

## THE SYSTEMATICAL COMPOSITION OF THE FAMILY HETERAXINIDAE AND OTHER ALLIED FAMILIES OF MONOGENEA

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**Abstract.** This paper briefly presents a system of Heteraxinidae and other allied small monogenean families of suborder Microcotylinea Lebedev, 1972 with the indication of specific composition of all taxa and diagnoses of some taxa; new families Megamicrocotylidae, Paramonoxinidae and Monaxinoitidae are proposed.

In a previous paper (Mamaev 1986), the systematical composition of the family Microcotylidae was analysed. The present paper proceeds and follows the same pattern. (The reader is referred to the abovecited paper for introductory material, which also applies to this paper.)

### Heteraxinidae (Unnithan, 1957) Price, 1962

Mazocraeidea, Microcotylinea. Haptor greatly asymmetric, seldom unilateral due to a reduction of clamps on the opposite side. Clamps are microcotylid type but with supplementary process trident or bident. Anchors frequently present and situated on the posterior end of haptor on the lappet. Buccal suckers usually aseptate. Intestinal limbs unfused, with lateral branches. Testes numerous, postovarial. Copulative apparatus is various. Ovary usually in form of interrogation mark. Vagina dorsal (double or single) or absent. True seminal receptacle present, rarely absent. Parasites of marine Perciformes (with few exceptions), mainly of Carangidae.

#### 1. Heteraxinae Unnithan, 1957

Heteraxinidae with bilateral haptor on one side of which the clamps are more numerous and a little larger than on the other. Clamp skeleton is usually symmetric, consisting (as in Microcotylidae) of 5 sclerites but with trident or, rarely, bident processus medio-supplementarius. Anchors in adult absent, as a rule. Buccal suckers aseptate. Genital atrium armed or unarmed, seldom inconspicuous. Vagina usually mediodorsal, single but with two ducts; rarely there are two dorsolateral vaginae or completely absent. Parasites of Perciformes, mainly of Carangidae.

1. *Heteraxine* Yamaguti, 1938. Type (single) species: *H. heterocarpa* (Goto, 1894) Yamaguti, 1938 (syn. *H. seriola* (Ishii, 1936) Yamaguti, 1938). Redescription — see Ogawa and Egusa (1977).

2. *Allencotyla* Price, 1962. Type species: *A. mcintoshi* Price, 1962. Other species: *A. pricei* Kritsky, Noble et Moser, 1978.

3. *Tripathiana* Unnithan, 1971. Type (single) species: *T. minuta* (Tripathi, 1959) Unnithan, 1971 (syn. *Heteraxine minuta* Tripathi, 1959).

4. *Heteraxinoides* Yamaguti, 1963. Type species: *H. triangularis* (Goto, 1894) Yamaguti, 1963. Other species: *H. argiropsi* Mamaev, 1977\*; *H. atlanticus* Gayevska-

\* The species marked with asterisks were studied on the basis of collection materials.

ya et Kovaljova, 1979\* (syn. *Cemocotyle trachuri* Kovaljova, 1970); *H. caprodontis* Yamaguti, 1968; *H. chinensis* (Yamaguti, 1937) Price, 1962\*; *H. hargisi* Price, 1962; *H. novaezealandiae* Dillon et Hargis, 1965\*; *H. oligoplitis* (Meserve, 1938) Price, 1962; *H. regis* Dillon et Hargis, 1965; *H. xanthophilis* (Hargis, 1956) Yamaguti, 1963; *H. xanthophilloides* Price, 1962; *H. zhukovi* Caballero et Bravo-Hollis, 1964. Species inquirendae: *H. pseudosciaenai* Gupta et Khullar, 1968; *H. scorpiis* (Sandars, 1944) Price, 1962.

5. **Karavolicola** Price, 1962. Type (single) species: *K. karavoli* (Unnithan, 1957) Price, 1962.

6. **Lethrinaxine** Mamaev, 1970. Type (single) species: *L. parva* Mamaev, 1970\*.

7. **Probursata** Bravo-Hollis, 1984. Type (single) species: *P. veraecrucis* Bravo-Hollis, 1984.

8. **Zeuxapta** Unnithan, 1957. Type (single) species: *Z. seriolae* (Meserve, 1938) Price, 1962\* (syn. *Axine seriolae* Meserve, 1938); *Zeuxapta zyxivaginata* Unnithan, 1957; *Z. japonica* Yamaguti, 1963 (syn. *Aspinatrium kahala* Yamaguti, 1968).

