

Checklists of Acanthocephalans of Freshwater and Marine Fishes of Basrah Province, Iraq

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Abstract. Reviewing the literature on all the acanthocephalans parasitizing freshwater and marine fishes of Basrah province, Iraq indicated the presence of 14 acanthocephalan taxa. Seven taxa belong to the class Eoacanthocephala and seven to the class Palaeacanthocephala. All these acanthocephalans, except *Serrasentis* spp. are adults living in the intestine of their fish hosts. Five species of such acanthocephalans were recorded from freshwater localities, seven from marine localities and two taxa from both freshwater and marine localities. The total number of acanthocephalan species recorded for each fish host species fluctuated from a minimum of one acanthocephalan species in 18 fish hosts to a maximum of six acanthocephalan species in *Liza abu* only. Number of fish hosts reported for these acanthocephalans fluctuated from one host in case of seven species to a maximum of 21 hosts in case of *Neoechinorhynchus iraqensis*.

Key words: Acanthocephala, freshwater fishes, marine fishes, Basrah province, Iraq.

Introduction

The acanthocephalans, also known as thorny-headed or spiny-headed worms have elongated non-segmented bodies composed of prosoma and the trunk. The prosoma includes a small neck and the most characteristic feature of this group; the proboscis which is the attachment organ that bears chitinous hooks of different numbers, size and arrangement. The proboscis may become withdrawn when the worm is removed from the host (28). These worms have neither alimentary canal nor circulatory system. They are of separated sexes, males being shorter than females and characterized by their cement glands and copulatory bursa (22).

The adult acanthocephalans live parasitically in the intestine of their hosts (fishes as well as other vertebrates). In addition to their sucking of host digested food directly through their teguments, they cause severe damage to the intestinal wall

and may block host intestine and hence its death (36, 18).

The acanthocephalan life cycle involves the egg that contains the larva (acanthor) which is passed into the water where it is ingested by an intermediate host (usually an amphipod or other crustacean). The acanthor enters the hemocoel of the intermediate host, forming a cystacanth. When the intermediate host is ingested by a fish, the cystacanth either matures into an adult worm or encysts in the fish tissues. The fish may thus act as final, intermediate or paratenic host, which is eventually ingested by the final host such as a fish, bird or mammal (51).

Habash & Daoud (26) reported the first acanthocephalan; *Neoechinorhynchus agilis* from fishes of Basrah. According to Amin *et al.* (17), this was a wrong identification and the right one is *N. iraqensis*. So, all reports concerning *N.*

agilis in Iraq refer to *N. iraqensis* (43). Later reports of new records of acanthocephalans of fishes from Basrah province included those of *Echinorhynchus* sp. (4), *Neoechinorhynchus* sp. (45), *N. australis*, *N. dimorphospinus*, *N. macronucleatus*, *N. rutili* and *Paulisentis fractus* (2), *N. iraqensis* (11), *Serrasentis* spp. (19), both *Micracanthorhynchina kuwaitensis* and *Slendrorhynchus breviclaviproboscis* (20) and *Serrasentis sagittifer* (33).

As some acanthocephalans as well as some fishes of Basrah province have been misidentified, misspelled or quoted with wrong authorities, it was decided to review these data in accordance with up-to-date acanthocephalan classification (16) and revise fish scientific names and their orders and families according to a widely used web site (25) to provide a host-parasite checklist in addition to the acanthocephalan list. This review is a continuation of previous literature reviews done on parasites of fishes of Basrah province (50, 42, 47). Finally, it was also planned to compare the richness of infected fishes of this province with acanthocephalans with those of the whole country of Iraq based on data extracted from the index-catalogue of parasites and disease agents of fishes of Iraq (44).

Sources and Methods

A total of 30 references (17 research papers, nine M. Sc. theses and four Ph. D. theses) dealing with acanthocephalans of fishes of Basrah province were used to prepare the present review. Data from such references was gathered to provide acanthocephalan list and a host-acanthocephalan list. Validity and authority of each acanthocephalan taxon followed that of Amin (16). For fishes, the scientific names were reported as they appeared in their original references and then checked with a recent account on freshwater fishes of Iraq (21). However, the

valid names used here were based, with minor modifications, on relevant electronic sites (24, 25) and a recent review on the fishes of *Acanthopagrus latus* complex (32).

