Bull. zool. Surv. India, 7 (2-3) : 245-249, 1985

"BIOSPELEOLOGICAL EXPLORATIONS IN INDIA"

By

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ABSTRACT

The present communication deals with the biological work carried out in the caves and subterranean waters of India. The zoological investigations are summarised and a list of literature dealing with biospeleological research in India is appended.

Biospeleology today has reached a new dimension and has become an autonomous science with its own requirement and following its own aims. Indian Zoologists have made notable contributions to our knowledge of the Indian subterranean fauna. Organised research on Indo-malayan caverns was pioneered by Nelson Annandale who can truly be called the father of unitory approach to biological problems in Asia. His summary in collaboration with Gravely (1914) of the fauna of the limestone caves of Burma and Malay peninsula undoubtedly promoted the investigations of the Siju caves of Assam by his colleagues, (Kemp and Chopra, 1924) the first extensive survey of its kind in the East.

In more recent years the fauna of caves in Dehradun district have been sampled (Glennie, 1947). His collections show (see e.g. Fage, 1946 ; Cameron, 1947) that there exist in India a more or less Palaearctic cave fauna quite different to the tropical fauna of the limestone caves that extend more from Assam to Malaya.

Indian ground (subterranean) water fauna dates back to the discovery of a blind Amphipod from a mine in West Bengal (Chilton, 1923 ; Stephensen, 1931), supplemented by the report of Entomostracan crustacea from a well at Lahore (Arora, 1931).

Still more recent works (Menon, 1950-52 ; Chopra and Tiwari, 1950 ; Tiwari, 1952-62 ; Lindberg, 1960 ; Pillai and Mariamma, 1963-64 ; Straskraba, 1966 ; Nath and Pillai, 1971-72, Tiwari and Lakshman Ram, 1972 ; Ram, 1972 ; Gupta, 1980, 1981, 1984, 1985) have enriched this field of work. Their taxonomical and biological studies have given new dimension to previous researches in India with their reports on subterranean fishes and crustaceans.

Nevertheless the larger portion of publications are devoted to taxonomic descrip-

tions and discussions and biological datas on these animals are almost nil.

Cave fauna

The cavernicolous fauna has been classified into three categories ; those which are strictly adapted for life in cave are called "troglobies" or troglobian, others which are frequent in caves but not totally confined to caves are called "troglophiles" and finally the occasional cavernicoles are called "trogloxene".

Siju cave fauna includes Mammals (5 spp), Amphibia (2 spp.), Pisces (8 spp.), Mollusca (4 spp.), Crustacea (7 spp.), Arachnida (12 spp.), Myriapoda (6 spp.), Insecta (52 spp.) and Oligochaeta (5 spp.). Out of 102 listed species the true Siju cave fauna consists of 86 species of these only 33 penetrate beyond a depth of 600 ft. Most of the species are not modified in response to their peculiar environment and the number of species showing definite adaptation to cavernicolous conditions is extremely small and of true "Troglobies" there are few or none. The only species in this category represented in the cave are :

Mollusca : Opeas cavernicola

Crustacea :

Decapoda : *Macrobrachium cavernicola*
Isopoda : *Philoscia dobakholi,*
Cubaris cavernosus.

The only species in this category known from other caves in Assam and other parts of the country are : *Setaphora kempi* (Collinge) a depigmented and anopthalmic isopod (Vandel, 1965) and *Diestrammena caeca* an orthopteran insect from caves in Assam and *Typhlomalota glenniei* a coleopteran from Simla caves (Cameron, 1947). Fage (1946) added four species of Araignees from Simla caves.

Recently Sinha (1983) has listed 9 spp. of cave dwelling bats from Rajasthan, which also occur in houses and monuments.

Ground water fauna

Entomostraca :

Arora (1931) described a cladoceran, *Mediomoina elliptica* and ten species of Ostracods from Lahore of which some were collected from wells but how far they exhibit subterranean adaptation is not clear. Hartmann (1964) described an Ostracod *Cypretta fontinalis* from Junagarh and Victor & Michael (1975) described 3 new ostracods *Potamocypris angularis*, *Physocypria minutus* and *Cypretta alagarkoilensis* from subterranean waters of Madurai area. Gupta (1984) described a new genus *Indocandona krishnakanti* from a well in *Monghyr*, Bihar.

Pillai and Mariamma (1963) described a mysid from a well from Kottayam in Kerala. This was described as *Keralomysis* Pillai and Mariamma and under taxonomic revisions transferred through *Speleomysis* to the *Lepidomysis longipes* (Pillai & Mariamma, 1964 ; Nath & Pillai, 1971). Nath & Pillai (1972) studied its digestive system throwing light on its food and feeding and subterranean habit and habitat.

