



# A checklist of helminth parasite fauna in anuran Amphibia (frogs) of Nagaland, Northeast India

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**Abstract** An exhaustive exploratory survey on helminth parasite fauna of anuran frogs was carried out in several localities falling under 5 districts of western region of Nagaland state. Altogether 34 parasite species were recovered from a total of 29 host species surveyed. The parasite spectrum (represented in all the localities by at least one or more parasite species) comprises 2 monogenean, 15 trematode (13 adult and 2 metacercaria stages), 4 cestode (3 adult and 1 larval stages), 12 nematode and 1 acanthocephalan taxa. A checklist of both the parasite and host species with short remarks for each parasite species is provided herein.

**Keywords** Anuran Amphibia · Helminth · Parasite · Monogenea · Trematoda · Cestoda · Nematoda · Acanthocephala · Nagaland · Northeast India

## Introduction

Among the native populations of Nagaland and Meghalaya (Northeast India), like in many Far-East countries, frogs are used as a food item and for treatment of various ailments (Kiyasetuo 1986). Their involvement in several zoonotic infections has been reported by many workers, particularly among the populations in Southeast Asian countries, where eating of frogs and treatment of wounds

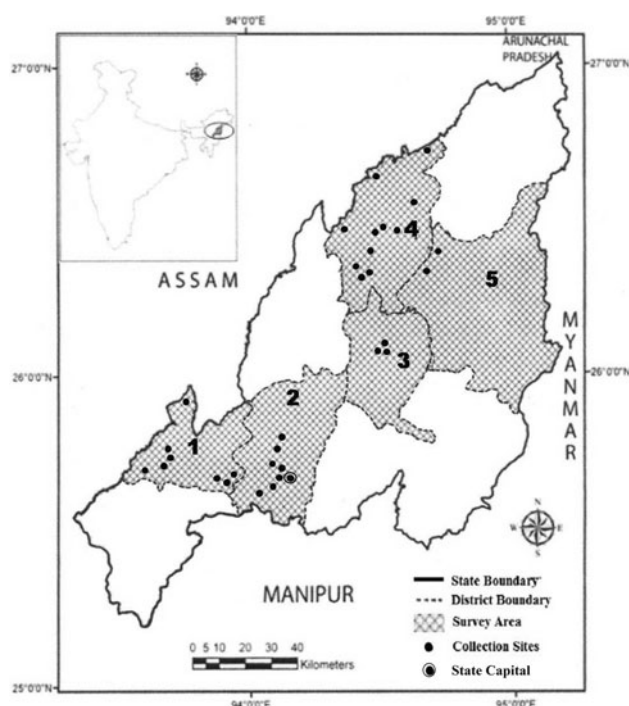
with raw flesh of frogs is customary (Suzuki et al. 1982; Shen 1988; Bodri 1994; Arora 1994). Highly endemic foci of Amphibia-borne zoonoses, sparganosis in particular, are known to occur among populations in the region (Mastura et al. 1995).

The first study pertaining to a survey of amphibian hosts occurring in Northeast India was carried out and limited to Meghalaya state only (Diengdoh 1989); it revealed the endemism and species richness of both anuran Amphibia and their sustained parasite fauna of the region (Diengdoh and Tandon 1991). In view of the commonality of sociocultural and culinary practices in the northeastern region with the neighbouring near-eastern countries, and also the fact that the region is known for its endemism (Chanda 1994), a preliminary study pertaining to the spectrum of helminth parasites of Anura was extended to Nagaland state; the survey results revealed a considerably high diversity and prevalence of helminth infections from all study areas of the region, with newer host and locality records for several helminth species (Imkongwapang 1997). The study also recorded a high intensity and prevalence of plerocercoid (sparganum) infection from several host species examined, all of which are used in traditional medicine and local cuisine among the natives of Nagaland (Tandon and Imkongwapang 1999; Tandon et al. 2001).

In Nagaland region, a rich diversity of anuran Amphibia, comprising as many as 32 species, has been reported (Ao et al. 2003). Since the earlier study covered only 13 species, a survey by furthering the study area and anuran host range was expected to bring out more and newer information of the hosts and their sustained parasite fauna in the region. In the present paper we provide a complete checklist of helminth parasites recorded till date from frog hosts in Nagaland, Northeast India.

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**Fig. 1** Map of Nagaland state, showing the survey area (shaded-districts) and collection sites (dots). 1 Dimapur, 2 Kohima, 3 Zunheboto, 4 Mokokchung, 5 Tuensang

## Materials and methods

### Study area

The study area comprised five major districts in the state of Nagaland. As a whole the state lies approximately between 26°6'–27°4'N and 93°20'–95°15', with an altitude ranging from 110 to 3,820 m ASL; the summer and winter temperatures vary from 0 to 29 °C in hill areas and in the foot hills, from 12 to 36 °C. The climate of the region is “modified tropical monsoon type” with an average annual rainfall of 250 cm (Husain 1988).

### Host/parasites collections and identifications

Exhaustive surveys were conducted at many localities in the study area during the period March to November for exploration and collection of anuran frog hosts (Fig. 1). A total of 29 host species falling under 15 genera represented by 5 families of anuran hosts were collected and examined for helminth infection, of which 7 host species (3 species of *Philautus*, 1 of *Theloderma*, 2 of *Rana* and 1 of *Fegervarya*) seem to be different from the known species in the respective genus, hence new to science. Therefore, these host forms could be identified till the level of genus only. Since a large number of anuran frog species are edible, they are collected from nature and sold in local markets by natives of Nagaland; therefore, many frog species were

bought from the market and some were caught by making frequent field excursions throughout the season. Collections were carried out preferably at nightfall with the assistance of local people in different spots of the mentioned localities, either with a net or bare hand by following the croaking sounds of males or by locating the nest constructed by the female (Cochran 1961) or by following the native ways of catching frogs.

Immediately after the catch, frogs were put in a container and prepared for autopsy and their various organs examined. The number of anuran species caught per field trip from a single spot was a maximum of five species on a particular night. The anuran hosts were identified following Chanda (1994), Chanda et al. (2001), Dutta (1997) and Ao et al. (2003).

Standard methods were followed in fixing and processing the parasite for examination. Identification of parasites is based on Yamaguti (1958, 1959, 1961, 1963a, b, 1971), Prudhoe and Bray (1982), Khalil et al. (1994), Jones et al. (2005), Pandey and Agarwal (2007), and CIH Keys to the Nematode Parasites of Vertebrates Nos. I–X (1974–1983).

## Host species examined for helminth parasites in Nagaland

FAMILY PELOBATIDAE	<i>Xenophrys glandulosa</i> (Boulenger, 1890)
	<i>X. wuliangshanensis</i> (Ye et Fei, 1995)
FAMILY HYLIDAE	<i>Hyla annectans</i> (Jerdon, 1870)
FAMILY MICROHYLIDAE	<i>Microhyla ornata</i> (Duméril et Bibron, 1841)
	<i>Microhyla</i> sp. 1
FAMILY RHACOPHORIDAE	<i>Rhacophorus maximus</i> (Günther, 1858)
	<i>R. bipunctatus</i> (Ahl, 1927)
	<i>R. gongshanensis</i> (Yang et Su, 1984)
	<i>Chirixalus vittatus</i> (Boulenger, 1887)
	<i>Philautus annandalii</i> (Boulenger, 1906)
	<i>Philautus</i> sp. 1
	<i>Philautus</i> sp. 2
	<i>Philautus</i> sp. 3
	<i>Polypedates leucomystax</i> (Gravenhorst, 1829)
	<i>P. megacephalus</i> (Hallowell, 1861)
	<i>P. taraiensis</i> (Dubois, 1987)
	<i>Theloderma asperum</i> (Boulenger, 1886)
	<i>Theloderma</i> sp.
	<i>Theloderma</i> sp.

