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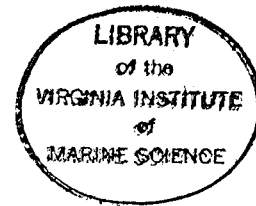
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VIRGINIA INSTITUTE OF MARINE SCIENCE  
GLOUCESTER POINT, VIRGINIA 23062

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HEXABOTHRIIDS (MONOGENOIDEA)  
FROM FAR-EASTERN SKATES

by

August Brinkmann, Jr.

Parazitologiya 5(6):532-538 (1971)

Translation Series No. 23

VIRGINIA INSTITUTE OF MARINE SCIENCE  
Gloucester Point, Virginia

William J. Hargis, Jr.  
Director

1972

## Preface

The publication of this interesting paper by Professor Brinkmann, is intended as a service to researchers and results from our studies on the systematics, host-specificity, and zoogeography of the Monogenea.

This paper is not a translation as such but rather a duplication of the original English manuscript sent by the author to Dr. Boris E. Bychowsky for publication in Parazitologiya. According to Dr. Bychowsky the Russian paper is a "word for word" translation of the manuscript. The abstract and last paragraph of the "Discussion" section did not appear in Dr. Brinkmann's manuscript (footnote 1) and were obviously added by Russian editors. We thank Dr. Pierre C. Oustinoff, Department of Modern Languages, College of William and Mary, Williamsburg, Virginia for translating these parts for us.

We also acknowledge the efforts of Mrs. Elena Burbidge of the Parasitology Section for her usual excellent assistance and for typing the final manuscript.

William J. Hargis, Jr.  
Director

David E. Zwerner  
Parasitology Section

HEXABOTHRIIDS (MONOGENOIDEA) FROM FAR-EASTERN SKATES

by

August Brinkmann, Jr.

Zoological Laboratory, University of Bergen

This article contains data from the study of monogeneans of the family Hexabothriidae from the gills of Far-Eastern skates. As a result of comparison between basic characteristics of the studied specimens with those representatives of various genera of this family, the author came to the conclusion that these specimens belong to the genus Squalonchocotyle and should be established as a new species - S. rajae sp. n., parasitizing the gills of Raja rosispinis Gill et Towns., R. smirnovi Sold. et Pavl. and Breviraja isotrachys (Günth.).<sup>1</sup>

Sproston (1946) does not accept Price's (1942) subdivision of the family Hexabothriidae Price, 1942, into two subfamilies, Hexabothriinae Price, 1942, and Rajonchocotylineae Price, 1942. Her view is based on the fact that the differences between the two basic genera - Squalonchocotyle Cerfontaine, 1899 and Rajonchocotyle Cerfontaine, 1899 - are too small to warrant the establishment of subfamilies. Bychowsky (1957 & 1961) agrees with this view, and I concur. Bychowsky also calls attention to the fact that too much importance has been paid to whether the vaginae are separate with their own openings into the common transverse vitelline duct, or they unite to form a common median canal which opens into the vitelline reservoir. This latter arrangement has so far been regarded as the main reliable diagnostic character of the genus Rajonchocotyle Cerfontaine, 1899, including the "genus" Rajonchocotyloides Price, 1940.

The basis for Bychowsky's view has been expressed (1961, p. 489) as follows: "-- at our disposal is a new and as yet undescribed species from a number of Far-Eastern skates which has a very peculiar structure of the vaginal ducts, now uniting in front of the vitelline duct, now not uniting, and eggs with very long filaments and little feet". As the generic relationships of these specimens was not of special importance to him, some years ago he kindly passed his material to me for closer examination.

MATERIAL

The material consists of 36 mounts of whole parasites or parts thereof, all stained in carmalum. Twenty eight slides contained whole parasites, one slide the posterior half of the parasite, three slides the anterior half and four slides with only the opisthaptor. All specimens had been collected on the 27th of September 1949 from the Sea of Okhotsk, west of the island of Sakhalin. The slide labels gave the hosts as Raja smirnovi Soldatov & Pavlenko, 1915, R. rosispinis Gill & Townsend, 1897 and Breviraja isotrachys (Günther, 1877). The only

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<sup>1</sup>This paragraph was not in original manuscript submitted by the author.

specimen from R. smirnovi was a single, obviously hexabothriid opisthaptor. There were 18 slides from R. rosispinis and 17 from B. isotrachys, each with a single parasite.