Isopoda :

Chopra and Tiwari (1950) described an interesting isopod *Nichollsia kashiense* of the sub-order Phreatoicoidea, from wells at Allahabad and Varanasi in U. P. This finding lend faunistic support to the Gondwana land theory of continents, as the other members of the sub-order Phreatoicoidea

are found in Australian continent in the East and African continent on the West. Tiwari (1955) described *Nichollsia menoni*, another species from Monghyr in Bihar. *Nichollsia* is the only isopod genus reported from the subterranean waters of India. *Nichollsia kashiensis* and *N. menoni* has been thoroughly investigated for its anatomy, histology and biology by the senior author (L. P. G.). This study has revealed many features not only in its morphology and anatomy but also in its ecology and biology reflecting the effect of subterranean mode of life on the animal. The most affected organs are the antennae, the eyes, the nervous system, the circulatory system, the digestive system and also the respiratory metabolism. In reproductive biology the size and number of their eggs and encubation period could be significantly correlated with the subterranean mode of life.

Amphipoda :

Chilton (1923) for the first time reported the occurrence of a blind and colourless amphipod as *Niphargus indicus* from coal mines in West Bengal near Asansole. This animal was shifted to another genus *Neoniphargus* by Stephensen (1931) and finally it was placed in a new genus *Indoniphargus* by Straskraba (1966) including specimen from a well in Rohod near Chaibasa in South Bihar. It has also been collected from wells in Monghyr district in Bihar by one of us (L. P. G.).

Fishes :

Menon (1951a) described a remarkable blind clariid fish, *Horaglanis krishnai* from a well at Kottayam, Kerala. The fish is depigmented and internal organs affected are alimentary canal, liver, kidney, gonads, air bladder and accessary respiratory organs (Menon 1952). Discovery of this fish in subterranean water in India is of great zoogeographical interest (Menon 1951b). He has also emphasized that the fish is secondarily simplified.

From the above account it is evident that the cave fauna in India is far less specialised. A vast majority of the animals belong to the species which occure or may be expected to occure outside the caves. These cavernicoles are at the early stages of evolution. From the degree of specialization of the fauna it can be safely inferred that the caves are of comparatively recent origin.

The ground water fauna is least explored in this country but from taxonomic, evolutionary and zoogeographical considerations it has yielded most interesting and valuable results.

ACKNOWLEDGEMENTS

The authors are thankful to Dr. B. K. Tikader, Director, Zoological Survey of India, Calcutta and Officer-in-Charge, G. P. R. Stn., Z. S. I., Patna, for the facilities during the work.

REFERENCES

ANNANDALE, N., BROWN, J. C. and GRAVELY, F. H. 1914. The limestone caves of Burma and the Malay Peninsula. *J. Asiat. Soc. Bengal*, **9** : 391-423.

ARORA, H. L. 1931. Fauna of Lahore. 2. Entomostraca (Waterflies) of Lahore. *Bull. Deptt. of Zool., Punjab Univ.*, **1** : 62-100.

CAMERON, M. 1947. A new genus of blind Cavernicolous Staphylinidea from India. *Proc. R. ent. Soc. London*, (B) **16** : 30.

CHILTON, C. 1923. A blind Amphipod from a mine in Bengal. *Rec. Indian Mus.*, **25**(2) : 195-198.

Chopra, B. and TIWARI, K. K. 1950. On a new genus of Phreatoicid Isopod from wells in Banaras. *Rec. Indian Mus.* **47** : 277-290.

FAGE, L. 1946. Araignees cavernicoles de L' Inde. *Bull. Mus Nat. Hist. Paris*, (2) **18** : 382-388.

GLENNIE, E. A. 1947. Cave fauna. *J. Bombay Nat. Hist. Soc*,, **46** : 587-593.

GUPTA, L. P. 1980. Studies on the biology of subterranean Isopoda of the genus *Nichollsia* Chopra & Tiwari, 1950 (Crustacea : Isopoda : Phreatoicoidea). Ph. D. Thesis, Patna Univ. Patna.

—— 1981. On some anomalies in the abdominal region of *Nichollsia menoni* Tiwari 1955 (Isopoda : Phreatoicoidea). *Bull. Zool. Surv. India*, 4 (1) : 7-8.

—— 1984. *Indocandona krishnakanti* n. gen., n. sp. (Crustacea : Ostracoda : Candonidae) from Subterranean water of Bihar, India. *Rec. Zool. Surv. India*, **81** (3 & 4) : 291-298.

—— 1985. The setae of Subterranean Isopoda *Nichollsia menoni* Tiwari 1955 (Crustacea : Isopoda : Phreatoicoidea : Nichollsidae). *Bull. Zool. Surv. India*, **7** (1) : 93-101.

