) arises from the front (or venter) of the head, has three segments and is bent backwards. On the ventral side, three pairs of coxae (c) are discernible. The abdomen has eight segments (sg). There are two spiracles (sp) visible in ventral view. The venter of the head posterior to rostrum forms a sclerotized bridge or gula (gu). The present specimen appears to be a male bug as space for male genitalia (gn) is observed in dorso-posterior region. All these characters suggest that this insect is a bug belonging to order Hemiptera, suborder Heteroptera. Its placement in superfamilial Pentatomomorpha is based on the presence of a small triangular head and large thorax, rare three-segmented antennae, and dorsoventrally flattened body.

It has partial characters of two modern families, viz. Neotropical Phloeidae and Neotropical and Australian Peloridiidae, which belong to different neontological classification series. Therefore, its taxonomic placement here is tentative and may be revised. In fact, it seems to belong to a new family of fossil insects from the Himalaya.

Insects inhabit a variety of ecological settings and can withstand extreme temperatures. The preservation of the bug in sediments in association with thecanomoebs typical of cold climate, indicates the fossil bug to be a habitant of cold environment.

The present record of a well-preserved, isolated, wingless fossil insect is a rare occurrence, especially from the Himalaya.

Figure 1. Map showing location of fossil bug-bearing section of Quaternary in Uttarakhand, India. (Based on Rawat and Gairola.)
Abdominal dropsy disease in major carps of Meghalaya: Isolation and characterization of *Aeromonas hydrophila*

Diseases in intensive freshwater aquaculture have assumed great importance in India due to economic loss observed in recent years. Infections due to *Aeromonas* are common and pose a threat to the development of the aquaculture enterprise. *Aeromonas hydrophila*, a ubiquitous organism present in the aquatic environment, causes diseases in fish under stress\(^1\).\(^2\). There are reports of isolation of *A. hydrophila* from dropsy-infected common carp, *Cyprinus carpio* from Meghalaya\(^3\). Dropsy outbreaks have taken heavy toll in the neighbouring state of Assam\(^4\)\(^5\) and also in Andaman\(^6\)\(^7\). All the outbreaks reported earlier were diagnosed based on symptoms, isolation and identification of the causative agent. Isolation and identification of Aeromonads from environmental sources pose serious challenges to microbiologists because of the large variety of strains present in water and the imprecision of conventional detection and identification methods\(^8\). Diagnosis based on isolation and identification of pathogen is not only time-consuming and tedious, but also can be misleading, specially in case of mesophilic and motile aeronomads. The present correspondence reports the involvement of *A. hydrophila* in abdominal dropsy disease by isolation, identification and detection of aerolysin and haemolysin genes as genetic markers of virulence determinants by multiplex polymerase chain reaction (mPCR).

Dropsy-infected *Catla catla* and *Cirrhinus mrigala* showing distended abdomen, loose scales, deep ulcers on the dorsal surface and extensive haemorrhages on the ventral part were collected from freshwater pond. The pond was stocked with catla, mrigal, silver carp and grass carp according to the standard ratio in a pond size of 0.2 ha with 2.5 m water level. The disease was reported during August, when the temperature and humidity ranged between 25 and 30 °C, and 80 and 90% respectively. The disease symptoms were noticed in 5–10% of the total population, among which catla and mrigal weighing approximately 500 g were mostly infected and suffered 5% mortality. Postmortem of catla (2) and mrigal (3) revealed degeneration of the lamellar structure of the gills, congested liver, distended intestines and fluid in the abdomen.

For isolation of *A. hydrophila*, samples from gills, heart blood, liver and abdominal fluid from both catla and mrigal were aseptically inoculated onto Ampicillin Dextrin Agar (ADA, DiFCo, USA) and *Aeromonas*-selective agar (ASA, Hi Media, Mumbai), and incubated at 24 °C for 48 h.

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