#### ANALYSIS OF MATERIAL

All specimens shared the following characters: 1) opisthaptor suckers and their hook-like sclerites all of nearly equal size; 2) cirrus unarmed; 3) eggs with long polar filaments.

These characters exclude the specimens from any of the following hexabothriid genera: Dicyclobothrium Leuckart, 1835, Paradicyclobothrium Bychowsky & Gussev, 1950 (these two genera being formerly included in the family Hexabothriidae), Heteronchocotyle Brooks, 1934, Hexabothrium Nordman, 1840, Pseudohexabothrium Brinkmann, 1952, Rhinobatonchocotyle Doran, 1953 and Rajonchocotyle Cerfontaine, 1899 ("Rajonchocotyloides" included).

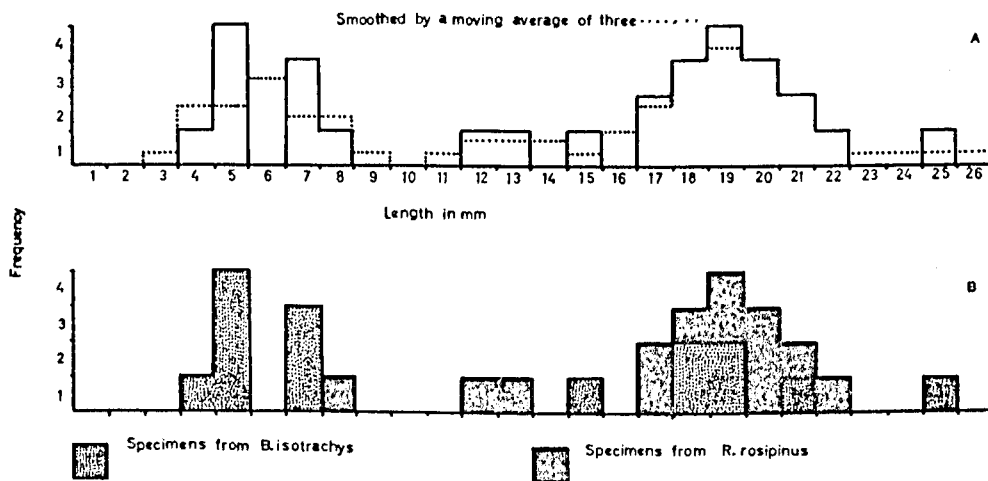


Fig. 1. Squalonchocotyle rajae sp. n.  
A - Size distribution of all specimens; the stippled line indicates the results obtained by calculating running averages of three size groups. B - Size distribution of the parasites in relation to host species.

As these three characters are diagnostic of the genus Squalonchocotyle Cerfontaine, 1899, sensu Sproston, 1946, the present specimens must belong to this genus, despite their being rajid parasites, and in spite of the fact that a few of the specimens possess vaginae which unite to form a single ventral vaginal duct before entering the vitelline reservoir (fig. 2 A-C). The two last mentioned features were formerly believed to be diagnostic of the genus Rajonchocotyle, but this can no longer be maintained.

Irrespective of the host species, the material immediately appeared to fall into two groups, one comprised of small specimens (4-8 mm) and the other of larger specimens (12-25 mm). This grouping is apparent in Fig. 1 A and can still be seen even after running averages have been calculated for groups of three. The question to be decided is whether this grouping indicates two distinct species of Squalonchocotyle, or a single species exhibiting intraspecific variability as has been demonstrated in certain Digenea (Dollfus, 1922; Belopolskaya, 1954, and Shulman-Albova, 1952).

