Studies on Freshwater Larval Trematodes

XVIII. The Life Cycle of *Stephanoprora denticulata* (RUDOLPHI, 1802) ODINER, 1910
(Trematoda: Digenea: Echinostomatidae)

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Summary. A new large-tailed echinostome cercaria with 22 collar spines and 36 flame cells in all has been experimentally connected with *Stephanoprora denticulata*. Chickens serve as suitable definitive laboratory hosts whereas *Actitis macularia* is the natural definitive host. Freshwater fish, *Lebistes reticulatus*, are the second intermediate hosts. The synonymy of the species has been discussed and there is a proposal for the rejection of the genus *Beaverostomum*. There is also a key for the separation of the large-tailed echinostome cercariae.


Introduction

Lutz, 1928, in Venezuela, by feeding fishes infected with the metacercariae of *Cercaria pachycerca*, which he previously found in Rio de Janeiro, Brazil, to the youngs of *Bautorida striata* recovered more than hundred immature specimens of *Mesorchis conciliatus* DIETZ, 1909, syn. *Stephanoprora conciliata* (Dietz) ODINER, 1910 = *S. denticulata* (RUDOLPHI, 1802) ODINER, 1910, from these birds which died between 5—7 days. The same author in the same year, near Caracas, Venezuela, obtained the adults of *S. denticulata* from *B. striata* and *Rynchosops nigra* as the natural infections. Although the account of Lutz is very inadequate yet this is the very first record of the life cycle of a species in the genus *Stephanoprora* ODINER, 1902. BEAVER, 1936, in USA,
redescribed *S. polycystus* (Dietz, 1909) Odhner, 1910, syn. *S. denticulata* from three crows of the species *Corvus brachyrhynchos brachyrhynchos* which had been fed on a fish apparently carrying the infection of this parasite and also gave a key to the “valid” species known up to that time. Lee and Seo, 1959, described a large-tailed echinostome cercaria, *C. ilecestrosa*, from *Anisocotyle limosa* (Say) in USA., in which the collar was discernible but the collar spines were undiscernible; however, in the metacercaria, from the experimental infection of fish, a collar of 22 spines was present including a group of 2 angle spines on each side of pharynx; without any experimental evidence, the cercaria was considered to be a larval form of “one of the rather numerous species of the genus *Stephanopora*”. Stunkard and Uzman, 1960, on feeding cysts from the gills of the killfish, *Fundulus heteroclitus*, to laboratory raised gulls, *Larus argentatus*, and golden hamsters, *Mesocricetus auratus*, recovered adult echinostomes which were identified as *S. denticulata*; apart from this report there is no detail of the intervening stages. We have come across a large-tailed echinostome cercaria, from *Biomphalaria glabrata* (Say), in which not only the collar spines are present but also their pattern is immaculately carried through metacercaria to adult. As a result of the feeding experiments, the cercaria in question has proven to be the larva of *S. denticulata* bred out in chickens whereas a fish-eating bird *Actitis macularia* (Linne) constitutes the natural definitive host.

**Materials and Methods**

The specimens of the snail, *Biomphalaria glabrata*, when brought into the laboratory were isolated individually in finger bowls which were half filled with pond water. The uninfected snails were discarded whereas those discharging the cercaria of *Stephanopora denticulata* were pooled in a small aquarium, aerated intermittently, and to which fresh lettuce leaves were added as a food for the mollusks. Whenever, a fresh supply of the cercariae was needed the infected snails were periodically confined in a small receptacle. The fresh-water fish, *Lebistes reticulatus* commonly known as “guppies”, were originally collected from their natural habitat and then raised in laboratory for experimental employment and were fed exclusively the commercial fish food. To determine the experimental definitive hosts, canaries, pigeons, ducks and chickens were obtained from commercial dealers. Every time before the commencement of feeding experiments the stool of these birds was examined for trematode eggs but none were ever found; only chickens proved to be the suitable laboratory hosts; these chickens were fed on chicken mash, confined in laboratory cages, and were denied any access to natural bodies of water. Since, the use of firearms was prohibited
around Laguna de Carrizales, Los Teques, Edo. Miranda, where the snail hosts were encountered, it was not possible to secure the avian definitive host for the observation of natural infections. However, from Laguna de Los Patos, near Universidad de Oriente, Cumaná, a fish eating bird Actitis macularia was shot down with the resultant yield of the adult specimens of S. denticulata.

