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HELMINTH PARASITES OF FISHES FROM THE ARABIAN GULF
2 – THE DIGENETIC TREMATODE GENERA *HAMACREADIUM* LINTON, 1910 AND *CAINOCREADIUM* NICOLL, 1909

By

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ABSTRACT

The status of the related digenetic trematode genera *Hamacreadium* Linton 1910 and *Cainocreadium Nicoll, 1909* is briefly reviewed. *Hamacreadium* Linton 1910 is described from *Lutjanus fulviflamma* and *L. russelli. Cainocreadium epinepheli* (Yamaguti, 1934) Durio and Manter, 1968 is described from *Lethrinus nebulosus, Epinephelus tauvina, E. chlorostigma, E. areolatus* and *E. summana. Hamacreadium ghardagense* Ramadan, 1983 is transferred to the genus *Cainocreadium* and thus a new combination, *Caincoreadium ghardagense* is suggested.

INTRODUCTION

Linton (1910) established the genus *Hamacreadium* for Allocreadiid trematodes having oblique testes, claviform and preacetabular cirrus pouch, lobulated ovary and caeca terminating at the posterior end of the body, with *H. mutabile* Linton, 1910 as the type species of the genus.

Manter (1947) has indicated the great similarity between *Hamacreadium* and *Plagioporus* Stafford, 1904, although there are considerable variations in the length of the excretory vesicle among species known from these genera.

Skrjabin (1964) proposed a key for six species of the genus *Hamacreadium* which was based on the lobulation of testes, position of genital pore and extension of vitellaria and excretory bladder.

Lamothe (1962) changed *Hamacreadium lethrini* Nagaty and Abdel Aal, 1962,

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a parasite of *Lethrinus mehsenoides* from Red Sea, to *H. lethrini* since the combination *H. lethrini* was previously used by Yamaguti (1934) for a parasite of *Lethrinus haematopterus.*

Fischthal and Kuntz (1965) redescribed *Hamacreadium interruptum* Nagaty, 1941 from *Lethrinus microdon* from North Borneo and synonymized *Plagioporus longivesicula* Yamaguti, 1952 with this species.

Pritchard (1966) transferred *H. mehsena* Nagaty, 1941 to the genus *Podocotyle* and Yamaguti (1971) transferred *H. diacope* Nagaty and Abdel Aal, 1962 to the genus *Plagioporus;* both *H. mehsena* and *H. diacope* were described from the Red Sea.

Durio and Manter (1968) transferred *Hamacreadium* species with a median genital pore to the genus *Cainocreadium* Nicoll, 1909; these included : *H. pteroisi* Nagaty and Abdel Aal, 1962; *H. epinepheli* Yamaguti 1934; *H. gulella* Linton, 1910; *H. longisaccum* Siddiqi and Cable, 1960 and *H. consuteum* Linton, 1910. Moreover, they proposed the genus *Pacificreadium* for *Hamacreadium serrani* Nagaty and Abdel Aal, 1962 in *Serranus miniatus* from the Red Sea. Durio and Manter (1968) characterized the genus *Pacificreadium* by the extension of the excretory vesicle across the caecal bifurcation to end alongside the pharynx.

Saoud, Abu Sinna and Ramadan (1977) described *Hamacreadium caranxi* from *Caranx altissimus* from the Red Sea in the Sudan.

Ramadan (1983) reviewed the genus *Hamacreadium* and described *H. ghardagense* from *Variola louti* and *H. khalili* from *Lethrinus mahsena* and *L. nebulosus.* He also suggested that *H. balistesi* Nagaty and Abdel Aal, 1962 should be synonymized with *H. interruptum* Nagaty, 1941. A key was also presented to differentiate the species of the genus *Hamacreadium* known at that time from the Red Sea fishes.

During the present work, two species belonging to this group of trematodes are described from fishes of the Arabian Gulf.

MATERIAL AND METHODS

The collection and identification of fish are described elsewhere (Saoud, Ramadan and Al Kawari, 1986.) The methods and techniques of collection, relaxation, fixation and staining of helminths are basically those described by Saoud and Ramadan (1983). Drawings are made to scale using the Camera lucida. All measurements are in millimetres unless stated otherwise.