The index-catalogue of parasites and disease agents of fishes of Iraq (44) was used to show number of acanthocephalans reported for each infected fish species in Basrah province in comparison with that of the whole Iraq as well as the richness of fishes of Basrah with acanthocephalans in comparison with such richness in fishes of the whole country of Iraq.

Results and Discussion

Surveys Achieved on Fish Acanthocephalans in Basrah

Digging for literature concerning acanthocephalans of fishes of Basrah showed the presence of 30 references on these worms from different varieties of aquatic environments. These environments included the shallow marshy area in the north, Shatt Al-Arab River and its tributaries and estuary as well as the marine habitats of the northwest part of the Arab Gulf (46). Such diversity in these environments facilitates the infection of freshwater as well as marine fishes of Basrah with various acanthocephalans as different intermediate, paratenic and final hosts are available. From these references, four major categories of fish habitats can be grouped. These are:

- 1- The marshy area (Al-Hammar marsh) north of Basrah.
- 2- Shatt Al-Arab River and its creeks and canals.
- 3- Shatt Al-Arab estuary near Al-Fao town.
- 4- Marine waters of the northwest of the Arab Gulf.

Reports on fish acanthocephalans from the marshy area of Basrah province were achieved in Al-Hammar marsh, north of

Basrah (3, 35, 1). In addition to these, fishes collected from Basrah fish market (41) were from Basrah marshy area.

Some reports on fish acanthocephalans were from Shatt Al-Arab River (26, 5) and its creeks and canals which included those from Mehajeran Creek, south of Basrah city (36, 48, 37, 49), Garmat Ali River, north of Basrah city (34, 2, 9, 11, 12, 13, 14, 15, 10, 7), Al-Salihiya canal (7) and Al-Majidiah River or creek (39, 6, 38, 40).

Only one report on acanthocephalans of fishes from brackish waters of mouth of Shatt Al-Arab estuary near Al-Fao town is documented (18).

Reports on acanthocephalans of marine fishes of Iraq included those from Khor Al-Zubair lagoon (4, 45), Khor Abdullah (19, 20) as well as another sampling area in the northwest of the Arab Gulf (33).

Acanthocephalans Recorded from Fishes of Basrah

The literature review indicated the existing of 14 acanthocephalan taxa belonging to two subclasses (Eoacanthocephala and Palaeacanthocephala), two orders (Neoechinorhynchida and Echinorhynchida), three families (Neoechinorhynchidae, Echinorhynchidae and Rhadinorhynchidae) and six genera as indicated in Table (1). These acanthocephalans are alphabetically presented under their families and genera. Notes on misspelling in names of some acanthocephalans and their hosts, authorities and synonyms are corrected in accordance with Amin (16) as well as with information from some electronic sites (23, 29, 30, 31, 52). Names of fish hosts are quoted as they appeared in the reviewed literature but the valid names have been updated according to Froese & Pauly (25). The full authority of each valid fish host is shown in Table (2).

Family Neoechinorhynchidae

This family is represented in fishes of Basrah with seven taxa belonging to genera *Neoechinorhynchus* and *Paulisentis*.

Neoechinorhynchus australis Van Cleave, 1931 was reported only from *Liza abu* from Garmat Ali River by Abdul-Rahman (2) who misspelled the specific name as *australe* instead of *australis*.

Neoechinorhynchus dimorphospinus Amin & Sey, 1996 was reported from three mugilid species. These are *L. abu* from Garmat Ali River (2), *Liza subviridis* (= *Chelon subviridis*) from Khor Abdullah (19) and *L. klunzingeri* from Shatt Al-Arab estuary near Al-Fao town (18).

Neoechinorhynchus iraqensis Amin, Al-Sady, Mhaisen & Bassat, 2001 was described for the first time in Iraq as *species de novo* from *L. abu* from the Euphrates River at Al-Faluja town (17). Prior to this description, specimens of this parasite were erroneously identified as *Neoechinorhynchus agilis* (Rud., 1819), firstly by Habash & Daoud (26) and later on by 28 reports from different parts of Iraq (43). Regrettably, few researchers in Iraq still use *N. agilis* instead of *N. iraqensis*. So far, *N. iraqensis* as well as the erroneously reported *N. agilis* (indicated with an asterisk in the following references) has 21 fish host species in Basrah. These included *Acanthobrama marmid* from Al-Salihiya canal (7), *Acanthopagrus arabicus* which was reported as *A. latus* (32) from Garmat Ali River (7), *Alburnus mossulensis* from Al-Salihiya canal (7), *Alburnus sellal*, reported as *Chalc-alburnus sellal* from Garmat Ali River (2*), *Arabibarbus grypus*, reported as *Barbus grypus* from Al-Salihiya canal (7), *Brachirus orientalis*, reported as *Euryglossa orientalis* from Al-Salihiya canal (7), *Carasobarbus luteus* and its synonym *Barbus luteus* from Mehajeran creek (36*,