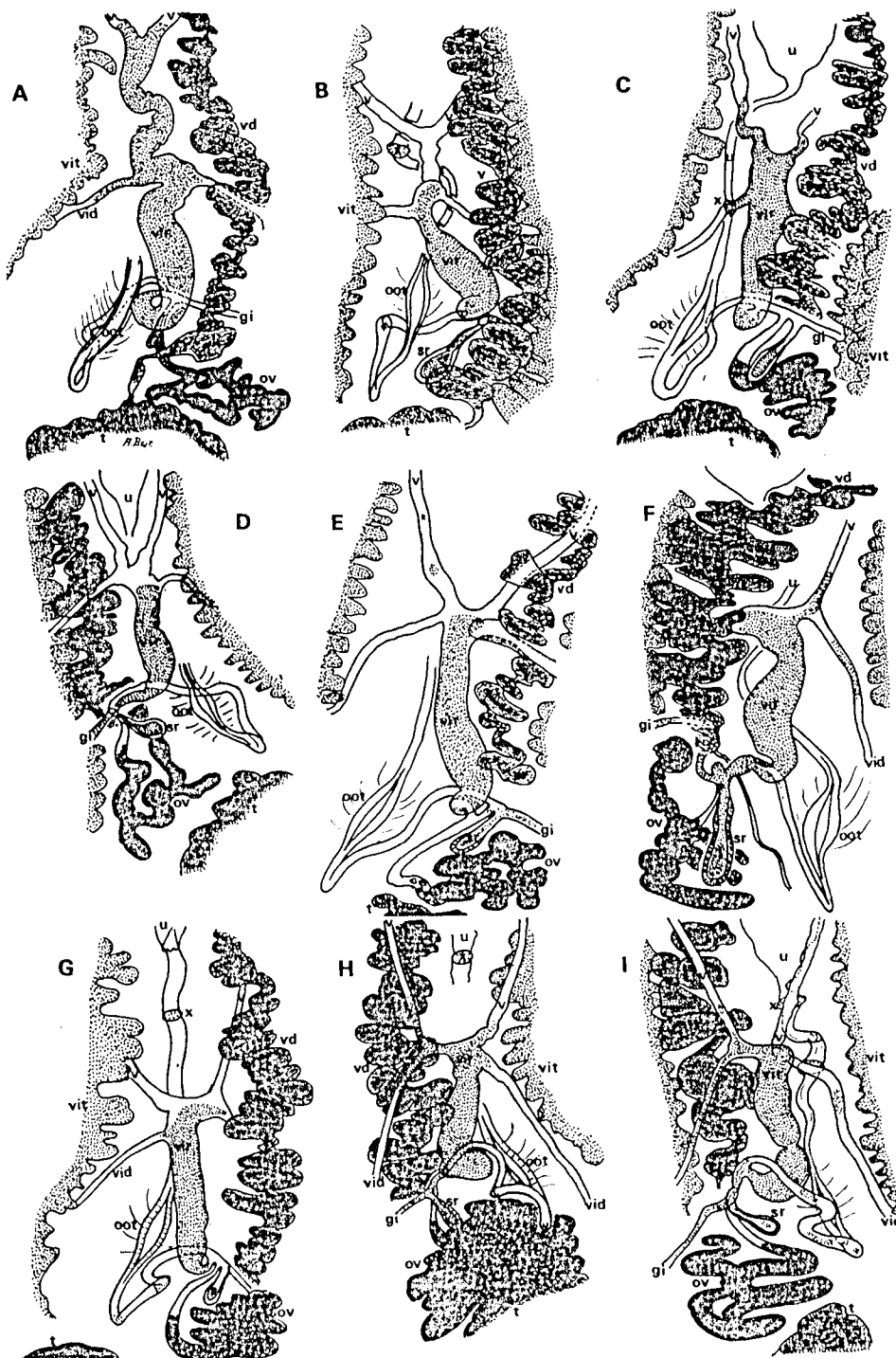


Fig. 2. *Squalonchocotyle rajae* sp. n. (forma major), variations of the vaginae/vitelline duct connections.