HAMACREDAIUM MUTABILE LINTON, 1910

(Fig. 1)

DESCRIPTION

The following description is based on twenty nine specimens collected from *Lutjanus fulviflamma* and *Lutjanus russelli.*

The body is elongate, with rounded extermities, 2.9 – 6.5 long and 1.02 – 2.2 wide. The length / width ratio is 2.5 – 3.3 : 1.The tegument is smooth. Both suckers are almost round in shape, the oral sucker is subterminal and measures 0.20 – 0.40 in diameter, while the ventral sucker measures 0.42 – 0.72 long and 0.41 – 0.80 wide. The ratio between the two suckers is 0.4 – 0.5 : 1.

A prepharynx is present and measures 0.07 – 0.14 long. The pharynx is well developed and measures 0.14 – 0.28 in diameter. The pharynx leads to a fairly long oesophagus, 0.14 – 0.57 long. The intestinal caeca are thin, bifurcating and extending to about the distal end of the body.

The testes are elongated oval, indented, diagonal, intercaecal and are located at the third fourth of body length. They are almost equal in size; the anterior testis measures 0.40 – 1.02 long and 0.32 – 0.62 wide, while the posterior one measures 0.42 – 0.97 long and 0.38 – 0.71 wide. The cirrus pouch is elongated and curved in shape; it lies on the right side between the ventral sucker and the intestinal bifurcation and measures 0.35 – 0.92 long and 0.14 – 0.28 wide. It is occupied posteriorly by a compact vesicula seminalis, short pars prostatica surrounded by few prostatic cells that lead to a short cirrus. The genital pore is located on the left side of the median line and lies posterior to the intestinal bifurcation; it measures 0.02 – 0.07 in diameter.

The ovary is lobulated and intercaecal, consisting of irregular 12 – 15 lobes. It lies towards the right side of the anterior testis and measures 0.10 – 0.52 long and 0.20 – 0.74 wide.

The vitellaria are composed of numerous small follicles which extend from the intestinal furca to the posterior end of the body. The uterus lies anterior to the ovary and contains brownish to yellow–coloured aggs. The eggs are oval, operculated and measure 47 – 89 um × 42 – 53 um.

DISCUSSION

Linton (1910) described *H. mutabile* from *Neomaenis griseus, N. apodus, Anisotremus virginicus and Ocyurus chrysurus and Pomacanthus arcuatus* in Tortugas. *H. mutabile* is characterized by the following : "Body variable in shape, ventral sucker larger than oral sucker, a short prepharynx, pharynx and long oesophagus are present, genital pore a short distance in front of the ventral sucker on the left side of the median line, cirrus pouch often extending to the right border of the ventral sucker".

Yamaguti (1934) described *Hamacreadium epinepheli* in *Epinephelus akaara* and *Lethrinus haematopterus* from Japan. He differentiated it from *H. mutabile* by the position of the genital pore which lied on the median line directly behind the caecal furca, the size of eggs as well as the relatively larger pharynx.

Nagaty (1941) recorded *H. mutabile* in *Serranus merra, Lethrinus mahsena, L. nebulosus, Teuthis marmorata* and *Diacope fulviflamma* from the Red Sea. Both Nagaty (1941) and Manter (1947) noted the great similarity between *H. mutabile* and *H. epinepheli* Yamaguti, 1934 and suggested that the latter species should be considered as a synonym of the former one. However, Yamaguti (1971) did not accept this synonymy and accordingly recognized both species as distinct. Moreover, he accepted the view of Durio and Manter (1968) that species of the genus *Hamacredium* with a median genital pore should be transferred to the genus *Cainocreadium* Nicoll, 1909.