48*, 37*), from Garmat Ali River (2*, 7) and from Al-Salihiya canal (7), *Carassius auratus* from both Al-Salihiya canal and Garmat Ali River (7), *Carassius carassius* from Garmat Ali River (2*), *Chelon subviridis*, reported as *Liza subviridis* from Garmat Ali River (2*) and from Al-Salihiya canal (7), *Ctenopharyngodon idella* from Garmat Ali River (2*), *Cyprinus carpio* from Garmat Ali River (2*, 10, 7) and from Al-Salihiya canal (7), *Gambusia holbrooki*, reported as *Gambusia affinis* from Garmat Ali River (10), *Heteropneustes fossilis* from Garmat Ali River (2*), *Leuciscus vorax*, reported as *Aspius vorax* from Garmat Ali River (2*) and from Al-Salihiya canal (7), *L. abu* from Mehajeran creek (36*, 3*, 41*, 48*, 49*), from Al-Majidia River (39*, 6*, 38*, 40*), from Garmat Ali River (34*, 2*, 9*, 12*, 13*, 14*, 15*, 10, 7) and from Al-Salihiya canal (7) in addition to the record from *Mugil hishni* which is a synonym of *L. abu* (25) from Shatt Al-Arab River (26*, 5*), *Mastacembelus mastacembelus* from Garmat Ali River (2*) *Mesopotamichthys sharpeyi*, reported as *Barbus sharpeyi* from Garmat Ali River (2*, 11), *Mystus pelusius* from Garmat Ali River (2*), *Poecilia latipinna* from Al-Salihiya canal (7) and *Silurus triostegus* from Garmat Ali River (2*, 7), from Al-Hammar marsh (35) and from Al-Salihiya canal (7).

Neoechinorhynchus macronucleatus Machado Filho, 1954 was reported only from *L. abu* from Garmat Ali River by Abdul-Rahman (2) who misspelled the specific name as *macronucleatum* instead of *macro-nucleatus*.

Neoechinorhynchus rutili (Müller, 1780) Hamann, 1892 was reported from six fish species from Garmat Ali River (2). These fishes were *C. carpio*, *H. fossilis*, *L. vorax* reported as *A. vorax*, *L. abu*, *M. mastacembelus* and *S. triostegus*. *N. rutili*

was reported for the first time in Iraq from both *B. xanthopterus* (= *Luciobarbus xanthopterus*) and *Mugil abu* (= *L. abu*) by Herzog (27) and now it has a total of 16 hosts in Iraq (44).

Unidentified species of *Neoechinorhynchus* was reported from *Periophthalmus waltoni* from Khor Al-Zubair (45). Amin (16) listed 68 species of *Neoechinorhynchus* assigned to subgenus *Neoechinorhynchus*, 14 species assigned to subgenus *Hebesoma* and 32 not assigned to either subgenus. In accordance with Amin (16), all the eight species of *Neoechinorhynchus* so far recorded in Iraq (44), except *N. elongatus*, belong to the subgenus *Neoechinorhynchus* (see Table 1). Internationally, 19 valid marine species are enlisted within the genus *Neoechinorhynchus* (52).

Paulisentis fractus Van Cleave & Bangham, 1949 was reported from fishes of Basrah only from *L. abu* from Garmat Ali River (2). Its first record from Iraq was from *Barbus barbulus* in 1993 but the publication (8) was delayed till 2000. Now *P. fractus* has three hosts in Iraq (44). The genus *Paulisentis* has two valid species (16, 23).

Family Echinorhynchidae

This family is represented in fishes of Basrah with unidentified species of the genus *Echinorhynchus*.

Unidentified species of *Echinorhynchus* was reported from *Pseudosynanceia melanostigma* from Khor Al-Zubair (4) and from *S. triostegus* from Al-Hammar marsh (1). The genus *Echinorhynchus* has 52 valid species (16). However, 81 species are reported by both EOL (23) and ITIS (31) among which 27 are valid marine species (52).