FAMILY RANIDAE *Rana khare* (Kiyasetuo *et* Khare, 1986)  
*R. danielii* (Pillai and Chanda, 1977)  
*Rana* sp. 1  
*Rana* sp. 2  
*Eburana chloronota* (= *Rana livida*) (Blyth, 1855)  
*Amolops marmoratus* (Blyth, 1855)  
*Euphlyctis cyanophlyctis* (Schneider, 1799) Dubois, 1922  
*Fejervarya limnocharis* (Gravenhorst, 1829)  
*Fejervarya* sp.  
*Haplobatrachus tigerinus* (Daudin, 1803)  
*H. crassus* (Jerdon, 1853)  
*Paa mokochungensis* (Das *et* Chanda, 2000)

## Helminth parasite spectrum in anuran Amphibia

### PLATHYHELMINTHES

#### Monogenea

Order Polyopisthocotylea Odhner, 1912  
 Superfamily Polystomatoidea Price, 1936  
 Family Polystomatidae Gamble, 1896  
     Subfamily Polystomatinae Gamble, 1896  
     Genus *Polystoma* Zeder, 1800  
 1. *Polystoma indicum* Diengdoh and Tandon, 1991  
 2. *Neoriojatrema mokochungensis* Imkongwapang and Tandon, 2010

#### Trematoda: Digenea

Family Gorgoderidae (Looss, 1899) Looss, 1901  
     Subfamily Gorgoderinae Looss, 1899  
     Genus *Gorgoderina* Looss, 1902  
 3. *Gorgoderina ellipticum* Dwivedi, 1968  
 Family Paramphistomidae Fiscoeder, 1901  
     Subfamily Diplodiscinae Cohn, 1904  
     Genus *Diplodiscus* Diesing, 1836  
 4. *Diplodiscus amphichrus* Tubangui, 1933  
 5. *Diplodiscus mehrai* Pande, 1937  
 Family Hemiuridae Looss, 1899  
     Subfamily Halipeginae Ejsmont, 1931/Poche, 1926  
     Genus *Halipegus* Looss, 1899  
 6. *Halipegus mehransis* Srivastava, 1933  
 Family Mesocoeliidae Dollfus, 1929  
     Subfamily Mesocoeliinae (Faust, 1924) Dollfus, 1929  
     Genus *Mesocoelium* Odhner, 1910

7. *Mesocoelium monas* (Rudolphi 1819) Freitas, 1958  
 Family Batrachotrematidae Dollfus *et* Williams, 1966  
     Subfamily Opisthioparorchinae  
     Genus *Opisthioparorchis* Wang, 1980  
 8. *Opisthioparorchis indica* Tandon *et al.*, 2005  
 9. *Opisthioparorchis yunnanse* Li, 1996  
     Genus *Batrachotrema* Dollfus *et* Williams, 1966  
 10. *Batrachotrema nagalandensis* Tandon *et al.*, 2005  
 Family Pleurogenidae Looss, 1899  
     Subfamily Prosotocinae Yamaguti, 1959  
     Genus *Mehraorchis* Srivastava, 1934  
 11. *Mehraorchis ranarum* Srivastava, 1934  
     Genus *Prosotocus* Looss, 1899  
 12. *Prosotocus infrequetum* Gupta and Arora, 1979  
     Genus *Pleurogenoides* Travassos, 1921  
 13. *Pleurogenoides gastroporus* (Lühe, 1901) Travassos, 1921  
 Family Lecithodendridae Lühe, 1901  
     Genus *Ganeo* Klein, 1905  
 14. *Ganeo tigrinum* Mehra *et* Negi, 1928  
 Family Haematoloechidae Dayal *et* Lent, 1939  
     Subfamily Haematoloechinae Freitas and Lent, 1939  
     Genus *Haematoloechus* Looss, 1899  
 15. *Haematoloechus almorai* (Pande, 1937) Freitas and Lent, 1939  
 Family Cathaemasiidae Fuhrmann, 1928, emended Baer, 1932  
     Genus *Cathaemasia* Looss, 1899  
 16. *Cathaemasia* sp. (Metacercaria)  
 Family Proterodiplostomidae Dubois, 1936  
     Genus *Proalarioides* Yamaguti, 1933  
 17. *Proalarioides* sp. (Metacercaria)

#### Cestoda

Order Cyclophyllidea van Beneden in Braun, 1900  
 Family Nematotaeniidae Lühe, 1910  
     Genus *Cylindrotaenia* Jewell, 1916  
 18. *Cylindrotaenia baeri* (Hsu, 1935) (*Baerietta baeri* Hsu, 1935) Jones, 1987  
     Genus *Nematotaenioides* Ulmer *et* James, 1976

19. *Nematotaenioides* sp.  
Order Proteocephalidea Mola, 1928  
Family Proteocephalidae La Rue, 1911  
Genus *Proteocephalus* Weinland, 1858

20. *Proteocephalus tigrinus* Woodland, 1925

Order Pseudophyllidea Carus, 1863

21. Plerocercoid larva

## NEMATODA: Secernentea

Superfamily Oxyuroidea

Family Pharyngodonidae Travassos, 1919

Genus *Pharyngodon* Diesing, 1861

22. *Pharyngodon* sp.

Superfamily Cosmocercidae

Family Cosmocercidae (Railliet, 1916) Travassos, 1925

Subfamily Cosmocercinae Railliet, 1916

Genus *Aplectana* Railliet et Henry, 1916

23. *Aplectana agubernaculum* Gupta, 1960

Genus *Oxysomatium* Railliet et Henry, 1916

24. *Oxysomatium macintoshii* (Stewart, 1914) Karve, 1927

Genus *Cosmocercella* Steiner, 1924

25. *Cosmocercella* sp.

Genus *Paracosmocerca* Kung et Wu, 1945

26. *Paracosmocerca mucronata* Kung et Wu, 1945

Superfamily Rhabditoidea

Family Rhabdiasidae Railliet, 1916

Genus *Rhabdias* Stiles et Hassel, 1905

27. *Rhabdias ranae* Walton, 1929

Superfamily Trichostrongyloidea

Family Molineidae (Skrjabin et Schultz, 1973) Durette-Desset et Chabaud, 1977

Subfamily Molineinae Skrjabin et Schultz, 1973

Genus *Oswaldocruzia* Travassos, 1917

28. *Oswaldocruzia goezi* Skrjabin et Schulz, 1952

Superfamily Ascaridoidea

Family Ascarididae Baird, 1853

Subfamily Angusticaecinae Skrjabin et Karokhin, 1945

Genus *Ophidascaris* Baylis, 1920

29. *Ophidascaris* sp.