## II. Cemocotylinae Price, 1962

Heteraxinidae with bilateral haptor, with clamps asymmetric, as a rule and symmetric, slightly different in size and structure. Anchors usually present. Buccal suckers aseptate. Genital atrium has two lateral muscular pockets with hooks or spines (in this case copulative organ is armed with some rows of short hooks), or has single muscular atrial bulbus resembling the sucker (in this case copulative organ is armed with stylet), or else genital atrium has not any muscular structures (in this case copulative organ is armed with conical bunch of spines). Parasites of Carangidae.

1. **Cemocotyle** Sproston, 1946. Type species: *C. carangis* (MacCallum, 1913) Sproston, 1946. Other species: *C. borinquensis* Price, 1962; *C. noveboracensis* Price, 1962; *C. trachuri* Dillon et Hargis, 1965.

2. **Cemocotylella** Price, 1962 (syn. *Carangiamata* Unnithan, 1971, part.; *Xureliphilus* Unnithan, 1971). Type species: *C. elongata* (Meserve, 1938) Price, 1962\* (syn. *C. carangis* Yamaguti, 1968; *Xureliphilus elongata* (Meserve, 1938) Unnithan 1971). Other species: *C. ovovivipara* (Radha, 1975) Mamaev, 1988\* (syn. *Carangoides ovovivipara* (Radha, 1975); *C. papuensis* Rohde, 1979; *C. sagae* (Manter et Prince, 1953) Price, 1962 (syn. *Cemocotyle sagae* Manter et Prince, 1953; *Carangiamata sagae* (Manter et Prince, 1953) Unnithan, 1971).

3. **Cemocotylelloides** Ramalingam, 1969. Type (single) species: *C. carangis* Ramalingam, 1969.

4. **Kannaphallus** Unnithan, 1957. Type species: *K. virilis* Unnithan, 1957\*. Other species: *K. lateriporis* Mamaev, 1988\*.

5. The new genus with single species from *Carangoides praeustus* (in press)\*.

## III. Gonoplasinae Price, 1962

Heteraxinidae with bilateral asymmetric haptor, the skeleton of clamps is symmetric, anchors present. Buccal suckers septate. Genital atrium has large muscular structure that is inversely trapeziform or inversely pyriform, with numerous various spines. Vagina mediadorsal, sometimes with two groups of hollows behind it. Parasites of Carangidae.

1. **Gonoplasius** Sandars, 1944. Type (single) species: *G. carangis* Sandars, 1944\* (syn. *G. longirostri* (Robinson, 1961) Price, 1962).

2. The new genus not previously described, from *Caranx dentex*, the Canary Islands. (We learned of it from Thesis of Armas Hernandez (1987) and expect its publication with the genus description.)

#### IV. *Lintaxininae* Price, 1962

Heteraxinidae with long bilateral subsymmetric haptor, the sides of which are nearly equal but differ in number, shape and size of clamps. Anchors absent. Buccal suckers aseptate. Copulative organ and genital atrium armed. Vagina mediadorsal. (We retain this subfamily of Price (1962) though it is no doubt artificial.)

1. *Lintaxine* Sproston, 1946. Type (single) species: *L. cokeri* (Linton, 1940) Sproston, 1946 (from freshwater fish *Aplodinotus*, USA).

2. *Bicotyle* Tripathi, 1956 (syn. *Dictydenteron* Unnithan, 1971, part.) (from marine fishes of genus *Pampus*). Type species: *B. stromatea* Tripathi, 1956\* (syn. *B. vellavoli* Unnithan, 1961; *B. dorabi* Gupta et Krishna, 1979, in paper of Gupta and Krishna (1979) the hosts are evidently confused, — cf. pp. 45—48 and 49—52). Other species: *B. reticulata* (Goto, 1894) Tripathi, 1956\*. (Unnithan (1971) for lacking of original material and leaning upon inaccurate description of Goto (1894) separated this species in genus *Dictydenteron*.); *B. perpolita* Lebedev, 1968\*\*.

#### V. *Monaxininae* Unnithan, 1957

Heteraxinidae with unilateral haptor and, accordingly, with single row of clamps (however the rudiments of some clamps sometimes occur on the other side). Anchors absent in adult. Vagina present or absent. Parasites of Carangidae.

1. *Monaxine* Unnithan, 1957. Type (single) species: *M. formionis* Unnithan, 1957\* (syn. *M. bivaginalis* Ramalingam, 1961) (Redescription of the species — see Mamaev 1970). Species inquirendae: *Monaxine belones* Deo et Karyakarte, 1981; *M. caballeroi* Thapar, Krishna et Gupta, 1977; *M. hargisi* Thapar, Krishna et Gupta, 1977; *M. mizelle* Thapar, Krishna et Gupta, 1977; *M. pseudosciaenae* Thapar, Krishna et Gupta, 1977. (In spite of very poor descriptions of these species it can be determined, that none belongs to the genus *Monaxine*.)

