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The system of fish leeches (*Hirudinea: Piscicolidae*)

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ABSTRACT. The *Piscicolidae* are divided into 3 subfamilies, including a total of 18 tribes with 52 genera. *Pterobdellinini* trib. n. (including genus *Pterobdellina* BENNIKE et BRUUN with its 2 species) and *Mysidobdellini* trib. n. (monotypic genera *Mysidobdella* SELENSKY and *Marsipobdella* MOORE) are erected within the *Platybdellinae*. Subfamilies are briefly characterized; tribes are diagnosed by a combination of reproductive system characters. For each tribe its member genera and species are listed. Tribal assignment of *Notobdella* BENHAM and *Trachellobdellina glabra* MOORE is uncertain.

Key words: Systematics, fish leeches, classification, new taxa, catalogue.

INTRODUCTION

At present it is generally agreed (SAWYER 1986, BURRESON and DYBDAHL 1989) to divide the family *Piscicolidae* into three subfamilies based on characters of their coelomic system. In 1983 V. M. EPSHTEIN divided the subfamilies into tribes assuming as a basis variants of the reproductive system. Below a new, more refined and supplemented version of the classification is proposed.

Family: *Piscicolidae* JOHNSTON, 1865

I. Subfamily: *Platybdellinae* EPSHTEIN, 1970

Body subcylindrical or flat to foliaceous. Size and eccentricity of suckers vary. No external respiratory organs (except that some species have small subepidermal vesicles).

3-4 annuli per mid-body somite. Somites and annuli separated by shallow furrows. Annulation inconspicuous.

Eyes, segmental ocelli, eye-like spots on posterior sucker present or absent. In some species anterior sucker and first annuli on trachelosome bear numerous ocelli. No eye spots on anterior sucker.

Body surface smooth. Tubercles absent or weakly developed (exceptions: in *Crangonobdella fabricii* and *Platybdella olriki* one pair of minute tubercles per somite; the latter bears tubercles on the dorsum of the posterior somites of the urosome. *Ostreobdella papillata* has two rings of tubercles on each somite of urosome). In some species tubercles on anterior sucker present.

Mouthpore centrally or anteriorly located. Oesophageal diverticula, crop caeca, intestinal caeca present or absent. Posterior crop caeca from separate to fused with 5 fenestrae.

5-6 pairs of testisacs. Seminal reservoirs laterally located. Length of bursa varies. Accessory glands on atrium present or absent. Length of ovisacs varies. Conductive tissue and copulatory area present or absent (exception: copulatory area in *Ringueletobdella patagonica* located on bursa; strands of conductive tissue connect bursa with ovisacs).

Coelomic system varies from weakly developed - only ventral coelom present - to well developed system of canals - dorsal, ventral, lateral lacunae, main and accessory communications present. No bichambered pulsatile vesicles.

Mostly marine species. The subfamily has a bipolar distribution. Almost all species are parasites of *Osteichthyes*. 9 tribes, 31 genera and 62 species.

DIAGNOSIS: No gills and pulsatile vesicles.

1. Tribe: *Platybdellini* EPSHTEIN, 1983

DIAGNOSIS: No accessory glands on atrium. Bursa short. Conductive tissue absent or weakly developed. No copulatory area. 7 genera and 21 species.

1. Genus: *Platybdella* MALM, 1863; 4 species: *P. anarrhichae* (DIESING, 1859); *P. olriki* MALM, 1863; *P. chilensis* MOORE, 1910; *P. michaelsoni* JOHANSSON, 1911.

2. Genus: *Cryobdella* HARDING, 1922; 2 species: *C. levigata* HARDING, 1922; *C. antarctica* EPSHTEIN, 1970.

3. Genus: *Heptacyclus* VASILYEV, 1939; 2 species: *H. virgatus* (OKA, 1910); *H. myoxocephali* SRIVASTAVA, 1966.

4. Genus: *Malmiana* STRAND, 1942; 7 species: *M. scorpii* (MALM, 1863); *M. brunnea* (JOHANSSON, 1896); *M. yorki* SRIVASTAVA, 1966; *M. bubali* SRIVASTAVA, 1966; *M. philotherma* SAWYER, LAWLER et OVERSTREET, 1975; *M. diminuta* BURRESON, 1977; *M. virida* BURRESON, 1977.

5. Genus: *Oceanobdella* CABALLERO, 1956; 4 species: *O. sexoculata* (MALM, 1863); *O. microstoma* (JOHANSSON, 1896); *O. blenii* (KNIGHT-JONES, 1940); *O. pallida* BURRESON, 1977.