Genus *Amplicaecum* Baylis, 1920

30. *Amplicaecum* sp.

Superfamily Filarioidea

Family Onchocercidae (Leiper, 1911) Anderson et Bain, 1976

Subfamily Icosiellinae Anderson, 1958

Genus *Icosiella* Seurat, 1917

31. *Icosiella* sp. 1

32. *Icosiella* sp. 2

Superfamily Diaphanicephaloidea

Family Diaphanicephalidae Travassos, 1920

Genus *Kalicephalus* Molin, 1861

33. *Kalicephalus* sp.

## ACANTHOCEPHALA

Order Echinorhynchida Petrochenko, 1956

Family Echinorhynchidae Cobbold, 1879

Subfamily Echinorhynchinae Travassos, 1920

Genus *Acanthocephalus* Koelreuter, 1771

34. *Acanthocephalus bufonis* (Shiple, 1903) Southwell et Macfie, 1925

## Monogenea

Order Polyopisthocotylea Odhner, 1912

Superfamily Polystomatoidea Price, 1936

Family Polystomatidae Gamble, 1896

Subfamily Polystomatinae Gamble, 1896

Genus *Polystoma* Zeder, 1800

1. *Polystoma indicum* Diengdoh et Tandon, 1991

Material: 115 specimens

Measurements: mature specimen 6.732–16.614 × 2.222–5.641 mm in size.

Host: *R. maximus* (= *R. nigropalmatus*), *R. bipunctatus*, *T. asperum*, *P. megacephalus*, *P. leucomystax*, *H. annectans*

Location: Urinary bladder, ureter, body cavity

Locality: Kohima, Mokochung and Zunheboto (Nagaland)

## Remarks:

The present report constitutes three new host records from Nagaland, i.e., *R. bipunctatus*, *T. asperum* and *P. megacephalus* and Zunheboto, as a new locality record for *P. indicum*. As the first representative of the genus *Polystoma* from the Indian subcontinent, *P. indicum* was originally described from *R. maximus* of Meghalaya by Diengdoh and Tandon (1991). *R. bipunctatus*, *P. leucomystax* and *H. annectans* are other host species recorded for this species (Dutta 1995; Tandon et al. 2001).

Paratypes No.: NEHU/Z-MA 1.1–1.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

**Genus** *Neoriojatrema* Imkongwapang et Tandon, 2010

2. *Neoriojatrema mokokchungensis* Imkongwapang et Tandon, 2010

Material: 13 specimens

Measurements: mature specimen  $6.969\text{--}13.34 \times 3.795\text{--}7.82$  mm in size.

Host: *X. glandulosa*

Location: Urinary bladder

Locality: Mokokchung, Tuensang (Nagaland)

#### Remarks:

*N. mokokchungensis* was established as a new monogenean genus and species recorded from the country.

#### Generic diagnostic characters:

Larger width of body than opisthaptor, pharynx not cylindrical and not constricted in middle but round and bulbous, caeca not extending into opisthaptor and uniting, vitellaria not extending into opisthaptor, genital crown with 11–12 spines.

Holotype No.: W9247/1, deposited in Zoological Survey of India, Kolkata

Paratypes No.: 1.1–1.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

#### Trematoda: Digenea

Family Gorgoderidae (Looss, 1899) Looss, 1901

Subfamily Gorgoderinae Looss, 1899

**Genus** *Gorgoderina* Looss, 1902  
(Syn. *Microlecithus* Ozaki, 1926)

3. *Gorgoderina ellipticum* Dwivedi, 1968

Material: 12 specimens

Measurements: mature specimen  $2.72\text{--}2.92 \times 1.28\text{--}1.33$  mm in size.

Host: *E. cyanophlyctis*, *A. marmoratus*

Location: Urinary bladder

Locality: Kohima, Mokokchung, Dimapur (Nagaland)

#### Remarks:

Originally *G. ellipticum* was described from *E. cyanophlyctis* (= *Rana cyanophlyctis*) in Madhya Pradesh. Diengdoh (1989) reported this species from the same host and also from *Fejervarya limnocharis* (= *Rana limnocharis*) in Meghalaya. The species was also reported from the same host and locality (*E. cyanophlyctis*, Dimapur) by Tandon et al. (2001). Mokokchung is a new locality record and *A. marmoratus*, a new host record for *G. ellipticum* from the region.

Paratypes No.: NEHU/Z-TA 4.1–4.2, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Paramphistomidae Fishchoeder, 1901

Subfamily Diplodiscinae Cohn, 1904

**Genus** *Diplodiscus* Diesing, 1836

4. *Diplodiscus amphichrus* Tubangui, 1933  
(Syn. *D. sinicus* Li, 1937; *D. amphichrus magnus* Srivastava, 1934)

Material: 52 specimens

Measurements: mature specimen  $4.83\text{--}6.34 \times 1.46\text{--}1.89$  mm in size.

Host: *R. maximus*, *P. leucomystax*, *Rana* sp. 2, *C. vittatus*

Location: Intestine and rectum

Locality: Mokokchung (Nagaland)

#### Remarks:

*D. amphichrus* has been reported from many localities all across India such as Uttar Pradesh, West Bengal, Maharashtra, Tamil Nadu, Kerala etc. (Agarwal 1966; Mukherjee and Ghosh 1972; Nama and Khichi 1973; Pandey 1969; Singh 1977). From Northeast India, this species was first reported by Diengdoh (1989) in Meghalaya and by Tandon et al. (2001) in Nagaland from two hosts, *P. leucomystax* and *R. maximus*. The hosts, *Chirixalus vittatus* and an unidentified species of *Rana* (designated herein as *Rana* sp. 2) are new host records for this amphistomid fluke.

Paratypes No.: NEHU/Z-TA 6.1–6.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

5. *Diplodiscus mehrai* Pande, 1937  
(Syn. *D. amphichrus* (Tubangui, 1933) Singh, 1954)

Material: 71 specimens

Measurements: mature specimen  $1.66\text{--}2.64 \times 0.85\text{--}1.13$  mm in size.

Host: *E. cyanophlyctis*, *Rana* sp. 1, *H. tigerinus*, *H. crassus*, *Fejervarya* sp.

Location: Rectum

Locality: Kohima, Dimapur (Nagaland)

#### Remarks:

*D. mehrai* was earlier described from Kumaon Hills (Pande, 1937a) and Kashmir from *E. cyanophlyctis*, *Bufo viridis* and *Rana* sp. It was reported for the first time from Northeast India by Tandon et al. (2001) in Nagaland from *Rana* sp. 1 and *E. cyanophlyctis*. In the present study *H. tigerinus* and *H. crassus* from Dimapur and *Fejervarya* sp. from Mokokchung are reported as new host records.

Paratypes No.: NEHU/Z-TA 14.1–14.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Hemiuridae Lühe, 1901  
 Superfamily Halipeginae Ejsmont, 1931

**Genus** *Halipegus* Looss, 1899

6. *Halipegus mehransis* Srivastava, 1933a  
 (Syn. *H. mehransis minutus* Srivastava, 1933a; *H. spindale* Srivastava, 1933a)

Material: 12 specimens

Measurements: mature specimens  $3.98\text{--}4.24 \times 1.17\text{--}1.19$  mm in size.