Manter (1963) reported *H. mutabile* from *Lethrinus sp.* in Fiji. Durio and Manter (1968) reported the same species of trematodes in *Lutjanus* sp., *L. amabilis, L. fulviflamma* and *Lethrinus miniatus* from New Caledonia. These authors indicated that *H. mutabile* was described from at least five species of *Lutjanus* as well as from other genera of fishes in several parts of the World, including the Caribbean, Galapagos Island, Hawaii and the Red Sea. On studying numerous specimens of *H. mutabile,* they concluded that the genital pore was never described as being median in this species.

Yamaguti (1971) reported *H. mutabile* in *Lutjanus synagris, L. jocu, L. analis* and *Epinephelus striatus.* Moreover, he re-identified *H. mutabile* described by Siddiqi and Cable 1960 in *Ocyurus chrysurus* from Florida as *H. confusum* Overstreet, 1969.

Hafeezullah and Siddiqi (1970) proposed the synonymy of *H. leiperi* Gupta, 1956 from India with *H. mutabile.*

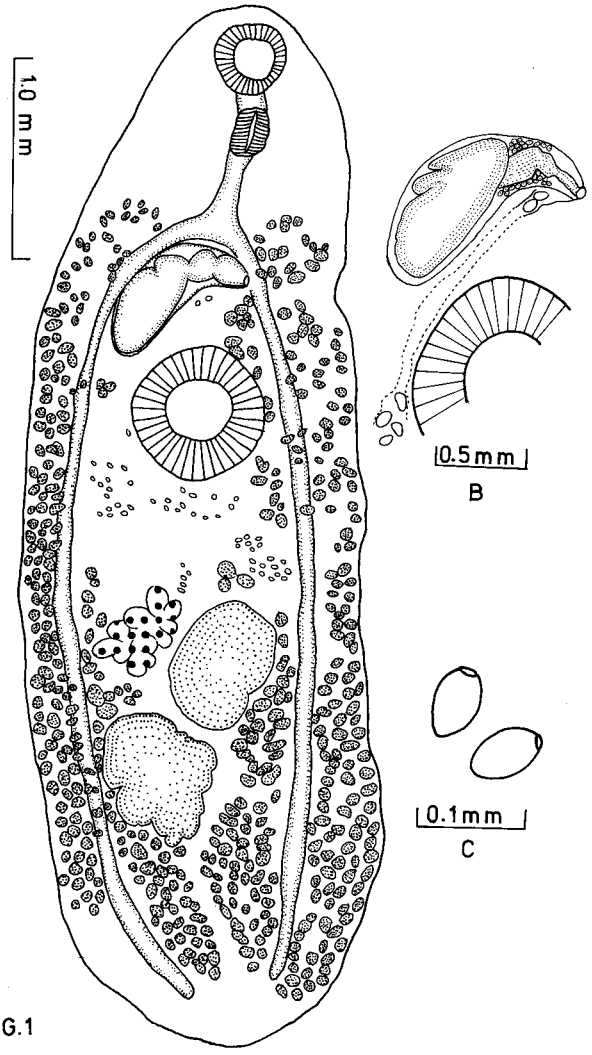

FIG.1

(A)

Fig. (1)