The cercariae, only freshly emerged, were studied alive, with or without intra vitam stains. The measurements were taken on freshly emerged cercariae killed by plunging into 10% hot formalin. Adult parasites, after several washings in Locke’s solution, were fixed in hot (70 deg. C.) Gilson’s fluid and stained either with Semichon’s acetocarmine or Haari’s haematoxyline as suggested by Cable, 1964.

The figures, for the most part, have been drawn with the aid of camera lucida and the measurements are in mm.

Results

Redia (Fig. 1)

Yellowish in color with a pair of posterior locomotor appendages and a weak muscular pharynx. Gut tortuous, filled with dark-brown material, may extend up to or slightly posterior to posterior locomotor appendages. Collar subdivided into 4 lobes one ventral, one dorsal and two lateral in position. Measurements of 10 randomly selected rediae: body 0.662—0.875 × 0.062—0.135; pharynx 0.030—0.036 in diameter.

73 specimens of Biomphalaria glabrata, from which the cercariae of Stephanoprora denticulata were emerging, have been dissected but in every case more cercariae were encountered in the hepatopancreas than in the lumen of the rediae. Once 249 cercariae were counted in the hepatopancreas of a snail whereas maximum number of cercariae in a redia was 7. At the same time, it was observed that whereas only few cercariae emerged from a snail at a given time there were always abundant cercariae in the hepatopancreas. It may be deduced that the cercariae of S. denticulata, apparently, leave their rediae while still in a state of immaturity and spend a certain period, during which their organ systems
are fully differentiated or matured, in the hepatopancreas of molluscan host prior to their escape in the outside environment. Thus, a period of extra-radial development seems to be necessary if the cercariae have to embark upon their next infective stage for the continuity of the life cycle.

**Remarks:** The rediae of the cercariae of *S. denticulata*, on the basis of the subdivision of collar into four lobes, are indistinguishable from those of the other large-tailed echinostome cercariae like the cercaria of *Petasiger nitidus* LINTON (1928) BEAVER, 1939, *Cercaria hamptonensis* KHAN, 1960, *C. thamesensis* KHAN, 1960, *C. rashidi* NASIR, 1962 and *C. titfordensis* but are distinguishable from those of *C. gigantura* JOHNSTON and ANGEL, 1941 = the supposed larva of *Petasiger australis* JOHNSTON and ANGEL, 1941, *C. illecebrosa* LEE and SEO, 1959, *C. limosa* HEDRICK, 1943, *C. oedematocauda* BYRD and REIBER, 1940 and *C. oscillatoria* BROWN, 1931, in which the collar is undivided. *Cercaria reynoldsei* ETGES, 1961, and *C. oedematocauda* are also separated in having two pairs of lateral appendages in contrast with a single pair of appendages in the cercaria of *S. denticulata*. The condition of collar in the rediae of the cercaria of *Petasiger chandleri* ABDLE-MALEK, 1953, in those of *C. amelii* HEDRICK, 1943, *C. caudadens FUNST, 1921, *C. magnacauda* O’ROKE, 1917, *C. paucispina* FUNST and HOFFMAN, 1934 and *C. reynoldsei* is not known with certainty.