Host: *E. cyanophlyctis*

Location: Stomach

Locality: Dimapur (Nagaland)

**Remarks:**

Originally described from *E. cyanophlyctis* by Srivastava (1933a), this species was reported from Shillong (Meghalaya) by Diengdoh (1989). Other locality records of this species include Rajasthan (Gupta 1970), Maharashtra (Mukherjee and Ghosh 1972), Bihar (Sinha and Prasad 1974), Tamil Nadu and Kerala (Singh 1977), Meghalaya (Diengdoh 1989) and Nagaland (Tandon et al. 2001). Besides *E. cyanophlyctis* and *H. tigerinus* the species has also been reported from a reptilian host in Andhra Pradesh (Sinha 1958).

Paratypes No.: NEHU/Z-TA 7.1–7.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Brachycoelidae (Looss, 1899) Johnston, 1912  
 Subfamily Mesocoeliinae (Faust, 1924) Dollfus, 1929

**Genus** *Mesocoelium* Odhner, 1910

7. *Mesocoelium monas* (Rudolphi, 1819) Freitas, 1958  
 (Syn. *Distoma monas* Rudolphi, 1819; *D. sociale* Lühe, 1901; *M. mesembrinum* Johnston, 1912; *M. oligoon* Johnston, 1912; *M. micron* Nicolis, 1914; *M. carli* Andre, 1915; *M. incognitum* Travassos, 1921; *M. megittii* Bhalerao, 1927; *M. monadi* Dollfus, 1929; *M. americanum* Hardwood, 1932; *M. burti* Fernando, 1933; *M. marrsi* Fernando, 1933; *M. leiperi* Bhalerao, 1936; *M. waltoni* Pereira and Cuoculo, 1940; *M. travassosi* Pereira and Cuoculo, 1940; *M. schwetzi* Dollfus, 1950; *M. marcoccanum* Dollfus, 1951; *M. macrebense* Dollfus, 1954; *M. brachyenteron* Dollfus, 1954; *M. sociale* Odhner, 1910).

Material: 137 specimens

Measurements: mature specimen  $2\text{--}2.57 \times 0.66\text{--}0.84$  mm in size.

Host: *P. leucomystax*, *P. taraiensis*, *P. annandalii*, *H. annectans*, *E. chloronota* (= *R. livida*), *E. cyanophlyctis*, *H. tigerinus*, *A. marmoratus* (= *A. afghanus*).

Location: Intestine

Locality: Mokokchung, Kohima, Tuensang, Dimapur

**Remarks:**

Species of *Mesocoelium* have been reported from different localities and a variety of amphibian and reptilian hosts in the Indian subcontinent or erstwhile British India. Sewell (1920) described *M. sociale* from *Bufo melanostictus* in Kolkata. This species has also been reported from West Bengal (Mukherjee and Ghosh 1972), Kerala and Tamil Nadu (Singh 1977). *M. megittii*, which was described by Bhalerao (1927) from lizards from Burma (Myanmar), was also reported to occur in toads and frogs of India (Meggit 1927; Bhalerao 1936). Diengdoh (1989) and Tandon et al. (2001) reported *M. monas* from *P. leucomystax* from Balphakram (Meghalaya) and Nagaland, respectively. Other species described in the genus *Mesocoelium* from India include *M. varunae* (Baugh 1956) from *B. melanostictus* and *M. thapari* (Gupta and Jahan 1976) from *H. tigerinus*.

The anuran species, i.e., *P. taraiensis*, *P. annandalii*, *H. annectans*, *E. chloronota* (= *Rana livida*), *E. cyanophlyctis* and *A. marmoratus* are new hosts record from the Indian subcontinent and Dimapur forms a new locality record for *M. monas*.

Paratypes No.: NEHU/Z-TA 7.1–7.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Batrachotrematidae Dollfus et Williams, 1966

**Genus** *Opisthioparorchis* Wang, 1980

8. *Opisthioparorchis indica* Tandon et al., 2005

Material: 76 specimens

Measurements: mature specimen  $1.80\text{--}2.33 \times 0.89\text{--}1.08$  mm in size.

Host: *A. marmoratus*

Location: Intestine

Locality: Mokokchung (Nagaland)

**Remarks:**

The genus *Opisthioparorchis* was erected by Wang (1980) for an intestinal fluke of *Rana spinosa* in Fujian Province, China. At present the genus includes six species, all described from China: *O. ranae* Wang, 1980 (type species) from *Rana spinosa*; *O. pleurogenitus* Wang, 1980 from the host and locality as those of the type; *O. boheansis* Wang, 1980 from *Struopsis wuyiensis*, also from Fujian; *O. megaloonis* Liang and Ke, 1988 and *O. meixianensis* Liang and Ke, 1988—both from *R. spinosa* in Changsha (Meixian, Guangdong Province) and *O. yunnanse* Li, 1996 also from Yunnan Province. *O. indica* is reported herein from a new

host *A. marmoratus* Nagaland, Northeast India and is a new leicithodendriid fluke species recorded from the country.

#### Specific diagnosis:

Intestinal caeca extending much beyond ventral sucker up to anterior level of testes, ventral sucker almost equal to oral sucker in size, genital pore in level with anterior margin of oral sucker, vitellaria extending beyond testes posteriorly, confluent medially in pre- and posttesticular regions.

Holotype No.: W 8341/1; Paratype No.: W 8342/1, 8343/1, deposited in Zoological Survey of India, Kolkata 700 053, India.

Paratypes No.: NEHU/Z-TA 12.1–12.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

#### 9. *Opisthioparorchis yunnanse* Li, 1996

Material: 10 specimens

Measurements: mature specimen 2.5–1.94 mm in size.

Host: *P. mokochungensis* (= *Rana liebigii*)

Location: Intestine

Locality: Kohima (Nagaland)

#### Remarks:

*O. yunnanse* was originally described from *Rana spinosa* from Yunnan Province, China. The present report from *P. mokochungensis* of Kohima (Nagaland) forms a new host and locality record from Northeast India.

Paratypes No.: NEHU/Z-TA 13.1–13.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

#### Genus *Batrachotrema* Dollfus et Williams, 1966

#### 10. *Batrachotrema nagalandensis* Tandon et al., 2005

Material: 16 specimens

Measurements: mature specimen  $2.38\text{--}3.89 \times 0.80\text{--}1.27$  mm in size.

Host: *A. marmoratus*, *R. khare*

Location: Intestine

Locality: Mokochung

#### Remarks:

Originally, *B. nagalandensis* was reported for the first time from *A. marmoratus* and *R. khare* of Nagaland, Northeast India (Tandon et al. 2001). In the present study *B. nagalandensis* was not encountered in new host species or other localities, except from *A. marmoratus* of Mokochung.

#### Specific diagnosis:

Body unspined, fusiform, testes located in middle third of body; cirrus sac long, extending beyond ventral sucker posteriorly, ovary rounded.

Holotype No.: W8338/1; Paratype No.: W8339/1, W8340/1, deposited in Zoological Survey of India, Kolkata 700 053, India.