6. Genus: *Sanguinotus* DE SILVA et BURDON-JONES, 1961; 1 species: *S. pinnarum* DE SILVA et BURDON-JONES, 1961.

7. Genus: *Arctobdella* DE SILVA et KABATA, 1961; 1 species: *A. branchiarum* DE SILVA et KABATA, 1961.

2. Tribe: *Austrobdellini* EPSHTEIN, 1983

DIAGNOSIS: Accessory glands on atrium present. Bursa long. Conductive tissue absent or weakly developed. No copulatory area. 4 genera and 7 species.

1. Genus: *Austrobdella* BADHAM, 1916; 4 species: *A. translucens* BADHAM, 1916; *A. anoculata* MOORE, 1940; *A. bilobata* INGRAM, 1957; *A. californiana* BURRESON, 1977.

2. Genus: *Pterobdella* KABURAKI, 1921; 1 species: *P. amara* KABURAKI, 1921.

3. Genus: *Phylobdella* MOORE, 1939; 1 species: *P. maculata* MOORE, 1939.

4. *Makarabdella* RICHARDSON, 1959; 1 species: *M. manteri* RICHARDSON, 1959.

3. Tribe: *Pterobdellinini* trib. n.

DIAGNOSIS: Accessory glands on atrium present. Bursa long. Conductive tissue well developed. No copulatory area. 1 genus and 2 species.

1. Genus: *Pterobdellina* BENNIKE et BRUUN, 1939; 2 species: *P. jenseni* BENNIKE et BRUUN, 1939; *P. australis* EPSHTEIN, 1970.

4. Tribe: *Notostomini* EPSHTEIN, 1983

DIAGNOSIS: No accessory glands on atrium. Bursa long. Conductive tissue absent or weakly developed. No copulatory area. 3 genera and 5 species.

1. Genus: *Notostomum* LEVINSEN, 1882; 2 species: *N. laeve* LEVINSEN, 1882; *N. cyclostomum* JOHANSSON, 1898.

2. Genus: *Ostreobdella* OKA, 1927; 2 species: *O. kakibir* OKA, 1927; *O. papillata* BURRESON, 1977.

3. Genus: *Glyptonotobdella* SAWYER et WHITE, 1969; 1 species: *G. antarctica* SAWYER et WHITE, 1969.

5. Tribe: *Myzobdellini* EPSHTEIN, 1983

DIAGNOSIS: Accessory glands on atrium present. Bursa short. Conductive tissue absent or weakly developed. No copulatory area. 3 genera and 8 species.

1. Genus: *Myzobdella* LEIDY, 1851; 2 species: *M. lugubris* LEIDY, 1851; *M. moorei* MEYER et MOORE, 1954.

2. Genus: *Piscicolaria* WHITMAN, 1889; 1 species: *P. reducta* MEYER, 1940.
3. Genus: *Illinobdella* MEYER, 1940; 5 species: *I. platense* (CORDERO, 1933); *I. alba* MEYER, 1940; *I. elongata* MEYER, 1940; *I. richardsoni* MEYER, 1940; *I. patzcuarensis* CABALLERO, 1940.

6. Tribe: *Crangonobdellini* EPSHTEIN, 1983

DIAGNOSIS: No accessory glands on atrium. Bursa short. Conductive tissue well developed. Copulatory area located on clitellum. 5 genera and 6 species.

1. Genus: *Crangonobdella* SELENSKY, 1914; 1 species: *C. fabricii* (MALM, 1863).
2. Genus: *Trulliobdella* BRINKMANN, 1948; 2 species: *T. capitis* BRINKMANN, 1948; *T. alba* EPSHTEIN, 1970.
3. Genus: *Cryobdellina* BRINKMANN, 1948; 1 species: *C. bacilliformis* BRINKMANN, 1948.
4. Genus: *Antarctobdella* DOLLFUS, 1965; 2 species: *A. tcherniai* DOLLFUS, 1965; *A. crosetensis* SAWYER, 1972.
5. Genus: *Beringbdella* CABALLERO, 1976; 1 species: *B. rectangulata* (LEVINSEN, 1882).

7. Tribe: *Mysidobdellini* trib. n.

DIAGNOSIS: No accessory glands on atrium. Bursa long. Conductive tissue well developed. Copulatory area located on clitellum. 2 genera and 2 species.