2. *Leuresticola* Price, 1962. Type (single) species: *L. olsoni* Price, 1962. Sp. inq.: *L. dollfusi* Thapar, Krishna et Gupta, 1977, poorly described, possibly belongs to another family.

3. *Allomonaxine* Yamaguti, 1965. Type (single) species: *A. carangoides* Yamaguti, 1965.

#### *Megamicrocotylidae* Mamaev, fam. nov.

Microcotylinae with ribbonlike body and well-defined asymmetric long haptor; clamps closed, microcotylid type on the whole but considerably modified, three different forms. Anchors absent. Buccal suckers aseptate. Genital atrium and copulative organ armed. Large ventral vagina far displaced posteriorly and situated next to the ovary, behind its ripe end. Parasites of dorabs (*Chirocentrus*).

*Megamicrocotyle* Tripathi, 1956. Type species: *M. chirocentrus* Tripathi, 1956\* (syn. *M. johnstoni* Gupta et Krishna, 1978; *M. stunkardi* Gupta et Krishna, 1978. — For the latter a *Pampus argenteus* is erroneously registered as a host.). Other species: *M. microcotyla* (Manter et Prince, 1953) Yamaguti, 1963\*; *M. unnithani* Mamaev, sp. nov.\* (pro *M. chirocentrus* sensu Unnithan, 1961, a genital atrium of this species armed with a single large hook resembling to miner's hack but not with 2—3 plates in contrast to two other species).

*Allopyragraphoridae* Yamaguti, 1963, emend. (syn. *Allomicrocotylidae* Yamaguti, 1965)

\*\* Another species of this genus, *B. lucknowensis* Agrawal et Sharma, 1990, is described in this number of *Folia parasitologica*.

Microcotylea with symmetric haptor, laterally flattened and ventrally directed, with two rows of similar massive clamps, the skeleton of which consists of 6 sclerites: two pairs of lateral, medio-basale and large medio-supplementarium with aperture or canal. Anchors present or absent. Buccal suckers septate. Copulative organ very complicated or simple cirrus, armed or unarmed. Vagina mediodorsal with highly sclerotized chamber. Parasites of Carangidae and other Perciformes.

1. *Allopyrgraphorus* Yamaguti, 1963 (syn. *Helixaxine* Caballero et Bravo-Hollis, 1965; *Hargisiella* Unnithan, 1971). Type species: *A. hippus* (Hargis, 1956) Yamaguti, 1963 (syn. *Pyrgraphorus hippus* Hargis, 1956; *Hargisiella hippus* (Hargis, 1956) Unnithan, 1971). Other species: *A. caballeroi* (Zerocero, 1960) Yamaguti, 1963; *A. incomparabilis* (MacCallum, 1917) Yamaguti, 1963 (syn. *Hargisiella incomparabilis* (MacCallum, 1917) Unnithan, 1971); *A. nemipteri* (Mamaev et Paruchin, 1981)-Mamaev, comb. nov\* (syn. *Helixaxine nemipteri* Mamaev et Paruchin, 1981; *A. winterti* (Caballero et Bravo-Hollis, 1965) Bravo-Hollis et Salgado-Maldonado, 1983\* (syn. *Helixaxine winterti* Caballero et Bravo-Hollis, 1965).

2. *Allomicrocotyla* Yamaguti, 1965. Type (single) species: *A. onagu* Yamaguti, 1965\*.

#### **Pyrgraphoridae** Yamaguti, 1963

Microcotylea with bilateral symmetric haptor, laterally flattened and ventrally directed, with clamps of two forms: anterior, on both sides, a narrow pedunculated "fire-tongs"-shaped clamp and on distal half of haptor a simple microcotylid type clamp. Anchors absent. Buccal suckers septate. Copulative organ — cirrus. Vagina mediodorsal. Parasites of Carangidae.

*Pyrgraphorus* Sproston, 1946. Type species: *P. pyrgraphorus* (MacCallum et MacCallum, 1913) Sproston, 1946. Other species: *P. hollisae* Euzet et Ktari, 1970\*.

#### **Heteromicrocotylidae** Unnithan, 1961, emend.

Microcotylea with bilateral asymmetric haptor, on one side of which clamps sessile, open, wide, and on the other pedunculated, closed, "fire-tongs"-shaped. Anchors absent. Buccal suckers septate. Copulative organ — cirrus. Genital atrium with complex arms and usually with atrial sucker (muscular cup, through which cirrus pushes). Anterior to atrium the "accessory copulatory apparatus"\*\*\*) is situated (muscular hole with some thin medial hooks and a pair of thick hollow lateral hooks with glandulosus reservoirs). Vagina single, mediodorsal, vaginal ducts two. Parasites of Carangidae.