Paratypes No.: NEHU/Z-TA 11.1–11.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Pleurogenidae Looss, 1899

#### Genus *Mehraorchis* Srivastava, 1934

#### 11. *Mehraorchis ranarum* Srivastava, 1934

Material: 44 specimens

Measurements: mature specimen  $2.41\text{--}3.10 \times 1.77\text{--}2.23$  mm in size.

Host: *H. tigerinus*

Location: Gall bladder and bile duct

Locality: Dimapur

#### Remarks:

Originally described by Mukherjee and Ghosh (1970a, b), in West Bengal from *H. tigerinus* (= *Rana tigrinus*), this species was also reported from Dimapur, Nagaland, by Tandon et al. (2001).

Paratypes No.: NEHU/Z-TA 8.1–8.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

#### Genus *Prosotocus* Looss, 1899

#### 12. *Prosotocus infrequentum* Srivastava, 1933b

Material: 17 specimens

Measurements: mature specimen  $0.93\text{--}1.34 \times 0.73\text{--}0.89$  mm in size.

Host: *H. tigerinus*

Location: Intestine

Locality: Dimapur

#### Remarks:

Originally *P. infrequentum* was described by Srivastava (1933b) in Sitapur (Uttar Pradesh) from *E. cyanophlyctis*. The description of the parasites in the present collection tallies with the original description of the species, with a few minor variations in the size and shape of the body and its organs. Dimapur (Nagaland) Northeast India is a new locality record and *H. tigerinus* a new host for *P. infrequentum*.

Paratypes No.: NEHU/Z-TA 9.1–9.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

#### Genus *Pleurogenoides* Travassos, 1921

#### 13. *Pleurogenoides gastroporus* (Lühe, 1901) Travassos, 1921

(Syn. *Pleurogenes gastroporus* Lühe, 1901; *P. (Pleurogenes) gastroporus* (Lühe, 1901) Mehra et Negi,

1928; *P. (Pleurogenes) gastroporus* var *equalis* Mehra et Negi, 1928; *Pleurogenes orientalis* Srivastava, 1934; *Pleurogenes sawanensis* Gupta, 1954a)

Material: 105 specimens

Measurements: mature specimen  $1.21\text{--}1.33 \times 0.95\text{--}0.99$  mm in size.

Host: *A. marmoratus* (= *A. afghanus*), *H. tigerinus*, *H. crassus*, *Rana khare*, *X. wuliangshanensis*, *Philautus* sp. 1 and *P. leucomystax*

Location: Intestine

#### Remarks:

Originally described from *H. tigerinus* in Uttar Pradesh by Mehra and Negi (1928), *P. gastroporus* has been recorded from *H. tigerinus* and *E. cyanophlyctis* from several localities in India such as Rajasthan, Uttar Pradesh, Maharashtra, Kerala and Meghalaya (Gupta 1970; Mukherjee and Ghosh 1970a, b, 1972; Diengdoh 1989). Earlier from Northeast region, the species was reported from Nagaland with *R. khare* and *A. marmoratus* as new hosts by Tandon et al. (2001). In the present study three more hosts, *H. crassus*, *Philautus* sp. 1 and *P. leucomystax* were encountered, which constitute new host records from the region for this species.

Paratypes No.: NEHU/Z-TA 2.1–2.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Lecithodendridae Lühe, 1901

#### Genus *Ganeo* Klein, 1905

14. *Ganeo tigrinum* Mehra et Negi, 1928  
(Syn. *G. attenuatum* Srivastava, 1933b; *G. gastricus* Srivastava, 1933b; *G. kumaonensis* Pande, 1937b; *G. srinagarensis* Kaw, 1950; *G. govindis* Dayal and Gupta, 1953; *G. punjabensis* Gupta, 1954b; *G. bufonis* Fotedar, 1959; *G. lucknowensis* Gupta and Jahan, 1976)

Material: 481 specimens

Measurements: mature specimen  $2.74\text{--}3.45 \times 1.09\text{--}1.65$  mm in size.

Host: *E. cyanophlyctis*, *H. tigerinus*, *H. crassus*, *F. limnocharis*, *Rana* sp. 1, *P. leucomystax* and *Fejervarya* sp.

Location: Intestine

Locality: Mokokchung, Kohima, Dimapur

#### Remarks:

Originally described from *H. tigerinus* at Allahabad by Mehra et Negi (1928), *G. tigrinum* has been reported from several other parts of the country, mainly represented in *Rana* and *Bufo* spp. (Mukherjee and Ghosh 1970a, 1972; Agarwal and Singh 1977), though its occurrence is also reported from reptilian and piscine hosts (Sinha 1958;

Hafeezullah and Dutta 1985). Two more new hosts, i.e., *H. crassus* and *Fejervarya* sp. were encountered in the present study for *G. tigrinum* from Nagaland, Northeast India. Earlier it was reported from Meghalaya and Nagaland, by Diengdoh (1989) and Tandon et al. (2001), respectively.

Paratypes No.: NEHU/Z-TA 1.1–1.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Haematoloechidae Freitas et Lent, 1939

Subfamily Haematoloechinae Freitas et Lent, 1939

#### Genus *Haematoloechus* (Looss, 1899) Freitas et Lent, 1939

15. *Haematoloechus almorai* (Pande, 1937b) Freitas et Lent, 1939  
(Syn. *Pneumonoeces almorai* Pande, 1937b)

Material: 32 specimens

Measurements: mature specimen  $6.92\text{--}9.45 \times 1.38\text{--}1.74$  mm in size.

Host: *E. cyanophlyctis*, *H. tigerinus* and *Rana* sp. 1

Location: Lung

Locality: Mokokchung, Kohima, Dimapur

#### Remarks:

Originally described from *E. cyanophlyctis* in Kumoan Hills by Pande (1937a), this species has been recorded from Meghalaya and Nagaland by Diengdoh (1989) and Tandon et al. (2001) from the hosts, *E. cyanophlyctis* and *H. tigerinus*, respectively. Together with these hosts, *Rana* species (designated herein as *Rana* sp. 1) was also recorded from the latter locality. *H. almorai* is well represented in many localities of India such as Kashmir (Kaw 1950), Andhra Pradesh (Khan and Mohiddin 1968), North India (Tickoo 1970; Mukherjee and Ghosh 1972), West Bengal, Maharashtra (Mukherjee and Ghosh 1970a, 1972), Tamil Nadu and Kerala (Singh 1977) from *H. tigerinus*.

Paratypes No.: NEHU/Z-TA 3.1–3.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Cathaemasiidae Fuhrmann, 1928

#### Genus *Cathaemasia* Looss, 1899

16. *Cathaemasia* sp.—Metacercaria

Material: 6 specimens

Measurements: encysted metacercaria  $1.64 \times 0.76$  mm in size.

Host: *E. cyanophlyctis*

Location: Liver, thigh muscle

Locality: Kohima

**Remarks:**

*Cathaemasia* sp. is known to be parasites of birds and *E. cyanophlyctis* represents the second intermediate host for the fluke. The presence of this species was recorded from Nagaland in Kohima region by Tandon et al. (2001).