**Cercaria (Figs. 2 and 3)**

Freshly emerged cercariae are negatively geotropic. Swimming movement in “snake-like” fashion, i.e., describing figure of “8” and not that of “8”. Body spinose. Tail aspinose. Collar spines 22 in all including a group of 2 angle spines on each side of pharynx; rest of 18 spines arranged in an unalternating series interrupted dorsally in region of oral sucker. Ventral sucker larger than oral sucker, with two outfoldings of body, one anterior and other posterior to it. Prepharynx about as long as pharynx. Esophagus dividing immediately anterior to anterior outfolding of ventral sucker. Intestinal ceca not extending beyond equatorial level of ventral sucker. Both esophagus and ceca enclosing granular material. Pharynx containing yellowish-brown pigment. Yellow pigment also present in proximal part of tail. Cystogenous glands with “rod-like” contents and furnished with yellow pigment. Pattern of excretory system shown in Fig. 3. Main excretory tubes in preacetabular region enclosing refractile excretory granules of a double nature. Secondary excretory tubes ciliated through most of their extent. Flame cell formula: \(2 \left(3 + 3 + 3\right) + \left(3 + 3 + 3\right) = 36\). No caudal excretory duct. Excretory pore located dorsally anterior to posterior end.
of body. Proximal region of tail containing a contractile structure of a variable shape which does not seem to have any connection with excretory vesicle. Tail somewhat leaf-shaped, provided with prominent musculature; two pairs of longitudinal muscle bands, occupying central region of tail, one pair dorsal and other ventral; circulo and circulodiagonal muscle fibres characteristically arranged. Measurements: body 0.156—0.204 × 0.063—0.090; tail 0.564—0.648 × 0.072—0.120; oral sucker 0.024—0.036 × 0.024—0.030; ventral sucker 0.030—0.036 in diameter; prepharynx 0.015—0.019 long; pharynx 0.012—0.015 in diameter.

Host: Biomphalaria glabrata (Say).
Type locality: Laguna de Carrizales, Los Teques, Edo. Miranda, Venezuela.

Remarks: BYRD and REBER, 1940, created a new subgroup “Magna-cauda” to accommodate large-tailed echinoostome cercariae. The cercaria of *Stephanopora denticulata* befittingly belong to this subgroup and its distinct entity, in relation to other species, can be established by the following key:

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<td>1.</td>
<td>(30) Collar spines present in cercarial stage</td>
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<td>2.</td>
<td>(21) Number of collar spines determined</td>
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<td>3.</td>
<td>(12) Collar spines 19</td>
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<td>4.</td>
<td>(5) Collar spines including a group of 3 angle spines</td>
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<td><em>C. paucispina</em> FAUST and HOFFMAN, 1934 syn. <em>Cercaria IV MARIN</em>, 1928</td>
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<td>5.</td>
<td>(4) Collar spines including a group of 4 angle spines</td>
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<td>(11) Swimming behavior with “snake-like” movement, not desering figure of “8”</td>
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<td>7.</td>
<td>(8) Color of cercaria orange-yellow</td>
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<td><em>C. gigantura</em> JOHNSTON and ANGEL, 1941 = supposed larva of <em>P. australis</em></td>
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<td>8.</td>
<td>(7) Cercaria colorless</td>
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<td>9.</td>
<td>(10) Flame cell formula: $2 \left(3 + 3 + 3 + (3 + 3 + 3)\right) = 36$</td>
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<td><em>C. titfordensis</em> NASH, 1962</td>
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<td>10.</td>
<td>(9) Flame cell formula: $2 \left(3 + 3 + 3\right) = 18$</td>
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<td>Cercaria of <em>P. nitsidus</em> after BRAVER, 1939</td>
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<td>11.</td>
<td>(6) Swimming behavior not with “snake-like” movement, describing figure of “8”</td>
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<td><em>C. rashidi</em> NASH, 1962</td>
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<td>12.</td>
<td>(3) Collar spines more than 19</td>
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<td>13.</td>
<td>(16) Collar spines 20</td>
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<td>14.</td>
<td>(15) Tail 4—9 times as long as body</td>
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<td><em>C. hamptonensis</em> KHAN, 1960</td>
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<td>15.</td>
<td>(14) Tail 3—4 times as long as body</td>
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<td><em>C. thamesensis</em> KHAN, 1960</td>
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<td>16.</td>
<td>(13) Collar spines more than 20</td>
<td>17</td>
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<td>17.</td>
<td>(18) Collar spines 21</td>
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<td><em>C. chandleri</em> ABD-MALEK, 1952</td>
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<td>= larva of <em>P. chandleri</em> ABD-MALEK, 1953</td>
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<td>18.</td>
<td>(17) Collar spines 22</td>
<td>19</td>
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19. (20) Collar spines including a group of 2 angle spines.  
Cercaria of *S. denticulata*