Family Rhadinorhynchidae

This family is represented in Basrah fishes with species belonging to three genera:

Micracanthorhynchina, *Serrasentis* and *Slendrorhynchus*.

Micracanthorhynchina kuwaitensis Amin & Sey, 1996 was reported only from *Hemiramphus marginatus* from Khor Abdullah by Bannai (20) who misspelled the generic name as *Micracanthorhynchus* instead of *Micracanthorhynchina*. The genus *Micracanthorhynchina* has 10 valid species (30) among which six are valid marine species (52). However, Amin (16) listed 11 species.

Serrasentis sagittifer (Linton, 1889) Van Cleave 1923 was reported only from *Acanthopagrus arabicus* which was misidentified as *A. latus* (32) from the Iraqi territorial waters of the Arab Gulf (33).

Three unidentified species of *Serrasentis* were reported, as larvae, from the intestine of *Johnius belangerii*, *Otolithes ruber* and *Synaptura orientalis*, which is a synonym of *Brachirus orientalis*, from Khor Abdullah (19). The fish generic name *Otolithes* was misspelled as *Otolithus* by the above researcher (19). The genus *Serrasentis* has 14 valid species (16). However, insects.tamu.edu (30) listed 11 species, both ITIS (31) and EOL (23) listed seven species and WoRMS (52) listed 15 valid species for this genus.

Slendrorhynchus breviclaviproboscis Amin & Sey, 1996 was reported only from *H. marginatus* from Khor Abdullah (20). This is the only species of the genus *Slendrorhynchus* (16, 23, 30, 52).

Host-Acanthocephalans List

The names of all fish hosts infected with acanthocephalans in Basrah province are alphabetically arranged. For each host, the acanthocephalan species are also alphabetically arranged. For each parasite species, the references are chronologically arranged

but references of the same year are alphabetically arranged. The present host list included the valid as well as the synonymous names. An asterisk on some of the references is inserted to indicate an erroneous report of *N. agilis* instead of the correct species *N. iraqensis* as explained by Mhaisen (43).

Acanthobrama marmid: *Neoechinorhynchus iraqensis* (7).

Acanthopagrus arabicus, reported as or misidentified as *A. latus*: *Neoechinorhynchus iraqensis* (7) and *Serrasentis sagittifer* (33).

Acanthopagrus latus: See *Acanthopagrus arabicus*.

Alburnus mossulensis: *Neoechinorhynchus iraqensis* (7).

Alburnus sellal, reported as *Chalcalburnus sellal*: *Neoechinorhynchus iraqensis*, reported as *N. agilis* (2*).

Arabibarbus grypus, reported as *Barbus grypus*: *Neoechinorhynchus iraqensis* (7).

Aspius vorax: See *Leuciscus vorax*.

Barbus grypus: See *Arabibarbus grypus*.

Barbus luteus: See *Carasobarbus luteus*.

Barbus sharpeyi: See *Mesopotamichthys sharpeyi*.

Brachirus orientalis, reported as *Euryglossa orientalis* and as *Synaptura orientalis*: *Neoechinorhynchus iraqensis* (7) and *Serrasentis* sp. (19).

Carasobarbus luteus also reported as *Barbus luteus*: *Neoechinorhynchus iraqensis* (36*, 48*, 37*, 2*, 7).

Carassius auratus: *Neoechinorhynchus iraqensis* (7).

Carassius carassius: *Neoechinorhynchus iraqensis* (2*).

Chalcalburnus sellal: See *Alburnus sellal*.

Chelon subviridis, reported as *Liza subviridis*: *Neoechinorhynchus dimorphospinus* (19) and *N. iraqensis* (2*, 7).

Ctenopharyngodon idella: *Neoechinorhynchus iraqensis* (2*).

Cyprinus carpio: *Neoechinorhynchus iraqensis* (2*, 10, 7) and *N. rutili* (2).

Euryglossa orientalis: See *Brachirus orientalis*.

Gambusia affinis: See *Gambusia holbrooki*.

Gambusia holbrooki, reported as *Gambusia affinis*: *Neoechinorhynchus iraqensis* (10).

Hemiramphus marginatus: *Micracanthorhynchina kuwaitensis* (20) and *Slendrorhynchus breviclaviproboscis* (20).

Heteropneustes fossilis: *Neoechinorhynchus iraqensis* (2*) and *N. rutili* (2).