1. Genus: *Mysidobdella* SELENSKY, 1927; 1 species: *M. borealis* (JOHANSSON, 1898).
2. Genus: *Marsipobdella* MOORE, 1952; 1 species: *M. sacculata* MOORE, 1952.

8. Tribe: *Hemibdellini* EPSHTEIN, 1983

DIAGNOSIS: Accessory glands on atrium present. Bursa long. Conductive tissue well developed. Copulatory area located on clitellum. 4 genera and 6 species.

1. Genus: *Hemibdella* VAN BENEDEN et HESSE, 1863; 1 species: *H. soleae* van BENEDEN et HESSE, 1863.
2. Genus: *Aestabdella* BURRESON, 1976; 3 species: *A. abditovesiculata* (MOORE, 1952); *A. platycephali* (INGRAM, 1957); *A. leiostomi* BURRESON, 1991.
3. Genus: *Bathybdella* BURRESON, 1981; 1 species: *B. sawyeri* BURRESON, 1981.
4. Genus: *Richardsonobdella* BURRESON et DYBDAHL, 1989; 1 species: *R. lineata* BURRESON et DYBDAHL, 1989.

9. Tribe: *Ringueletobdellini* EPSHTEIN, 1983

RINGUELET (1945) described *Platybdella patagonica* which has a well developed conductive tissue connecting ovisacs with bursa. Since representatives of the genus *Platybdella* lack the conductive tissue and copulatory area, EPSHTEIN (1989) proposed to include this species in the genus *Ringueletobdella*.

DIAGNOSIS: No accessory glands on atrium. Bursa long. Conductive tissue well developed. Copulatory area located on bursa. 1 genus and 1 species.

1. Genus: *Ringueletobdella* EPSHTEIN, 1983; 1 species: *R. patagonica* (RINGUELET, 1945).

The subfamily *Platybdellinae* includes also:

1. Genus: *Notobdella* BENHAM, 1909; 2 species: *N. nototheniae* BENHAM, 1909; *N. streptocheles* YANG, 1987.

It is impossible to include these species in any existing tribe because of the lack of adequate data on their internal structure.

II. Subfamily: *Pontobdellinae* LLEWELLYN, 1966

Body cylindrical, less often flattened. Suckers small, their width not exceeding maximum width of body. Suckers attached to body somewhat eccentrically. No external respiratory organs.

2-5 annuli per mid-body somite. Somites and annuli separated by deep furrows. Annulation conspicuous (exception: *Oxytonostoma typica* has 14 annuli per somite and inconspicuous annulation).

Weakly developed eyes or eye spots on anterior sucker present. No ocelli on anterior sucker and first annuli of trachelosome.

Large tubercles on body surface present; their arrangement being species-specific. In some species tubercles on anterior sucker present.

Mouthpore centrally located. Oesophageal diverticula, crop caeca and intestinal caeca vestigial or absent (exceptions: oesophageal diverticula present in *Moorebdellina binnulata*; crop caeca and intestinal caeca - in *M. uschakovi*). Posterior crop caeca fused with 5 fenestrae or without fenestrae.

5-6 pairs of testisacs. Seminal reservoirs laterally or medially located. Bursa short. No accessory glands on atrium. Ovisacs short. Conductive tissue present. No copulatory area.

Dorsal, ventral, lateral lacunae, main and accessory communications present. Two pairs of pulsatile vesicles per somite.

Marine leeches. Most species occur in tropical waters. Others inhabit the northern Atlantic and adjacent waters of the Arctic Ocean, as well as Antarctic seas.

Representatives of the subfamily are absent in the northern Pacific. Hosts: cartilaginous fishes. 1 tribe, 4 genera and 21 species.

DIAGNOSIS: Body surface bears well developed tubercles. Two pairs of inconspicuous vesicles per somite.

1. Tribe *Pontobdellini* LLEWELLYN, 1966

DIAGNOSIS: No accessory glands on atrium. Bursa short. Conductive tissue well developed. No copulatory area.

1. Genus: *Pontobdella* LEACH, 1815; 15 species: *P. muricata* (LINNAEUS, 1758); *P. macrothela* SCHMARDA, 1861; *P. planodiscus* BAIRD, 1869; *P. rayneri* BAIRD, 1869; *P. afra* BAIRD, 1869; *P. vosmaeri* APATHY, 1888; *P. australiensis* GODDARD, 1909; *P. bimaculata* OKA, 1910; *P. moorei* OKA, 1910; *P. loricata* HARDING, 1924; *P. aculeata* HARDING, 1924; *P. dispar* CORDERO, 1938; *P. tasmanica* HICKMAN, 1947; *P. benhami* RICHARDSON, 1950; *P. taprobanensis* DE SILVA, 1963.