Hamacreadium mutabile Linton, 1910

A – Ventral view

B – Terminal genitalia

C – Eggs

Table 1

Comparison Between Some Descriptions of *Hamacreadium mutabile* Linton, 1910

Characters	Linton, 1910	Nagaty, 1941	Present Material
Body length	2.30 – 5.5	2.4 – 5.7	2.9 – 6.5
Width	0.77 – 0.98	0.79 – 2.17	1.02 – 2.2
Length/Width	3.3 – 5.6 : 1	3 : 1	2.5 – 3.3 : 1
Oral sucker	0.22 – 0.24 × 0.26	0.20 – 0.52	0.20 – 0.40 in diameter
Prepharynx	Short	Short	0.07 – 0.14
Pharynx	0.11 – 0.15	0.16 – 0.34	0.14 – 0.28 long
Oesophagus	Long, slender	Present	0.14 – 0.57 long
Ventral suker	0.32 – 0.34 long	0.38 – 0.89	0.42 – 0.72 × 0.41 – 0.80
Oral Sucker/Ventral sucker	0.3 – 0.4 : 1	0.52 : 1	0.4 – 0.5 : 1
Testes	Diagonal, indented	Diagonal, 0.19 × 0.72 in diameter	Oval, diagonal, indented, 0.40–1.02 × 0.32 – 0.62 and 0.42 – 0.97 × 0.38 – 0.71
Cirrus pouch	Cylindrical, on the anterior right border of the ventral sucker	Cylindrical	Elongate, curved between the ventral sucker and intestinal bifurcation, 0.35–0.92 × 0.14–0.28, on the right side of the worm
Genital pore	On the left side of median line	At the level of intestinal bifurcation	Sub–median, posterior to intestinal bifuraction, to the left side of median line
Ovary	Lobed, in front of right testis	3 – 11 lobes anterior to testis, 0.12 × 0.82	12–15 lobes, to the right of anterior testis, 0.10 – 0.52 × 0.20 – 0.74
Receptaculum seminis	On the dorsal side of ovary	Present	Indistinct
Vitellaria	Diffuse, extend in front of the intestinal bifurcation to posterior end	———	Small follicles, extend from intestinal bifurcation to the posterior end
Eggs	75 – 78 × 33 – 34 um	77 × 41 um	74 – 89 × 42 – 53 um
Locality	Dry Tortugas	Red Sea	Arabian Gulf

Ramadan (1983) redescribed *H. mutabile* from *Lethrinus mahsena, L. nebulosus, Epinephelus chlorostigma* and *E. summana* from the Red Sea. In the opinion of the present writers, Ramadan's identification of that species cannot be accepted as final for the following reasons :

1. The exact position of the genital pore is not indicated in Ramadan's description.
2. The relative size of the ventral sucker is much larger than Linton's material.
3. The topography of the genital organs in relation to the ventral sucker.
4. The eggs are smaller than those reported in the original description of *H. mutabile.*

The above described material of *H. mutabile* in fishes from the Arabian Gulf agrees in many aspects with Linton's original description, particularly in the position of the genital pore, cirrus pouch, shape of testes and ovary as well as the shape and size of eggs. In Table (1) a comparison between the descriptions of *H. mutabile* by Linton, 1910; Nagaty, 1941 and the present writers is given.

CAINOCREADIUM EPINEPHELI (YAMAGUTI, 1934) DURIO AND MANTER, 1968

(Fig. 2)

DESCRIPTION

The following description is based on thirty eight specimens collected from *Lethrinus nebulosus, Epinephelus tauvina, E. chlorostigma, E. areolatus* and *E. summana.* The body shape is elongate, pear-shaped with the broadest diameter at the posterior half of the body. The tegument is smooth. The size varies between 2.28 – 7.3 in length and 0.9 – 2.4 in maximum width. The ratio between the length to width is 2.53 – 3.04 : 1.

The oral sucker is subterminal, fairly round in shape and measures 0.20 – 0.57 long and 0.20 – 0.64. It leads to a very short prepharynx that measures 0.02 – 0.08 in length. The pharynx is muscular, wider than long and measures 0.21 – 0.54 long and 0.31 – 0.65 wide. This is followed by a moderately long oesophagus that measures 0.11 – 0.85 in length. The oesophagus bifurcates into two intestinal caeca that end very close to the posterior extremity of the body.

The ventral sucker is almost round in shape, larger than oral sucker and measures

0.31 – 1.07 in length and 0.34 – 1.02 in width. The ventral sucker lies about 1.14 – 1.82 from the anterior extremity of the body. The ratio of the oral sucker diameter to that of the ventral sucker is 0.50 – 0.58 : 1.

The two testes are diagonally placed, lying at the posterior third of the body. They are oval in shape, slightly indented; the anterior testis measures 0.24 – 1.07 in length and 0.28 – 0.85 in width, while the posterior testis is 0.28 – 1.08 in length and 0.28 – 0.92 in width. The cirrus pouch is medium in size, pear–shaped, lies dorsal and lateral to the ventral sucker and contains the vesicula seminalis at its posterior end; it measures 0.70 – 1.28 long and 0.21 – 0.28 wide. The genital pore lies on the median line below the intestinal bifurcation.