Paratypes No.: NEHU/Z-MC (A) 1.1–1.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Proterodiplostomidae Dubois, 1936

**Genus** *Proalarioides* Yamaguti, 1933

(Syn. *Travassosstomum* Bhalerao, 1938)

17. *Proalarioides* sp.—Metacercaria

Material: 73 specimens

Measurements: encysted metacercaria  $2.55 \times 1.33$  mm in size.

Host: *E. cyanophlyctis*, *H. tigerinus*

Location: Liver, body muscles

Locality: Dimapur

**Remarks:**

A metacercaria representing the genus *Proalarioides* was reported for the first time from Northeast India by Tandon et al. (2001) in the host, *E. cyanophlyctis*. In the present study, the parasite was recovered from *H. tigerinus* at Dimapur, which thus constitute a new host and locality record for the species from the region. This metacercaria has earlier been reported from frog hosts in India from *Bufo melanostictus*, *H. tigerinus* and *E. cyanophlyctis* from several localities (Srivastava and Ghosh 1969; Karyakarte 1967; Mukherjee and Ghosh 1970a).

Paratypes No.: NEHU/Z-MC (A) 2.1–2.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

**Cestoda**

Order Cyclophyllidea Van Beneden In Braun, 1900

Family Nematotaniidae Lühe, 1910

**Genus** *Cylindrotaenia* Jewell, 191618. *Cylindrotaenia baeri* (Hsu, 1935) Jones, 1987  
(Syn: *Baerietta baeri* Hsu, 1935)

Material: 169 specimens

Measurements: strobila  $0.176\text{--}0.243 \times 9.5\text{--}19.5$  mm in size.

Host: *H. annectans*, *R. bipunctatus*, *P. annandalii*, *Philautus* sp. 1, *P. taraiensis*, *E. cyanophlyctis*, *F. limnocharis*

Location: Intestine

Locality: Kohima, Mokokchung

**Remarks:**

While revising the family Naematotaenioides, Jones (1987) considered the genus *Baerietta* (with two testes per proglottid) to be similar to *Cylindrotaenia* Jewell, 1916 (with one testis per proglottid), since this distinguishing character (of number of testes per proglottid) was not valid. Thus, *Baerietta* became a junior synonym of *Cylindrotaenia*, with *B. baeri* becoming a new combination, i.e., *C. baeri* (Hsu 1935).

The occurrence of *Cylindrotaenia* (= *Baerietta*) *baeri* in anuran Amphibia was reported for the first time from Meghalaya by Diengdoh (1989) and also by Dutta (1991). Originally described from *Bufo asiaticus* in China, this species was also reported from Kohima (Nagaland), a new locality record with a new host *H. annectans* by Tandon et al. (2001). The present study recorded its presence in yet another new locality, Mokokchung (Nagaland) with the addition of five more new anuran hosts, viz. *R. bipunctatus*, *P. annandalii*, *Philautus* sp. 1, *P. taraiensis*, *F. limnocharis*.

Paratypes No.: NEHU/Z-CA 3.1–3.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

**Genus** *Nematotaenioides* Ulmer et James, 197619. *Nematotaenioides* sp.

Material: 2 specimens

Measurements: strobila 40–67 mm in length.

Host: *H. tigerinus*, *P. taraiensis*

Location: Intestine

Locality: Mokokchung, Dimapur

**Remarks:**

The report of *Nematotaenioides* sp. from Nagaland forms a new locality record and *H. tigerinus* and *P. taraiensis*, new host records for the genus from the region.

Paratypes No.: NEHU/Z-CA 4.1, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Proteocephalidae La Rue, 1911

**Genus** *Proteocephalus* Weinland, 185820. *Proteocephalus tigrinus* Woodland, 1925

Material: 1 mature specimen

Measurements: strobila 15 mm in length.

Host: *H. tigerinus*, *P. megacephalus*

Location: Intestine

Locality: Dimapur

**Remarks:**

Originally described by Woodland (1925) from *H. tigerinus* (= *Rana tigrina*) from Allahabad, Uttar Pradesh,

*P. tigrinus* was redescribed by Gupta and Arora (1979) from the same host from Punjab. Dimapur (Nagaland) and *P. megacephalus* constitute a new locality and a new host record, respectively for *P. tigrinus*.

Paratypes No.: NEHU/Z-CA 5.1, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Order Pseudophyllidea Carus, 1863

## 21. Plerocercoid larva

Material: The collection comprised numerous specimens  
Measurements: 50.2–75.1 mm in length.

Host: *E. cyanophlyctis*, *H. tigerinus*, *H. crassus*, *F. limnocharis*, *Fejervarya* sp., *Rana* sp. 1, *R. maximus*, *R. bipunctatus*, *P. leucomystax*

Location: Thigh and body muscles

Locality: Kohima, Mokochung, Dimapur

### Remarks:

Plerocercoid larvae have been reported earlier from Northeast India by Diengdoh (1989) in Meghalaya and by Tandon and Imkongwapang (1999) in Nagaland from several hosts, namely, *E. cyanophlyctis*, *H. tigerinus*, *F. limnocharis*, *R. bipunctatus* of Meghalaya and *H. tigerinus*, *Rana* sp. 1, *R. bipunctatus* and *P. leucomystax* of Nagaland, respectively. In the present study, Zunheboto forms a new locality record from the region and *H. crassus*, *F. limnocharis* and *Fejervarya* sp. are new hosts for plerocercoid larvae.

Paratypes No.: NEHU/Z-CA 2.1–2.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

## Nematoda: Secernentea

### Oxyuroidea

Family Pharyngodonidae Travassos, 1919

Genus *Pharyngodon* Diesing, 1861

## 22. *Pharyngodon* sp.

Material: 6 female specimens

Measurements: body 4.163–7.521 mm in length and 0.230–0.414 mm in maximum width;  
eggs 0.131–0.133 × 0.032–0.037 mm in size.

Host: *P. annandalii*, *Theloderma* sp.

Location: Intestine

Locality: Mokochung

### Remarks:

On account of the characters evident in the female worms viz., vulva post-esophageal, directly below the excretory

pore; eggs numerous, with thin membrane and elongated, the present form seems to belong to the genus *Pharyngodon*. However, species identification is difficult if not based on the characters such as the number of spicules, presence or absence of gubernaculum etc. in the male worm. Since the present collection comprised only female specimens, the species identification is being kept in abeyance pending collection of male specimens from the same hosts and locality. Nevertheless, the genus *Pharyngodon* is being reported herein for the first time from amphibian hosts and from the country.

Paratypes No.: NEHU/Z-NA 9.1–9.3, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

### Cosmocercioidea

Family Cosmocercidae (Railliet, 1916) Travassos, 1925

Subfamily Cosmocercinae Railliet, 1916

Genus *Aplectana* Railliet and Henry 1916

## 23. *Aplectana agubernaculum* Gupta, 1960

(Syn. *Neorielletnema* Ballesteros, 1945; *Nyeraplectana* Ballesteros, 1945; *Neoxysomatoides* Yamaguti, 1961)

Material: >900 specimens

Measurements: body 1.61–3.0 mm in length and 0.13–0.30 mm in maximum width (male);  
6.46–7.06 × 0.47–0.49 mm (female);  
eggs 0.13–0.14 × 0.04–0.04 mm in size.