A-C - Examples of vaginae uniting at different levels, with consequent decrease in length of common vaginal duct (A - same specimen as in Bychowsky, 1957 (1961), Fig. 291, A). D-I - Individual variations of the common pattern with two separate vaginae entering the transverse vitelline duct with vitelline reservoir. gi - genito-intestinal canal; oot - ootype; ov - ovary; sr - seminal receptacle; t - testis; u - uterus; v - vagina; vd - vas deferens; vid - vitelline duct; vir - vitelline reservoir; vit - vitellaria; x - uterine "valves".

Fig. 1 B shows that all but one of the small specimens were obtained from B. isotrachys, while 12 of the 19 larger specimens came from R. rosispinis. Unless anatomical differences between the two groups can be demonstrated, the analysis of body length indicates that the material consists of a single Squalonchocotyle species which is not host specific and which exhibits intraspecific variation.

#### MORPHOLOGY

No material suitable for sectioning was available; sectioning of specimens taken from whole mounts was quite unsuccessful. As far as could be seen from the whole mounts the specimens followed the general pattern of the genus Squalonchocotyle in all respects, except for the uniting of vaginae in some specimens.

TABLE I: COMPARATIVE MORPHOLOGY OF THE TWO TYPES

	FORMA MINOR	FORMA MAJOR
Length of body (opisthaptor excluded) in slightly flattened specimens	4-8 mm	12-25 mm
Width of body in slightly flattened specimens	0.9 mm	3-4 mm
Vaginal relation to transverse vittelline duct and vitelline reservoir	Vaginae parallel, joining the transverse vitelline duct separately (the common squalonchocotylid pattern)	Vaginae parallel generally, joining the transverse vitelline duct and reservoir (fig. 2 D-I) separately. Occasionally vaginae uniting to form a midventral vaginal canal entering the vitelline reservoir (fig. 2 A-C). (The common rajonchocotylid pattern)
Location of ovary	On the right, at the posterior end of the anterior half of body	On the right, at the posterior end of the anterior third of body
Uterine "valves"	Not observed	Valve-like structures at the base of anterior distended uterine part ("egg-sac") and between this and the ootype (fig. 2 B, C, G, H, I-x)
Eggs	0.26 mm, connected by polar filaments forming an uninterrupted chain (fig. 3)	0.31 mm, probably in chains as no loose filament ends could be observed between the eggs in the uterus. Where the filaments were bent back upon themselves they might resemble a small foot.
Seminal receptacle	Not observed	Present; small, club-shaped and thick-walled, containing vitelline granulae and sperms
Haptoral hook-like sclerites	Linear length of sclerital prong (from pointed end to insertion in sclerite proper) about twice the width of sclerite proper (fig. 4, a)	Linear length of sclerital prong (from pointed end to insertion in sclerite proper) about the same as the width of sclerite proper (fig. 4, b)
Appendix hooklets	Length about 70 $\mu$ . Fairly long, subequal roots (fig. 4, c)	Length about 70-90 $\mu$ . Roots on same side as hook-point longer than the one on the opposite side (fig. 4, d)



Comparison between the two groups (forma minor and major), and between them and other Squalonchocotyle species which form egg-chains, reveals some interesting facts.

This table [Table I] shows no conclusive anatomical differences to warrant the establishment of separate species. On the other hand some relative differences between the two groups do exist. Until further material for sectioning is available, it is best to regard the present material as representing a single new species - Squalonchocotyle rajae n. sp. - which exhibits intraspecific variation and is characterized by egg-chains and a tendency for the two vaginae to unite into a median vaginal canal, as invariably found otherwise within the genus Rajonchocotyle.

#### DISCUSSION

Within the genus Squalonchocotyle, the present species clearly belongs to that group proposed by Dollfus (1936) which is characterized by eggs united in a chain by means of long polar filaments. Comparison of S. rajae n. sp. with the members of this group is presented accordingly in Table II.