20. (19) Collar spines including a group of 5 angle spines.  
*C. reynoldsi* Egerst, 1961

21. (2) Number of collar spines undetermined

22. (23) Redia with a stylet  
*C. magnacauda* O'Roke, 1917

23. (22) Redia without a stylet

24. (25) Tail with 6 large cells filled with brownish granules  
*C. cita* Miller, 1929; 1929

25. (24) Tail without 6 large cells

26. (28) Suckers isodiametric

27. (29) “not more than 24 (3) collar spines”  
*C. caudadema* Faust, 1921

28. (26) Suckers not isodiametric

29. (27) Collar spines represented by a group of 5 angle spines  
*C. oscillatoria* Brown, 1931

30. (1) Collar spines absent in cercaria

31. (34) Flame cell formula 2 [(3 + 3 + 3) = 18

32. (33) Tail about 10 times the length of body  
*C. illecebrosa* Lee and Seo, 1959

33. (32) Tail 4 times the length of body  
*C. oedematocauda* Byrd and Reiber, 1940

34. (31) Flame cell formula 2 [(2 + 2 + 2 + 2 + 2)] = 20

35. (37) Oral sucker with 10 spines

36. (38) Tail 4—5 times as long as body  
*C. rimosa* Hedrick, 1943

37. (35) Oral sucker without spines

38. (36) Tail more than twice the length of body  
*C. amedi* Hedrick, 1943

**Metacercaria (Fig. 4)**

Various species of freshwater snails, e.g. *Biomphalaria glabrata*, *Fossaria capillaris*, *Lymnaea cubensis*, *Marisa cornuarietis*, *Pomacea glauca* and *P. ureus* were exposed to the cercaria of *S. denticulata* but penetration never took place. When laboratory raised “guppies”, the tropical freshwater fish of the species *Lebistes reticulatus*, were placed in a small aquarium with the infected specimens of *B. glabrata* the cercariae were seen either being actively eaten by fish or carried by respiratory currents into their gill chambers. The cercariae form an active prey due to their “fish-lure” movements.
The cercariae exhibit a special predilection for encystment on the inner surface of the esophagus of the guppies; rarely, occasional cysts are found on the gill filaments as well. One of the guppies which had been exposed to cercariae for 15 min was dissected and several cast off tails were observed in its stomach whereas some of the decended cercariae were creeping anteriorly and some were already in the process of cyst formation on the inner surface of the esophagus. Thus, it appears that the cercariae once inside the fish, whether directly ingested or passively carried by respiratory currents, are taken into the stomach where the tails are gotten rid off and the tailless bodies migrate again anteriorly to encyst in the esophagus; however, we are not sure whether the same applies to the cercariae encysted on the gill filaments.

Most of the cysts are oval and each one of these is enclosed in a cyst wall composed of two layers: an inner layer of parasitic origin and an outer layer of host origin. The latter layer is in fact of the host origin is deduced from the fact that on the first day of the cyst formation there is hardly any trace of this layer but by the passage of time more and more fibrous material of the host origin is gradually added to the inner layer of the parasitic origin until on the 8th day of the encystment a fibrous layer of the host origin 24 microns in thickness is clearly demarcated from the inner layer of the parasitic origin. Moreover, it is difficult to dissect away the layer of the parasitic origin without injuring the enclosed metacercaria whereas the fibrous material of the host origin can be readily removed.

Measurements of 24 randomly selected alive cysts, including layer of the host origin, with a moderate pressure of the coverglass, are 0.106—0.112 × 0.067—0.072.