Host: *R. maximus*, *P. leucomystax*, *Philautus* sp. 1, *R. khare*, *Rana* sp. 1, *R. danielii*, *E. chloronota* (= *R. livida*), *E. cyanophlyctis*, *A. marmoratus* (= *A. afghanus*)

Location: Intestine

Locality: Mokochung

### Remarks:

Species of *Aplectana* are well distributed all over the world among the amphibians (Yamaguti 1961). Gupta (1960) described two species, *A. agubernaculum* and *A. asiatica* from *H. tigerinus* and *B. melanostictus*. Diengdoh (1989) reported the occurrence of *Aplectana* sp. in *R. maximus* (= *R. nigropalmatus*) in Northeast India. Tandon et al. (2001) also reported the same form from Nagaland, constituting a new locality record and added five new hosts—*E. chloronota* (= *R. livida*), *R. khare*, *E. cyanophlyctis*, *P. leucomystax* and *A. marmoratus* for *A. agubernaculum*.

Paratypes No.: NEHU/Z-NA 6.1–6.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Genus *Oxysomatium* Railliet et Henry, 1913

24. *Oxysomatium macintoshii* (Stewart, 1914) Karve, 1927

Material: 159 specimens

Measurements: body 1.788–2.124 mm in length and 0.071–0.08 mm in maximum width (male); 2.21–3.45 × 0.122–0.198 mm (female); eggs 0.122–0.0203 × 0.066–0.152 mm in size.

Host: *P. leucomystax*, *E. cyanophlyctis*, *H. annectans*

Location: Intestine

Locality: Kohima, Mokokchung, Zunheboto

**Remarks:**

First described by Karve (1927) from India, this nematode species was earlier reported by Diengdoh (1989) from Meghalaya, Northeast India. In the present study Nagaland (Zunheboto, Mokokchung and Kohima) constitutes a new locality record for *O. macintoshii* and *P. leucomystax*, *H. annectans*, *P. annandalii*, *R. gongshanensis* and *E. cyanophlyctis* are new host records from the region for the species.

Paratypes No.: NEHU/Z-NA 2.1–2.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

**Genus** *Cosmocercella* Steiner, 1924

25. *Cosmocercella* sp.

Material: 1 male and 16 female specimens

Measurements: body 3.61 mm in length and 0.161 mm in maximum width (male); 3.31–3.35 × 0.13–0.14 mm (female); eggs 0.151–0.153 × 0.100–0.102 mm in size.

Host: *R. maximus* (= *R. nigropalmatus*), *P. leucomystax*

Location: Intestine

Locality: Mokokchung

**Remarks:**

The representation of the genus *Cosmocercella* from Amphibia in Nagaland, Northeast India was first reported by Tandon et al. (2001) with *R. maximus* and *P. leucomystax* as new host species.

Paratypes No.: NEHU/Z-NA 7.1, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

**Genus** *Paracosmocerca* Kung and Wu, 1945

(Syn. *Nematoxys* Schneider, 1866, partim; *Ananconus* Railliet and Henry, 1916)

26. *Paracosmocerca mucronata* Kung and Wu, 1945

Material: 22 specimens

Measurements: body 2.72–2.98 × 0.23–0.26 mm (male); 3.23–4.12 × 0.16–0.17 mm (female); eggs 0.27–0.34 × 0.27–0.34 mm in size.

Host: *P. leucomystax*, *X. wuliangshanensis*, *R. khare*

Location: Intestine

Locality: Kohima, Mokokchung

**Remarks:**

*P. mucronata* was originally described from *Rana nigromaculata*, *R. günther*, *R. limnocharis*, *Bufo bufo* and *Micrhylla ornata* from China by Kung and Wu (1945). Gupta and Duggal (1980) added a new species, *P. indica* (from *Rana* sp. from Chandigarh) to the genus, describing it as the first representative of the genus from India and differentiating it from the type species in having three pairs of plectanes as against five pairs of plectanes in the latter. The present form, in having five pairs of plectanes definitely represents *P. mucronata* that is being recorded herein from a new locality (Northeast India) and three new host species.

Paratypes No.: NEHU/Z-NA 8.1–8.3, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

**Rhabdisidoidea**

Family Rhabditidae Railliet, 1916

**Genus** *Rhabdias* Stiles et Hassel, 1905

(Syn. *Ophiorhabdias* Yamaguti, 1943; *Shorttia* Singh et Ratnamala, 1977)

27. *Rhabdias ranae* Walton, 1929

Material: 1,151 female specimens

Measurements: body 10.88–11.27 mm in length and 0.29–0.31 mm in maximum width; eggs 0.09–0.1 × 0.051–0.052 mm in size.

Host: *R. maximus*, *R. gongshanensis*, *R. bipunctatus*, *H. annectans*, *Theloderma* sp., *P. annandalii*, *Philautus* spp (i.e., sp. 1, 2, 3), *P. leucomystax*, *P. megacephalus*, *Rana khare*, *Rana* sp. 2, *R. danielii*, *H. tigerinus*, *E. cyanophlyctis*, *F. limnocharis*, *A. marmoratus*, *X. glandulosa* and *X. wuliangshanensis*

Location: Lungs

Locality: Kohima, Mokokchung, Dimapur, Tuensang

**Remarks:**

The first reporting of *R. ranae* from Northeast India was by Diengdoh (1989) from various localities of Meghalaya. Tandon et al. (2001) also reported this species from Nagaland, with the addition of some new hosts such as *H. annectans*, *R. bipunctatus*, *R. khare* and *E. cyanophlyctis* from the region. In the present study numerous specimens of this form were collected from many host species, *R. gongshanensis*, *Theloderma* sp., *P. annandalii*, *Philautus*

spp., *P. megacephalus*, *Rana* sp. 1, *R. danielii*, *F. limnocharis*, *X. glandulosa* and *X. wuliangshanensis*, all of which are recorded as new hosts for *R. ranae*.

Paratypes No.: NEHU/Z-NA 1.1–1.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

### Trichostrongyloidea

Family Molineidae (Skrjabin *et* Schultz, 1937) Durette-Desset *et* Chabaud, 1977

Subfamily Molineinae Skrjabin *et* Schultz, 1937

**Genus** *Oswaldocruzia* Travassos, 1917  
(Syn. *Oswaldocruzia* (*Bialata*) Morishita, 1926)

28. *Oswaldocruzia goezi* Skrjabin *et* Schultz, 1952  
(Syn. *Ascaris filiformis* Goeze, 1782 partially; *O. filiformis* (Goeze, 1782) Travassos, 1917; *O. indica* Lal, 1942; *O. melanosticti* Gupta, 1960)

Material: 23 specimens

Measurements: body 5.33–5.39 mm in length and 0.11–0.12 mm in maximum width (male); 11.5–11.8 × 0.21–0.23 mm (female); eggs 0.06–0.07 × 0.02–0.03 mm in size.

Host: *E. cyanophlyctis*

Location: Intestine

Locality: Kohima, Dimapur

### Remarks:

Earlier *O. goezi* was reported from Meghalaya by Dindogoh (1989) and also from Kohima, Nagaland by Tandon *et al.* (2001). The present study reports Dimapur as a new locality from Nagaland for the species.