It is apparent from this table that the present species is easily distinguished from all other squalonchocotylids which have eggs in chains. In the large size of its eggs it differs from all but S. dollfusi, from which it differs in not having a distended glandular anterior part of the vaginae.

Certainly the most interesting feature of the present new species is that the vaginae, which are usually parallel, occasionally unite to form a median common vaginal duct, as previously known only for the genus Rajonchocotyle.



Fig. 3. Squalonchocotyle rajae sp. n. (forma minor), formation of egg-chain.

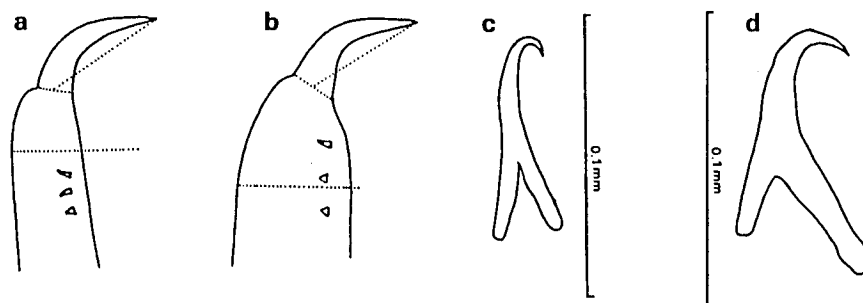


Fig. 4. Haptoral hook-like sclerites with prong.  
a - from S. rajae forma minor; b - from S. rajae forma major, appendix hooklets;  
c - from S. rajae forma minor; d - from S. rajae forma major.

*S. torpedinis* is the only squalonchocotyloid previously known to have a rajid host, and this species has parallel vaginae. It is thus possible that the present species is the squalonchocotyloid ancestor of the rajonchocotyloids.

TABLE II: COMPARATIVE MORPHOLOGY OF THE SQUALONCHOCOTYLE SPECIES CHARACTERIZED BY CHAIN-FORMATION OF EGGS

<i>S. rajae</i> sp. n.	<i>S. canis</i> Carfontaine 1899	<i>S. carenolata</i> Kuberlet 1933	<i>S. calearhini</i> (Price 1942) Sproston 1946 ( <i>S. abbreviata</i> F. A or Dollfus)	<i>S. eugalei</i> (Price 1942) Sproston 1946 ( <i>S. abbreviata</i> F. B or Dollfus)	<i>S. torpedinis</i> (Price 1942) Sproston 1946 ( <i>S. abbreviata</i> F. C or Dollfus)	<i>S. dollfusi</i> (Price 1942) Sproston 1946 ( <i>S. abbreviata</i> F. D or Dollfus)
Cuticle not tuberculate	Cuticle tuberculate, including cavities of haptor					
Width of pharynx/ width of oral sucker 1/3-1/2		1/5	1/7	1/6	1/3	1/5
Length of pharynx/ length of oral sucker, slightly less than 1/1		1/1	1/4	1/4	1/2	1/2
Location of ovary in anterior half of body		In middle of body			Just posterior to middle of body	
Anterior part of vaginae not distended and glandular						Anterior part of vaginae distended and glandular
Small, thick-walled seminal receptacle		Large, thin-walled seminal receptacle		Large, thin-walled seminal receptacle		
Egg-length (pole to pole, filum excl.) 0.26-0.31 mm	0.10 mm	0.127- 0.141 mm	0.13-0.25 mm	0.118-0.130 mm	0.16 mm	0.26 mm
Appendix hooklets with well separated roots, deep space between them (fig. 4, c-d)	Short roots with shallow space in between, triangular appearance			Short roots	Short roots	

This material is registered under the number Mon. 3206-3234 in the collection of the Laboratory of Parasitology of the Zoological Institute of the Academy of Sciences USSR. Since the author considers that further research is needed for final clarification before attributing a forma minor to this species, we suggest that *Raja rosispinis* (from which the largest quantity of samples of the forma major was collected) be considered the type host of the species.<sup>1</sup>

<sup>1</sup>This paragraph was not in original manuscript submitted by the author.

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