The ovary is lobulated with 3 – 6 lobes, lies immediately anterior to the testes and measures 0.17 – 0.47 in length and 0.14 – 0.48 in width. There is a large receptaculum seminis which is found antero–dorsal to the ovary; it measures 0.35 – 0.48 in length and 0.16 – 0.21 in width. The vitellaria are extensive, composed of irregularly shaped follicles that extend from the posterior end of the body to about the level of the intestinal bifurcation. The uterus is relatively small; it lies between the ovary and the ventral sucker. The metraterm is observed passing along the cirrus pouch and towards the right side of the worm. The eggs are elongated oval, measuring 42 – 89 um in length and 17 – 49 um in width; they are operculated at one side and have a knob–like structure at the other side.

The excretory vesicle is tubular and elongated, reaching in some specimens in front of the ventral sucker.

DISCUSSION

Yamaguti (1934) described *Hamacreadium epinepheli* in *Epinephelus akaara* and *Lethrinus haematopterus* from Japan. This species was differentiated from *H. mutabile* by the position of the genital pore, lying on the median line behind the intestinal furca in the former species and on the left of the median line in the latter. Durio and Manter (1968) believed that the distinct difference in the position of the genital pore was of generic importance and suggested the accommodation of *H. epinepheli* in the genus *Cainocreadium* Nicoll, 1909 and thus re–named that species *Cainocreadium epinepheli* (Yamaguti, 1934) Durio and Manter, 1968. Moreover, they transferred *H. gulella* Linton, 1910; *H. lintoni* Siddiqi and Cable 1960 and *H. pteroisi* Nagaty and Abdel Aal, 1962 to the genus *Cainocreadium.*

Yamaguti (1971) accepted the view of Durio and Manter and suggested to

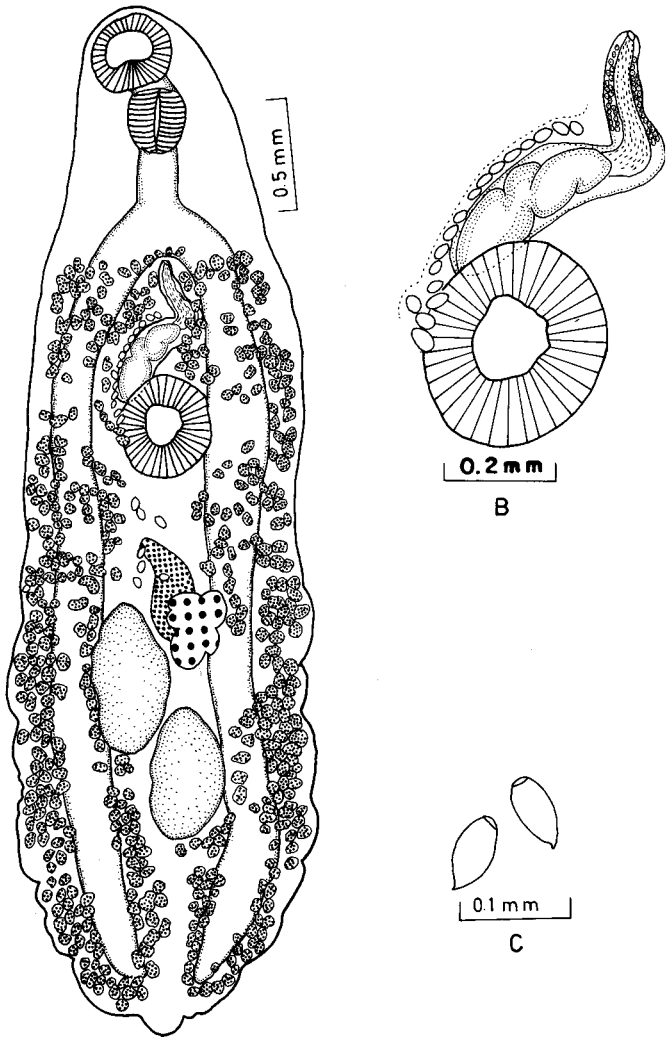

Fig. (2)
Cainocreadium epinepheli (Yamaguti, 1934)
Durio and Manter, 1968
A – Ventral view
B – Terminal genitalia
C – Eggs

re-accommodate two more species in the genus *Cainocreadium,* namely *H. consuteum* Linton, 1910 and *Distoma verrucosum* Molin, 1859.