Paratypes No.: NEHU/Z-NA 3.1–3.2, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

### Ascaridoidea

Family Ascarididae Baird, 1855

Subfamily Angusticaecinae Skrjabin *et* Karokhin, 1945

**Genus** *Ophidascaris* Baylis, 1920

29. *Ophidascaris* sp.

Material: 203 specimens

Measurements: body 50.8–52.79 mm in length and 0.01–0.013 mm in maximum width (male); 51.73–76.2 × 0.01–0.02 mm (female); eggs 0.0004–0.0005 × 0.0003–0.0004 mm (eggs) in size.

Host: *A. marmoratus*

Location: Intestine

Locality: Mokokchung

### Remarks:

Members of the genus *Ophidascaris* are mainly parasites of snakes and lizards, occasionally of amphibians. Two species, namely, *O. gestri* Parona, 1890 and *O. ajaris* Khera, 1956 have been reported from reptiles of India. Only *O. labiadopapillosa* Walton, 1927 has been recorded to be naturally occurring in *Rana* species in USA (Ash and Beaver 1963). This form was assigned to the genus *Ophidascaris* by Tandon *et al.* (2001).

In the present study numerous specimens of this form, both male and female, were collected from the same host, *A. marmoratus*, but never from any other host species collected from the same spot; hence the worm seems to maintain a specific host. The species identification is being kept in abeyance, due to pending examination of and comparison with the hitherto known species of the genus.

Paratypes No.: NEHU/Z-NA 10.1–10.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Heterocheilidae Railliet *et* Henry, 1915

**Genus** *Amplicaecum* Baylis, 1920

30. *Amplicaecum* sp.

Material: 13 female specimens without any eggs in the uterus

Measurements: body 10.11–11.81 mm in length and 0.48.2–0.55 mm in maximum width.

Host: *H. tigerinus*, *H. crassus*

Location: Intestine

Locality: Dimapur

### Remarks:

The occurrence of *Amplicaecum* sp. was for the first time reported from Nagaland (Northeastern India) by Tandon *et al.* (2001).

Paratypes No.: NEHU/Z-NA 13.1, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

### Filaroidea

Family Onchocercidae (Leiper, 1911) Anderson *et* Bain, 1976

Subfamily Icosiellinae Anderson, 1958

**Genus** *Icosiella* Seurat, 1917

31. *Icosiella* sp. 1 of Imkongwapang, 1997

Material: 49 specimens, all female

Measurements: body 11.99–13.17 mm in length and 0.31–0.33 mm in maximum width; eggs 0.027–0.034 × 0.016–0.018 mm.

Host: *E. cyanophlyctis*, *P. leucomystax*, *Rana* sp. 1

Location: Intestine, stomach

Locality: Dimapur

**Remarks:**

On account of having an oesophagus with a distinct anterior muscular and a posterior glandular region and the opening of vulva located in the glandular region of the oesophagus, the present form is relegated to the genus *Icosiella*. Since only female specimens were recovered during the study, their species status could not be ascertained. Hence, the species identification of this *Icosiella* has been kept in abeyance.

The genus *Icosiella* was reported for the first time from the Indian subcontinent by Imkongwapang (1997). *E. cyanophlyctis*, *P. leucomystax*, *Rana* sp. 1 are new host records for the genus. So far the members of this genus have been reported to occur in the connective, subcutaneous or intermuscular tissue of frogs. The present form, however, was recovered from the gastro-intestinal tract of the host.

Paratypes No.: NEHU/Z-NA 14.1, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

32. *Icosiella* sp. 2 of Imkongwapang, 1997

Material: 25 specimens

Measurements: body 16.5–17.1 mm and 0.5–0.6 mm in maximum width (male); 18.4–28.2 × 0.98 mm (female).

Host: *A. marmoratus*

Location: Peritoneal wall, peritoneal cavity

Locality: Mokokchung

**Remarks:**

In earlier survey and study of helminth parasites of anuran hosts in Northeast India, Imkongwapang (1997) had encountered *Icosiella* sp. 2 from peritoneal wall tissue of *A. mamoratus* from Mokokchung. The present form fully tallies in description with *Icosiella* sp. 2 of Imkongwapang (1997). The present observations also reconfirm the restricted distribution and host specificity of this filaroid nematode. However, since male specimens recovered were very fragile and getting disintegrated on handling and processing, good whole mounts of these specimens could not be prepared. Therefore, for want of more material of male specimens to be available for study, the species identification is being kept in abeyance.

Paratypes No.: NEHU/Z-NA 11.1–11.5, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

## Diaphanicephaloidea

Family Diaphanicephalidae Travassos, 1920

**Genus** *Kalicephalus* Molin, 1861

33. *Kalicephalus* sp.

Material: 30 female specimens

Measurements: body 7.38–8.27 mm in length and 0.28–0.37 mm in maximum width; eggs 0.04–0.05 × 0.03–0.03 mm in size.

Host: *P. leucomystax*, *E. cyanophlyctis*

Location: Intestine, stomach

Locality: Dimapur

**Remarks:**

The presence of two lateral jaws in the anterior extremity, absence of corona radiata, oesophagus with bulbous posterior and vulva closer to mid body than to anus in mature specimens and the amphidelphic condition of the female specimen confirm the placement of this form under the genus *Kalicephalus*.

For want of male specimens and also pending comparison with the hitherto known species of the genus, the identification of the present form up to the species level is being kept in abeyance. Nagaland forms a new locality record and *P. leucomystax*, a new host for *Kalicephalus* sp. from amphibians in Northeast India.

Paratypes No.: NEHU/Z-NA 12.1, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

Family Echinorhynchidae Cobbold, 1879

Subfamily Echinorhynchinae Travassos, 1920

**Genus** *Acanthocephalus* Koelreuther, 1771

34. *Acanthocephalus bufonis* (Shipley, 1903) Southwell and Macfie, 1925

(Syn. *Echinorhynchus bufonis* Shipley, 1903; *Acanthocephalus sinensis* Van Cleave, 1937)

**Material:** 83 specimens (male and female)

Measurements: body 8.82–14.53 mm in length and 0.98–1.56 mm in maximum width (male); 11.52–52.52 × 1.74–1.94 mm (female).

Host: *E. cyanophlyctis*, *H. tigerinus*, *Rana* sp. 1, *R. khare*,  
*E. chloronota* (= *R. livida*), *A. marmoratus*, *X.*  
*glandulosa*, *P. leucomystax*, *P. taraiensis*

Location: Intestine

Locality: Kohima, Mokokchung, Dimapur

**Remarks:**

*Acanthocephalus bufonis* was earlier reported from *H. tigerinus* from Meghalaya by Diengdoh (1989) and from *E. cyanophlyctis* and *P. leucomystax* from Nagaland by Tandon et al. (2001). In the present study, *P. taraiensis*, *R. khare*, *E. chloronota* (= *R. livida*), *A. marmoratus*, and

*X. glandulosa* constitute new host records for this acanthocephalan species.

Paratypes No: NEHU/Z-AA 1.1–1.4, in helminthological collection of Department of Zoology, NEHU, Shillong, India.

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