1. *Heteromicrocotyla* Yamaguti, 1953. Type species: *H. carangis* Yamaguti, 1953. Other species: *H. australiensis* Rohde, 1977; *H. indica* Ramalingam, 1960\*; *H. polychoris* Unnithan, 1961\*; *H. vaginispina* Unnithan, 1961\* (syn. *H. yamagutii* Gupta et Krishna, 1979); *H. atriospinata* Mamaev, 1988\*; *H. paruchini* Mamaev, 1988\*; and two new species in collection of Zoological Institute of the USSR Academy of Sciences, Leningrad (descriptions in press)\*.

Sp. inq.: *H. multispina* Ali et Des, 1971.

2. *Heteromicrocotylodes* Rohde, 1977. Type (single) species: *H. mirabilis* Rohde, 1977\*.

#### **Monaxinoididae** Mamaev, fam. nov.

Microcotylea with simple clamps on unilateral haptor (on the other side there is usually only one clamp), anchors present. Buccal suckers aseptate. Genital atrium

\*\*\* Terminology after Rohde (1977).

submedial, with long curved spines and muscular atrial sucker at its bottom. Anterior to atrium (not connected with it) is "accessory copulatory apparatus" — muscular cup with sagittate hooks and a single large hollow hook, to which the ducts of glandulae go up. Vagina single, submediodorsal, with two vaginal ducts. Parasites of Carangidae. Type (single) genus *Monaxinoides* Yamaguti, 1963 with single species *M. indica* (Ramalingam, 1961) Yamaguti, 1963\* (syn. *Heteraxine indica* Ramalingam, 1961; *Monaxinoides laminata* Radha, 1975). The first description (Ramalingam 1961) is wrong and for that reason Yamaguti (1963) erroneously placed this genus in Monaxinidae.

This family is undoubtedly related to Heteromicrocotylidae (there are an atrial sucker and "accessory copulatory apparatus") but differs in unilateral haptor with simple uniform clamps, aseptate buccal suckers and single "glandulosus" hook in "accessory copulatory apparatus".

#### Rhinecotylidae Lebedev, 1979

Microcotylina with unilateral haptor on that, on two paddles, the clamps of two different forms: simple on anterior paddle and "firetongs"-shaped on posterior. (The young worms have anchors between paddles, losing in adults.) Ventral surface of basal part of haptor turned into multialveolar sucker. Buccal suckers septate. Genital atrium has two muscular bulbs armed with spines. Vagina and receptaculum seminis absent. Parasites of Sphyraenidae.

**Rhinecotyle** Euzet et Trilles, 1960. Type species: *R. crepitacula* Euzet et Trilles, 1960. Other species: *R. deloyai* Bravo-Hollis, 1981.

#### Paramonaxinidae Mamaev, fam. nov.

Microcotylina with unilateral haptor on that, on two paddles, the simple uniform clamps of microcotylid type but with large sticklike scleritum medio-supplementarium. There is a lappet with anchors between paddles of haptor, or it (in adults) is absent. Buccal suckers septate. Genital atrium has two muscular bulbs armed with spines. Ovary in form of an interrogation mark. The seminal receptacle absent. Vagina present or absent. Parasites of Sphyraenidae and other Perciformes.

This family is undoubtedly related to Rhinecotylidae but less evolved (clamps simple, a sucker on the haptor absent). Both of these families are similar in structure of haptor to the unrelated family Axinidae.

1. **Paramonaxine** Bravo-Hollis, 1978. Type species: *P. yamagutii* Bravo-Hollis, 1978. Other species: *P. argentea* (Crane, 1972) Mamaev, comb. nov. (syn. *Pseudocharhanea argentea* Crane, 1972; *Heteraxine argentea* (Crane, 1972) Crane, 1974).

2. **Incisaxine** Mamaev, 1970\*. Type (single) species: *I. dubia* Mamaev, 1970.

### СИСТЕМАТИЧЕСКИЙ СОСТАВ СЕМЕЙСТВА НЕТЕРАКСИНИДЫЕ И ДРУГИХ РОДСТВЕННЫХ СЕМЕЙСТВ МОНОГЕНЕЙ

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**Резюме.** В статье кратко излагается система моногеней семейства Heteraxinidae и других мелких родственных ему семейств подотряда Microcotylina Lebedev, 1972, с указанием видового состава всех таксонов, даются диагнозы ряда таксонов, выделяются новые семейства Megamicrocotylidae, Paramonaxinidae и Monaxinoididae.

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