Johnius belangerii: *Serrasentis* sp. (19).

Leuciscus vorax, reported as *Aspius vorax*: *Neoechinorhynchus iraqensis* (7, 2*) and *N. rutili* (2).

Liza abu, also reported as *Mugil abu* and as *M. hishni*: *Neoechinorhynchus australis* (2), *N. dimorphospinus* (2), *N. iraqensis* (26*, 5*, 36*, 3*, 41*, 48*, 49*, 39*, 6*, 38*, 34*, 2*, 9*, 12*, 13*, 14*, 15*, 10, 40*, 7), *N. macronucleatus* (2), *N. rutili* (2) and *Paulisentis fractus* (2).

Liza klunzingeri: *Neoechinorhynchus dimorphospinus* (18).

Liza subviridis: See *Chelon subviridis*.

Mastacembelus mastacembelus: *Neoechinorhynchus iraqensis* (2*) and *N. rutili* (2).

Mesopotamichthys sharpeyi, reported as *Barbus sharpeyi*: *Neoechinorhynchus iraqensis* (2*, 11).

Mugil abu: See *Liza abu*.

Mugil hishni: See *Liza abu*.

Mystus pelusius: *Neoechinorhynchus iraqensis* (2*).

Otolithes ruber: *Serrasentis* sp. (19).

Periophthalmus waltoni: *Neoechinorhynchus* sp. (45)

Poecilia latipinna: *Neoechinorhynchus iraqensis* (7).

Pseudosynanceia melanostigma: *Echinorhynchus* sp. (4).

Silurus triostegus: *Neoechinorhynchus iraqensis* (2*, 35, 7), *N. rutili* (2) and *Echinorhynchus* sp. (1).

Synaptura orientalis: See *Brachirus orientalis*.

To sum up, it is worthwhile to show here that the 14 acanthocephalan taxa so far recorded from fishes of Basrah province represent 73.7% of the total number of acanthocephalan taxa from all freshwater and marine fishes of the whole Iraq (44). Such high percentage is due to the presence of marine acanthocephalans from fishes of Basrah province in addition to the freshwater acanthocephalans.

Table (1): List of acanthocephalans of fishes of Basrah province[§].

Class Eoacanthocephala

Order Neoechinorhynchida

Family Neoechinorhynchidae

Neoechinorhynchus (N.) australis Van Cleave, 1931 {1/1}*

Neoechinorhynchus (N.) dimorphospinus Amin & Sey, 1996 {3/3}

Neoechinorhynchus (N.) iraqensis Amin, Al-Sady, Mhaisen & Bassat, 2001 {21/24}

Neoechinorhynchus (N.) macronucleatus Machado Filho, 1954 {1/1}

Neoechinorhynchus (N.) rutili (Müller, 1780) Hamann, 1892 {6/16}

Neoechinorhynchus sp. {1/4}

Paulisentis fractus Van Cleave & Bangham, 1949 {1/3}

Class Palaeacanthocephala

Order Echinorhynchida

Family Echinorhynchidae

Echinorhynchus sp. {2/2}

Family Rhadinorhynchidae

Micracanthorhynchina kuwaitensis Amin & Sey, 1996 {1/1}

Serrasentis sagittifer (Linton, 1889) Van Cleave, 1923 {1/1}

Serrasentis spp. {3/3}

Slendrorhynchus breviclaviproboscis Amin & Sey, 1996 {1/1}

[§] Arranged according to the updated classification of the phylum Acanthocephala (16).

* Numbers in curly brackets occurring after the authority of each parasite refer to number of host species recorded for that parasite in Basrah province/ number of hosts recorded for the same parasite from the whole fishes of Iraq based on data obtained from the index-catalogue of parasites of fishes of Iraq (44).

Table (2): List of fishes of Basrah province and their richness with the acanthocephalans[§].