2. Genus: *Oxytonostoma* MALM, 1863; 2 species: *O. typica* MALM, 1863; *O. varituberculata* MOORE, 1938.

3. Genus: *Mooreobdellina* EPSHTEIN, 1972; 3 species: *M. rugosa* (MOORE, 1938); *M. biannulata* (MOORE, 1957); *M. uschakovi* EPSHTEIN, 1974.

4. Genus: *Megaliobdella* MEYER et BURRESON, 1990; 1 species: *M. szidati* MEYER et BURRESON, 1990.

III. Subfamily: *Piscicolinae* JOHNSTON, 1865

Body cylindrical, flattened, or flat. Size and eccentricity of suckers vary. One pair of conspicuous vesicles per somite. Gills present or absent.

3-14 annuli per mid-body somite. Somites and annuli divided by shallow furrows. Annulation inconspicuous (except for genera with 3 annuli per somite: *Baicalobdella* and *Branchellion*).

Eyes, segmental ocelli, eye-like spots on posterior sucker present or absent. No ocelli on anterior sucker and first annuli of trachelosome. No eye spots on anterior sucker.

Body surface smooth or with small tubercles. No tubercles on anterior sucker.

Mouthpore centrally located. Oesophageal diverticula, crop caeca and intestinal caeca present or absent. Posterior crop caeca fused with 5 fenestrae (exception: in *Trachelobdella lubrica* only one fenestra remains. Posterior crop caeca in *Limnotrachelobdella turkestanica* are similar to glossiphoniid ones).

4-6 pairs of testisacs. Seminal reservoirs laterally located. Length of bursa varies. Accessory glands on atrium present or absent. Length of ovisacs varies. Conductive tissue present, located on clitellum or on bursa, or absent.

Dorsal, ventral, lateral lacunae, main and accessory communications present (exception: in some species communications undergo reduction). One pair of bichambered pulsatile vesicles per somite.

They are distributed in all regions of the World Ocean and continental freshwaters.
Hosts: *Osteichthyes*. 8 tribes, 19 genera and 39 species.

DIAGNOSIS: One pair of pulsatile vesicles per mid-body somite.

1. Tribe: *Piscicolini* JOHNSTON, 1865

DIAGNOSIS: Accessory glands on atrium present. Bursa long. Conductive tissue well developed. Copulatory area located on clitellum. 7 genera and 16 species.

1. Genus: *Piscicola* BLAINVILLE, 1818; 5 species: *P. geometra* (LINNAEUS, 1758); *P. fasciata* KOLLAR, 1842; *P. respirans* TROSCHEL, 1850; *P. punctata* (VERRILL, 1871); *P. milneri* (VERRILL, 1874); *P. pojmanskae* BIELECKI, 1994.

2. Genus: *Codonobdella* GRUBE, 1873; 2 species: *C. truncata* GRUBE, 1873; *C. zelenskiji* FINOGENOVA et SNIMSCHIKOVA, 1991.

3. Genus: *Baicalobdella* DOGIEL, 1957; 2 species: *B. torquata* (GRUBE, 1871); *B. cottidarum* DOGIEL, 1957.

4. Genus: *Zeylanicobdella* DE SILVA, 1963; 1 species: *Z. aurganensis* DE SILVA, 1963.

5. Genus: *Caspiobdella* EPSHTEIN, 1966; 3 species: *C. tuberculata* EPSHTEIN, 1966; *C. caspica* (SELENSKY, 1915); *C. fadejewi* EPSHTEIN, 1961.

6. Genus: *Acipenserobdella* EPSHTEIN, 1969; 1 species: *A. volgensis* (ZYKOFF, 1903).

7. Genus: *Italobdella* BIELECKI, 1993; 1 species: *I. ciosi* BIELECKI, 1993

2. Tribe: *Limnotrachelobdellini* EPSHTEIN, 1983

DIAGNOSIS: No accessory glands on atrium. Bursa long. Conductive tissue absent or weakly developed. No copulatory area. 2 genera and 6 species.