Remarks: The large-tailed echinostome cercariae which like the cercaria of *Stephanoprora denticulata* involve fishes as the second intermediate hosts for encystment are the cercaria of *Petasiger nitidus*, cercaria of *P. australis*, *Cercaria illecebrosa*, C. *puncispina*, C. *rashidi*, C. *titfordensis* and the cercaria of *P. chandleri*. Brown, 1931, recovered
what he thought to be the cysts of *C. oscillatoria* from *Planorbis carinatus* but his assumption was solely based on the fact that the main collecting excretory tubes of the metacercaria enclosed calcareous concretions of compound nature like those in the corresponding tubes of the cercaria. As pointed out by Beaver, 1939, and later supported by Khan, 1960, Brown probably saw the cysts of another species of cercaria. Johnston and Angel, 1941, found that whereas *Cercaria gigascura* = the supposed larva of *Pettiger australis* under normal conditions encysts in fishes may also do so in snail intermediate hosts under abnormal conditions, such as lateness of season and isolation of a snail with cercariae for a long time, when the cercariae would either encyst in the snail or perish. Khan, 1960, as a result of repeated attempts, failed to infect the snails *Planorbis planorbis* with *Cercaria hamptonensis*. Our own efforts too in relation to the cercariae of *S. denticulata* have proved negative to establish the use of snails as the second intermediate host. As suggested by Johnston and Angel, it may be possible that the cercariae under abnormal conditions might encyst in snails.

**Feeding Experiments**

Canaries, pigeons and ducks proved as negative experimental hosts whereas chickens have been successfully infected. Four, 5 days old chickens were obtained from a commercial dealer and their stool was examined for two days but no trematode eggs were encountered. Two of the chickens were kept as controls and other 2 chickens A and B, 7 days old, on 18.10.1965, were fed 189 and 83 cysts, which were 15 days old, respectively, and their stool was examined daily. On 25.10.1965, the echinostome eggs appeared in their stools, i.e. on the 7th day after the introduction of cysts. On dissection, on the same day, from the small intestine of the chicken A, 4 adult specimens of *Stehlanopora denticulata* and from the small intestine of the chicken B, 7 adults were recovered. The controls were also dissected but with negative results.

**Adult (Figs. 5—7)**

Body typically echinostome in shape, with greatest width in uterine region. Posterior end of body smoothly rounded, exceptionally drawn into a conical protuberance. Cuticular spines in preacetabular region set in close transverse rows whereas in postacetabular region spination reduced in density with rows set further apart and posterior limits of spination varying from anterior border of ovary to level of intertesticular space. Body surface in region of oral sucker not beset with general cuticular spines. Collar spines 22 in all including a group of 2 angle spines on each side of pharynx while remaining 18 spines arranged
in an unalternating series interrupted dorsally in central region of oral sucker. Oral sucker almost equal in diameter to that of pharynx, considerably smaller than ventral sucker. Intestinal ceca in postacetabular region considerably dilated, not extending to extreme posterior end of body. Testes unlobed, with one or more indentations in some specimens, almost equal in transverse diameter while posterior testis larger in longitudinal diameter than that of anterior testis. Intertesticular space varying from nil to 0.025 mm. Cirrus sac highly variable in position: may be dorsally over central region of ventral sucker with a part of it projecting anterior to it or lying anterolaterally either on right or on left of ventral sucker with partial eclipsing of corresponding anterolateral margins of it. Cirrus sac enclosing a coiled seminal vesicle, a prostate complex and a cirrus. Ovary unlobed, from isodiametric to transversely elongated, pretesticular, median or submedian. Uterus
occupying most of space between ventral sucker and ovary. Receptacle of the genital organs is very well developed, conspicuously present in whole mounts. Common genital pore immediately postbifurcal, from median to slightly submedian. Vitelline follicles in two lateral fields; in testicular region mostly extracecal; in posttesticular region fields of two sides mostly kept apart along median longitudinal line, with occasional convergence of follicles of both sides. Anterior limits of vitelline follicles never reaching as far as anterior border of anterior testis and never limited posterior to posterior border of it but always fluctuating between anterior and posterior borders of anterior testis. Posterior limits of vitelline follicles varying from posterior terminations of intestinal ceca to about halfway in postintestinal space. Main longitudinal ducts of vitelline follicles, one on each side, converging anterior to anterior testis with resultant formation of median vitelline reservoir. Eggs with an operculum at one end and a conical protuberance at abopercular end. Excretory vesicle Y-shaped with side branches; main stem of Y extending up to posterior testis. Measurements: body 2.160—3.096 × 0.288—0.504; collar 0.162 to 0.237 in transverse diameter; oral sucker 0.072—0.112 in diameter; ventral sucker 0.162—0.225 in diameter; prepharynx 0.028—0.047 long; pharynx 0.078—0.109 in diameter; esophagus 0.114—0.168 long; anterior testis 0.150—0.275 × 0.150—0.255; posterior testis 0.237—0.375 × 0.150—0.212; cirrus sac 0.056 to 0.112 × 0.092—0.254; ovary when isodiametric 0.087, when transversely elongated 0.087—0.112 × 0.087—0.162; intrauterine eggs 0.067 to 0.084 × 0.033—0.044; extrauterine eggs 0.069—0.084 × 0.051—0.054; distance of ovary from ventral sucker 0.137—0.237; distance of ovary from anterior testis 0.037—0.087; posttesticular extent 0.000—1.276; pretesticular extent 0.864—1.152; precaetal extent 0.415—0.523; postintestinal extent 0.086—0.154; collar spines 0.025—0.033 × 0.008 to 0.011.