The material described above from some fishes of the Arabian Gulf shows a clear similarity with *Cainocreadium epinepheli* as well as *H. ghardagense,* a recently described species from the Red Sea (Ramadan, 1983). The present material can be definitely identified as *Cainocreadium epinepheli* while the similarity between that species and *H. ghardagense* is remarkable (Table 2).

H. ghardagense Ramadan, 1983 was recently described in *Variola louti* from the Red Sea. The description of that species-which is based on a single mature specimen - indicates that the genital pore is median and located behind the intestinal furca; a character which clearly places it in the genus *Cainocreadium* and not *Hamacreadium.* Accordingly, a new combination *Cainocreadium ghardagense* (Ramadan, 1983) is proposed. Ramadan (1983) believed that his material differed from other species known at that time by its characteristic egg shape, being "oval, operculated at one end and with a small distinct process at the other end" as well as the characteristic arrangement of the ovarian lobes in the form of a "V-shaped structure". More recently, Ramadan (personal communication) agreed that his species could not be characterized by the egg shape, since eggs with the same configuration were already known in *Cainocreadium consuteum* (Linton, 1910) and *C. epinepheli* (Yamaguti, 1934) (Table 3). However, he restressed the importance of the ovary shape and the distribution of vitellaria as important characteristics of his species. It is the opinion of the present writers that examination of more specimens of that species could confirm either its distinctiveness as a separate species or its synonymy with *Cainocreadium epinepheli.*

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Table 2

A Comparison Between *Cainocreadium epinepheli* and *Cainocreadium ghardagenese*

Characters	*Cainocreadium epinepheli* (Yamaguti, 1934) Durio and Manter 1968	*Cainocreadium ghardagense* (Ramadan, 1983) n. comb.	Present Material
Body length	3.23	3.75	2.28 – 7.3
Width	0.74	0.83	0.9 – 2.4
Length/Width	4.36 : 1	4.52 : 1	2.53 – 3.04 : 1
Oral sucker	0.2 in diameter	0.26 × 2.25	0.20 – 0.57 × 0.20 – 0.64
Ventral suker	0.36 in diameter	0.50 × 0.42	0.31 – 1.0 × 0.34 – 1.02
Oral sucker / Ventral suker	0.55 : 1	0.52 : 1	0.50 – 0.58 : 1
Prepharynx	0.04	0.04	0.02 – 0.08
Pharynx	0.21 × 0.14	0.16 in diameter	0.21 – 0.54 × 0.31 – 0.65
Oesophagus	0.21 long	0.13 long	0.11 – 0.85 long
Testes	Slightly indented, subglobular, obliquely tandem in position, at the junction of the middle and posterior thirds of body, 0.32 × 0.29 and 0.35 × 0.31	Elongated, egg–shaped, slightly indented, diagonal and in the third fourth of body length, 0.45 × 0.21 and 0.47 × 0.26	Oval, slightly indented, diagonal, in the posterior third of the body, 0.24 – 1.07 × 0.28 – 0.85 and 0.28 – 1.08 × 0.28 – 0.92
Cirrus pouch	Spirally curved	Elongated, narrow, 0.52 × 0.18	Pear–shaped, 0.70 – 1.28
Genital pore	Directly behind the intestinal bifurcation	Just posterior to intestinal bifurcation, 20 um in diameter	On the median line below the intestinal bifurcation
Ovary	Irregularly lobed, anteroventral to the anterior testis, 0.12 × 0.20	Irregularly lobed, arranged in the form of V–shaped structure to the right side of anterior testis,	Lobulated with 3–6 lobes anterior to the testes, 0.17 – 0.47 × 0.14 – 0.48
Vitellaria	At the level of the middle of oesophagus, extend along the caeca to a short distance before the end of the body	Small follicles, extend from oesophageal level to the posterior extermity of the body	Small, irregularly shaped follicles, from the intestinal bifurcation to the posterior end
Eggs	Oval, operculated, has a small papilla–like projection at the anti–opercular pole, 73–76 × 42–45 um	Oval, operculated from one end and with a small distinct process at the other end, 68 × 42 um	Elongated, oval, operculated from one side and has a knob–like structure at the other side, 42 – 89 × 17 – 49 um
Locality	Japan and Pacific Coast	Red Sea	Arabian Gulf