| |
|---|
| Order Cypriniformes |
| Family Cyprinidae |
| <i>Acanthobrama marmid</i> Heckel, 1843 {1/1} |
| <i>Alburnus mossulensis</i> Heckel, 1843 {1/1} |
| <i>Alburnus sellal</i> Heckel, 1843 {1/1} |
| <i>Arabibarbus grypus</i> (Heckel, 1843) {1/1} |
| <i>Carasobarbus luteus</i> (Heckel, 1843) {1/1} |
| <i>Carassius auratus</i> (Linnaeus, 1758) {1/2} |
| <i>Carassius carassius</i> (Linnaeus, 1758) {1/1} |
| <i>Ctenopharyngodon idella</i> (Valenciennes, 1844) {1/1} |
| <i>Cyprinus carpio</i> Linnaeus, 1758 {2/2} |
| <i>Leuciscus vorax</i> (Heckel, 1843) {2/4} |
| <i>Mesopotamichthys sharpeyi</i> (Günther, 1874) {1/1} |
| Order Siluriformes |
| Family Bagridae |
| <i>Mystus pelusius</i> (Solander, 1794) {1/1} |
| Family Siluridae |
| <i>Silurus triostegus</i> Heckel, 1843 {2/4} |
| Family Heteropneustidae |
| <i>Heteropneustes fossilis</i> (Bloch, 1794) {2/2} |
| Order Cyprinodontiformes |
| Family Poeciliidae |
| <i>Gambusia holbrooki</i> Girard, 1859 {1/1} |
| <i>Poecilia latipinna</i> (Lesueur, 1821) {1/1} |
| Order Beloniformes |
| Family Hemiramphidae |
| * <i>Hemiramphus marginatus</i> (Forsskål, 1775) {2/2} |
| Order Synbranchiformes |
| Family Mastacembelidae |
| <i>Mastacembelus mastacembelus</i> (Banks & Solander, 1794) {2/2} |
| Order Scorpaeniformes |
| Family Synanceiidae |
| * <i>Pseudosynanceia melanostigma</i> Day, 1875 {1/1} |
| Order Perciformes |
| Family Sparidae |
| ** <i>Acanthopagrus arabicus</i> Iwatsuki, 2013 {2/2} |
| Family Sciaenidae |
| * <i>Johnius belangerii</i> (Cuvier, 1830) {1/1} |
| * <i>Otolithes ruber</i> (Bloch & Schneider, 1801) {1/1} |
| Family Gobiidae |
| * <i>Periophthalmus waltoni</i> Koumans, 1941 {1/1} |
| Order Mugiliformes |
| Family Mugilidae |
| ** <i>Chelon subviridis</i> (Valenciennes, 1836) {2/2} |
| <i>Liza abu</i> (Heckel, 1843) {6/8} |
| ** <i>Liza klunzingeri</i> (Day, 1888) {1/1} |
| Order Pleuronectiformes |
| Family Soleidae |
| * <i>Brachirus orientalis</i> (Bloch & Schneider, 1801) {2/2} |

§ Richness of fishes with acanthocephalans: number of acanthocephalan species recorded in any particular fish in Basrah province/ number of acanthocephalan species recorded from that fish from the whole waters of Iraq, based on the index-catalogue of parasites of fishes of Iraq (44).

* Marine fishes, ** marine fishes entering freshwaters and the remaining fishes are freshwater fishes. The arrangement of fish orders and families followed that of Eschmeyer (24) except for order Mugiliformes which was according to Froese & Pauly (25).

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قوائم مرجعية للديدان شوكية الرأس في أسماك المياه العذبة والبحرية في محافظة البصرة، العراق

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الخلاصة. أظهر إستعراض المراجع لكل الديدان شوكية الرأس المتطفلة على أسماك المياه العذبة والبحرية في محافظة البصرة، العراق وجود 14 نوعا من هذه الديدان. تعود سبعة أنواع لصنف شوكية الرأس الحقيقية *Eoacanthocephala* بينما تعود سبعة أنواع لصنف شوكية الرأس القديمة *Palaeacanthocephala*. كل هذه الديدان، عدا أنواع الجنس *Serrasentis* هي بالغة وتعيش في أمعاء مضيفاتها من الأسماك. سجلت خمسة أنواع من هذه الديدان من بيئات عذبة وسجلت سبعة منها من بيئات بحرية في حين سجل نوعان من بيئات عذبة وبحرية معا. تذبذب عدد أنواع الديدان شوكية الرأس المسجلة في كل نوع من أنواع الأسماك ما بين نوع واحد من الديدان في 18 مضيفا سمكيا إلى أعلى رقم وهو ستة أنواع في سمكة الخشني فقط. تذبذب عدد أنواع الأسماك المضيفة لتلك الديدان شوكية الرأس من مضيف واحد في حالة الإصابة بسبعة أنواع من هذه الديدان إلى أقصى عدد وهو 21 مضيفا في حالة الدودة شوكية الرأس *Neoechinorhynchus iraqensis*.