Type host: *Actitis macularia* (Linne).

Habitat: Small intestine.

Locality: Laguna de los Patos, near Universidad de Oriente, Cumaná, Venezuela.


**Discussion**

ODHNER, 1910, regarded *Stephanopora denticulata* (RUDOLPH, 1802), *S. pseudochinatum* (OLSSON, 1876), *S. polycystus* (Dietz, 1909) and *S. spinosa* ODHNER, 1910, as synonyms. BEAYER, 1936, considered *S. polycystus* as an independent species and justifiably reduced *S. denticulatoides* ISAIKCHIW, 1924, *S. reynoldii* BHALERAO, 1926, and
The Life of _Stephanopora denticulata_. XVIII

*S. merulae* Yamaguti, 1933, to the synonymy of *S. polycystus*. Kuntz and Chandler, 1956, synonymized *S. magniovata* Yamaguti, 1939, with *S. polycystus*. Skrjabin and Baschikrova, 1956, recognized the identical status of *S. pseudoechinatum* and *S. polycystus* but *S. denticulata*, *S. magniovata*, *S. merulae* and *S. reynolds* were treated as distinct species. Gupta, 1963, not only asserted the validity of *S. polycystus* of Beaver but also separated it from *S. polycystus* of Dietz and created a new genus _Beaverostomum_ to accommodate the parasites of Beaver under a new specific name _Beaverostomum brachyrhynchos_. In fact, *S. polycystus* of Beaver and *S. polycystus* of Dietz are one and the same species and the genus _Beaverostomum_ should be suppressed; in addition, the aforementioned species should all be relegated to the synonymy of *S. denticulata* (Rudolph) Odhner, 1910.