—— (in press) Monograph on *Nichollsia kashiensis* Chopra & Tiwari 1950 (Crustacea : Isopoda : Phreatoicoidea : Nichollsidae). *Mem. Zool. Surv. India*

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HARTMANN, G. 1964. Asiatische Ostracoden Systametiche and Zoogeographische Unter suchungen. *Int. Rev. ges. Hydrobiol* ; Beihefte **3** : 115 pp.

KEMP, S. W. and CHOPRA, B. N. et al 1924. The Siju cave, Garo Hills, Assam. *Rec. Indian Mus.*, **26** : 3-135.

LINDBERG, K. 1960. Revue des recherches biospeologiques in Asie moyenne et dans le sud du continent asiatique. *Rass. Speleol. Ital.*, XII.

MENON, A. G. K. 1951a. On a remarkable blind siluroid fish of the family Clariidae from Kerala (India). *Rec. Indian Mus.*, **48** (1950) : 59-66.

MENON, A. G. K. 1951b. Dirtribution of clariid fishes and its significance in zoogeographical studies. *Proc. Nat. Inst. Sci. India.*, **17** : 291-299.

MENON, A. G. K. 1952. On certain features in the anatomy of *Horaglanis* Menon. *J. Zool. Soc. India.*, **3** : 240-253.

NATH, C. N. & PILLAI, N. K. 1971. Studies on the genus *Lepidomysis* Clarke. (Crustacea : Mysidacea). *Hydrobiologia*, **37** (2) : 285-300.

NATH, C. N. & PILLAI, N. K. 1972. On the alimentary canal of *Speleomysis longipes* (Crustacea : Mysidacea)., *J. Zool. Soc. India.*, **23** (2) (1971) : 95-108.

PILLAI, N. K. & MARIAMMA, T. 1963. On the discovery of the primitive mysidacean family Lepidomysidae in India., *Curr. Sci. Banglore*, **32** : 219-220.

PILLAI, N. K. & MARIAMMA, T 1964. On a new Lepidomysid from India. *Crustaceana*, **7** (2) : 113-124.

RAM, L. 1972. A note on an abnormality in *Nichollsia kashiensis* Chopra and Tiwari. 1950. (Isopoda Phreatoicoidea). *Crustaceana*. Suppl. **3** : 7-10.

SINHA, Y. P. 1983. Bats of Rajasthan. *Science Reporter*, **20** (7) : 423-424.

STADLER, H. 1927. Foerschritte in dere Erforsohung der tierischen Bewohnerschaft dere hohlen Sudasiens und Indonesiens., *Metteil. Hohl Karstf.* Heft. **3** : 92-101.

STEPHENSEN, K. 1931. *Neoniphargus indicus* (Chilton), an Indian freshwater amphipod. *Rec. Indian Mus.*, **33** : 13-19.

STRASKRABA, M. 1966. Re-examination of the taxonomic status of *Niphargus indicus* Chilton (Amphipoda, Gammaridae) and its zoogeographical relations. *Proc. Symp. on Crustacea*, Pt. I : 126-132.

TIWARI, K. K. 1952. The morphology of *Nichollsia kashiense* Chopra and Tiwari (Crustacea : Isopoda : Phreatoicoidea). *Proc. Indian Acad. Sci.*, **35**(2) B : 69-77.

TIWARI, K. K. 1955. Another new species of *Nichollsia* (Crustacea : Isopoda : Phreatoicoidea). *Rec. Indian Mus.*, **53** : (3 & 4) : 379-381.

TIWARI, K. K. 1955. Nichollsidae, a new family of Phreatoicoidea (Crustacea : Isopoda). *Rec. Indian Mus.*, **53** (1 & 2) : 293-396.

TIWARI, K. K. 1962. A note on the testes in *Nichollsia kashiense* Chopra and Tiwari (Crustacea : Isopoda : Phreatoicoidea : Nichollsidae). *Crustaceana*, **3**(3) : 247-248.

TIWARI, K. K. AND LAKSHMAN RAM 1972. The foregut of *Nichollsia kashiense* Chopra and Tiwari, 1949 (Crustacea : Isopoda : Phreatoicoidea). *J. zool. Soc. India*, **24**(1) : 69-79.

VANDEL, A. 1964. "Biospeleology" The biology of cavernicolous animals. (English Translation—B. E. Freeman, 1965, Pergamon Press Ltd. London).

VICTOR, R. AND MICHAEL, R. G. 1975. Nine new species of freshwater Ostracoda from Madurai area in Southern India. *J. nat. Hist.*, **9** : 361-376.