1. Genus: *Limnotrachelobdella* EPSHTEIN, 1968; 5 species: *L. sinensis* (BLANCHARD, 1896); *L. elegans* (BLANCHARD, 1896); *L. turkestanica* (STICHEGOLEW, 1912); *L. okae* MOORE, 1924; *L. taimeni* (EPSHTEIN, 1957).

2. Genus: *Taimenobdella* EPSHTEIN, 1964; 1 species: *T. amurensis* (EPSHTEIN, 1964).

3. Tribe: *Trachelobdellini* EPSHTEIN, 1983

DIAGNOSIS: Accessory glands located on atrium present. Bursa long. Conductive tissue absent or weakly developed. No copulatory area. 3 genera and 12 species.

1. Genus: *Trachelobdella* DIESING, 1850; 10 species: *T. lubrica* (GRUBE, 1840); *T. muelleri* DIESING, 1850; *T. maculata* MOORE, 1898; *T. rugosa* MOORE, 1898; *T. vividus* MOORE, 1898; *T. australis* BLANCHARD, 1900; *T. luederitzi* AUGENER, 1936;

T. leptcephali INGRAM, 1957; *T. oregonensis* BURRESON, 1976; *T. bathyraja* MEYER et BURRESON, 1990.

2. Genus: *Bdellamaris* RICHARDSON, 1953; 1 species: *B. eptatrete* RICHARDSON, 1953.

3. Genus: *Brumptiana* KNIGHT-JONES et LLEWELLYN, 1984; 1 species: *B. lineata* KNIGHT-JONES et LLEWELLYN, 1984.

4. Tribe: *Branchellini* EPSHTEIN, 1983

DIAGNOSIS: No accessory glands on atrium. Bursa short. Conductive tissue absent or weakly developed. No copulatory area. 1 genus and 10 species.

1. Genus: *Branchellion* SAVIGNY, 1822; 10 species: *B. torpedinis* SAVIGNY, 1822; *B. ravelii* (GIARD, 1851); *B. orbiniensis* QUATRAFAGES, 1852; *B. australis* LEIGH-SHARPE, 1916; *B. angeli* SIGALAS, 1921; *B. borealis* LEIGH-SHARPE, 1933; *B. parkeri* RICHARDSON, 1949; *B. lobata* MOORE, 1951; *B. plicobranchus* SANJEEVA RAJ, 1954; *B. callorhynchus* SCIDAT, 1972.

5. Tribe: *Orientobdellini* EPSHTEIN, 1983

DIAGNOSIS: No accessory glands on atrium. Bursa long. Conductive tissue well developed. No copulatory area. 1 genus and 2 species.

1. Genus: *Orientobdella* EPSHTEIN, 1962; 2 species: *O. japonica* (VASILYEV, 1939); *O. confluens* BURRESON, 1977.

6. Tribe: *Johanssoniini* EPSHTEIN, 1983

Diagnosis: Accessory glands located on atrium present. Bursa long. Conductive tissue well developed. No copulatory area. 1 genus and 2 species.

1. Genus: *Johansonia* SELENSKY, 1914; 2 species: *J. arctica* (JOHANSSON, 1898); *J. kolaensis* SELENSKY, 1914.

7. Tribe: *Cystobranchini* EPSHTEIN, 1983

DIAGNOSIS: No accessory glands on atrium. Bursa long. Conductive tissue well developed. Copulatory area located on bursa. 1 genus and 4 species.

1. Genus: *Cystobranchus* DIESING, 1859; 4 species: *C. mammillatus* (MALM, 1863); *C. verrilli* MEYER, 1940; *C. salmositicus* (MEYER, 1946); *C. meyeri* HAYUNGA et GREY, 1976.

8. Tribe: *Calliobdellini* EPSHTEIN, 1983

DIAGNOSIS: Accessory glands located on atrium present. Bursa long. Conductive tissue well developed. Copulatory area located on bursa. 2 genera and 6 species.

1. Genus: *Calliobdella* VAN BENEDEN et HESSE, 1863; 3 species: *C. lophii* VAN BENEDEN et HESSE, 1863; *C. nodulifera* MALM, 1863; *C. vivida* (VERRILL, 1872); *C. livanovi* OKA, 1910; *C. knightjonesi* BURRESON, 1984.

2. Genus: *Galatheabdella* RICHARDSON et MEYER, 1973; 1 species: *G. bruuni* RICHARDSON et MEYER, 1973.

In addition, *Trachelobdellina glabra* MOORE, 1957 belongs to the subfamily *Piscicolinae*. Since only its external characters are known, it is impossible to place this species in any existing tribe.

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