The synonymy of the genus _Stephanopora_ Odhner, 1902, with _Mesorchis_ Dietz, 1909, _Montifer_ Dietz, 1909, and _Sobolevistoma_ Sudarkin, 1950, has been adequately dealt with by Odhner, 1910, Beaver, 1936; Mendheim, 1940; Yamaguti, 1958, and Gupta, 1963. Thus, the genus _Stephanopora_, as it stands now, includes the following species which like *S. denticulata* possess a total number of 22 collar spines, an unlobed ovary and in which the anterior limits of the vitelline glands fluctuate between the anterior limits of the anterior testis and the testicular junction: *S. conciliata* (Dietz, 1909) Odhner, 1910, _S. denticulatoides_ Isajtschikow (1924) Kuntz and Chandler, 1956, _S. fusca_ Lal, 1939, _S. gracilis_ Mendheim, 1940, _S. magniovata_ Yamaguti, 1939, _S. mergi_ Canlon, 1938, _S. merulae_ Yamaguti, 1933, _S. polycystus_ (Dietz, 1909) Odhner, 1910, _S. pseudodenticulata_ Mendheim, 1940, _S. pseudoechinatum_ (Olsson, 1876) Odhner, 1910, _S. reynoldsii_ Bialerco, 1926, _S. skrjabini_ (Dozenko, 1954) Yamaguti, 1958 and _S. spinosa_ Odhner, 1910. Excerpt for minor differences, from the standpoint of the anterior limits of the vitelline glands, in smaller size of the eggs than the ovary, the uterine extent, the diameter of the suckers, the sucker ratio and in having 2 angle spines on each side of the pharynx, *S. conciliata*, *S. denticulatoides*, *S. magniovata*, *S. merulae*, *S. polycystus*, *S. pseudodenticulata*, *S. pseudoechinatum*, *S. reynoldsii*, *S. skrjabini* and *S. spinosa* should be synonymized with *S. denticulata_. Beaver, 1936, distinguished *S. polycystus* from *S. denticulata* on the basis that in the former the anterior limits of the vitelline glands extend anterior to the junction of the testes whereas in the latter the corresponding limits reach as far as the middle level of the posterior testis; on the contrary, Dietz, 1910, did mention that in one of the specimens of *S. denticulata* the anterior limits of the vitelline glands extend to the middle of the anterior testis. It is, therefore, suggested that *S. polycystus* and *S. denticulata* should be considered identical.
Stephanoprora denticulata is characterized by eggs which are smaller than its ovary in contradistinction with S. gracilis and S. mergi in which the eggs are larger than the ovary. It is also separated from S. fusca which is beset with 4 angle spines on each side of the pharynx whereas in S. denticulata there are only 2 angle spines on each side of the pharynx.

Gupta, 1963, regarded Stephanoprora polycystus of Beaver, 1936, as a distinct species from Mesorchis polycystus Dietz, 1909 = S. polycystus (Dietz, 1909) Odhner, 1910, on the following basis:

1. "The collar spines in Beaver's specimens are all arranged in a single row, whereas in the specimens of S. polycystus described by Dietz, four ventralmost collar spines on each side are alternately arranged.

2. A true receptaculum seminis is absent in Beaver's specimens, whereas it is present in S. polycystus of Dietz.

3. A uroproct is present in Beaver's specimens, whereas it is absent in the original specimens of S. polycystus.

4. The ventral sucker in Beaver's specimens is almost double the size of the oral sucker, whereas in the original specimens of S. polycystus the suckers are roughly equal."

In the light of the "so-called" differences Gupta erected a new genus Beaverostomum for the parasites of Beaver. Insofar as the first two points are concerned, Gupta seemingly presented a wrong interpretation. In the description advanced by Beaver, 1936 (p. 248; Figs. 2, 3) the four ventralmost spines are very definitely alternately arranged like the specimens of Dietz, 1910, but not in a single row as erroneously presented by Gupta; furthermore, Beaver makes no mention about the presence or absence of a true receptaculum seminis whereas Gupta has somehow taken it for absent; in the diagram (p. 248; Fig. 1) Beaver has shown a structure posterior to the ovary which might be a receptaculum seminis uterinum or a true receptaculum seminis but again there is no reference in the text. The relative difference in the diameters of the suckers is a question which depends on the state of the contraction of these muscular organs and on the method of fixation as well; unless there are other diagnostic characters, too much reliance, as to the specific determination, on the size of the muscular structures might be misleading. The connections of the excretory bladder and the intestinal ceca with the uroproct as shown in Beaver's specimen (p. 248; Fig. 4) indeed is a unique feature for the members of the subfamily Echinocochasminae as has already been pointed out by Gupta. In our specimens of S. denticulata this structure is absent and certainly it has not been reported for other members of the genus. The presence of the "uroproct" might be a mistaken identity. In our
opinion, *S. polycus* of Braver and that of Diitz are the same species and there is no justification for the retention of the genus *Baxterostomum*.

References


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1 Only those references which are actually consulted are cited.


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