Table 3

Comparison Between *Cainocreadium epinepheli* and Other Related Species

Characters	*Cainocreadium epinepheli* (Yamaguti, 1934) Durio and Manter 1968	*Cainocreadium consuteum* (Linton, 1910) Yamaguti, 1971	*Cainocreadium gulella* (Linton 1910) Durio and Manter, 1968
Length	3.23	1.55	1.85
Width	0.74	0.46	0.67
Length/Width	4.36 : 1	3.36 : 1	2.76 : 1
Oral sucker	Subterminal, 0.2 in diameter	Subterminal, 0.15 in diameter	Subterminal, 0.15 in diameter
Ventral sucker	0.36 in diameter,	0.2 in diameter	0.24 in diameter
O. sucker/V. sucker	0.55 : 1	0.55 : 1	0.52 : 1
Prepharynx	0.042	Absent	Short
Pharynx	0.21 × 0.14	0.06 in diameter	0.08 in diameter
Oesophagus	0.21 long	As long as pharynx or longer	Very short
Testes	Slightly indented, subglobular, obliquely tandem, 0.32 × 0.29 and 0.35 × 0.31	Oval, diagonal on opposite side of median line	Oval, about half–way between ventral sucker and the posterior end
Cirrus pouch	Spirally curved, its posterior end extends to the middle of acetabulum	Overlaps anterior edge of ventral sucker or may pass to the right but not reach as far as middle of ventral sucker	Its base overlapping anterior edge of ventral sucker
Genital pore	Directly behind the intestinal bifurcation	Median, immediately behind the intestinal bifurcation	In front of ventral sucker, about half–way between it and the bifurcation of the intestine, median
Ovary	Irregular, lobed, anteroventral to the anterior testis, 0.12 × 0.2	Lobed, variable, near anterior border of posterior testis	4–lobed, on the right of median line, near the proximal border of anterior testis
Vitellaria	At the level of middle of oesophagus, extend along the caeca to a short distance before the end of the body	Diffuse, extend as far forward as the pharynx	Diffuse, scattered behind testes to about the level of intestinal bifurcation
Eggs	Oval, operculated, have small papilla–like projection at the anti–opercular pole, 73–76 × 42 – 45 um	Large with a tubercle at one pole, 52 × 39 um	Large, 78 × 44 um
Locality	Japan and Pacific Coast	Florida	Florida

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الديدان الطفيلية في أسماك الخليج العربي
(٢) ديدان التريماتودا من جنسى هاماكريديم لِينتون ١٩١٠ وكينوكريديم نيكول ١٩٠٩

محمد فتحي عبد الفتاح سعود و مصطفى محمود رمضان
و
كلثم سالم الكواري

قدم المؤلفون عرضاً تاريخياً وتحليلياً وتصنيفياً للتريماتودات التابعة لجنسي **هاماكريديم** و **كينوكريديم** ، وقد أعاد المؤلفون وصف الطفيليات من نوع **هاماكريديم ميتابايل** من نوعين من أسماك الخليج ، ونوع **كينوكريديم إيبينفلي** من خمسة أنواع من الأسماك ، وهذان النوعان من الطفيليات يسجلا لأول مرة من الخليج العربي ، وقد تمت مناقشة وتعديل التشخيص النوعي للطفيلين المذكورين ، وأقتُرح تعديل الوضع التصنيفي لنوع **هاماكريديم غردقنس** الذي سبق وصفه من البحر الأحمر .