

**DIGENEAN TREMATODES OF MARINE TELEOST FISHES :
THE GENUS *HELICOMETRA* ODHNER, 1902
(OPECOELIDAE) : ON THE VALIDITY OF TWO KNOWN
SPECIES FROM THE RED SEA**

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ABSTRACT

The genus *Helicometra* Odhner, 1902 (Trematoda : Digenea : Opcoelidae) was briefly reviewed. The digeneans now referred to *H. marmoratae* Nagaty and Abdel-Aal, 1962 and *H. nasae* Nagaty and Abdel-Aal, 1962 were collected from their original fish hosts at Hurgada, Red sea, Egypt. These species are redescribed in details and figured. The given redescrptions are broadened and revealed that *H. marmoratae* is actually a synonym of *H. pulchella* (Rudolphi, 1819) Odhner, 1902 (the type species of the genus), while *H. nasae* is actually a synonym of *H. equilata* (Manter, 1933) Siddiqi and Cable, 1960. However, the misidentification of these species was discussed.

INTRODUCTION

Helicometra Odhner, 1902 (Trematoda: Digenea: Opcoelidae) is a large cosmopolitan genus. Through the years 1902-1973, many of its species underwent numerous taxonomic changes and a large number of synonyms were proposed. Therefore, Sekerak and Arai (1974) comprehensively reviewed this genus accepting the validity of 15 out of 31 species known at that time. These are: *H. pulchella* (Rudolphi, 1819) odhner, 1902 (the type species) [synonyms=*H. sinuata* (Rudolphi, 1819) Odhner, 1902, *H. fasciata* (Rudolphi, 1819) Odhner, 1902, *H. mutabilis* stossich, 1903, *H. flava* (Stossich, 1902) Stossich, 1903, *H. gobii* (Stossich, 1883) Stossich, 1904, *H. labri* (Stossich, 1886) Isaichikov, 1928, *H. epinepheli* Yamaguti, 1934, *H. hypodytis* Yamaguti, 1934, *H. markewitschi* Pogorel'tseva, 1954, *H. dochmosorchis* Manter and Pritchard, 1960, *H. aposinuta* Pritchard,

1966, and *H. upapalu* Yamaguti, 1970], *H. torta* Linton, 1910 (synonym= *H. pretiosa* Bravo-Hollis and Manter, 1957), *H. plovornini* Isaichikov, 1928, *H. tenuifolia* Woolcock, 1935 (synonym= *H. neosebastodis* Crowcroft, 1947), *H. bassensis* Woolcock, 1935, *H. grandora* Manter, 1954, *H. pterois* (Gupta, 1956) Siddiqi and Cable, 1960, *H. equilata* (Manter, 1933) Siddiqi and Cable, 1960 (synonym= *H. boseli* Nagaty, 1956), *H. marmoratae* Nagaty and Abdel-Aal, 1962, *H. nasae* Nagaty and Abdel-Aal, 1962 (synonym= *H. rectisaccus* Fischthal and Kuntz, 1964), *H. indica* Agrawal, 1964, *H. borneoensis* Fischthal and Kuntz, 1965, *H. kyliotrema* Pritchard, 1966, *H. paracirrhiti* Pritchard, 1966 and *H. gomphosi* Yamaguti, 1970. Through the years 1974-1993, 5 additional species have been ascribed to the genus *Helicometra*; namely *H. robinsorum* Overstreet and Martin, 1974, *H. filamentosa* Madhavi, 1975, *H. sinipercae* Wang, 1982, *H. scorpaenae* Wang, 1982, and *H. gibsoni* Meenakshi and Swarnakumari, 1993. Thus, the genus is now comprising 20 valid species.

Until now, 4 species of *Helicometra* are known from the Red Sea fishes; namely *H. pulchella* (Rudolphi, 1819) Odhner, 1902 [described as *H. hypodytis* Yamaguti, 1934 by Nagaty (1956), and as *H. epinepheli* Yamaguti, 1934 by Ramadan (1986)], *H. equilata* (Manter, 1933) Siddiqi and Cable, 1960 [described as *H. boseli* by Nagaty (1956)], *H. marmoratae* Nagaty and Abdel-Aal, 1962, and *H. nasae* Nagaty and Abdel-Aal, 1962. To date, *H. marmoratae* and *H. nasae* are only known by their original descriptions since 1962. The validity of these species was questioned by Sekerak and Arai (1974) who stated that "further collections of these species are required to establish their validity". In fact, the original descriptions of *H. marmoratae* and *H. nasae* were inadequate, for example, the first species was briefly described from one specimen only. In the present study, the digeneans now referred to *H. marmoratae* and *H. nasae* were collected from their original fish hosts at Hurgada, Red Sea, Egypt (Fig. 1) and redescribed in details to discuss their validity.

MATERIAL AND METHODS

In January 2001, 42 and 26 individuals of the fish *Teuthis marmorata* (local name= Sigan) and *Epinephelus fasciatus* (local name = Koshar) respectively, were collected from the coasts of

Hurgada, Red Sea, Egypt. Standard parasitological techniques were used to examine the alimentary canal of fish. Digenean trematodes were removed from their host fishes under a dissecting microscope, kept alive in sea water diluted to 1% salinity as recommended by Schroeder (1971), and observed under a compound research microscope. Some worms were fixed in alcohol-formalin-acetic (AFA) under slight coverslip pressure, and preserved in 70% ethyl alcohol. Whole mounts were stained by alum carmine, cleared in terpeneol, and mounted in Canada balsam. Figures were drawn with the aid of a camera lucida. Mounted specimens were deposited in the Helminthological collection of the Red Sea fishes, Marine Science Department, Faculty of Science, Suez Canal University, Ismailia, Egypt.

RESULTS AND DISCUSSION

Helicometra marmoratae Nagaty and Abdel-Aal, 1962 (Fig. 2 A)

Out of 42 *Teuthis marmorata* examined, 6 individuals (14.29%) were found parasitized by the intestinal trematode *Helicometra marmoratae* Nagaty and Abdel-Aal, 1962. The following description of this species is based on 30 mounted specimens:

The body is elongate, somewhat flattened dorso-ventrally, unspined, and measures 3.20-6.10 mm long by 0.75-1.33 mm wide at the acetabular level. The oral sucker is sub-terminal, nearly spherical, and measures 0.26-0.45 mm in diameter. The acetabulum is spherical, 0.38-0.70 mm in diameter, and situated at the middle of the anterior half of body. Sucker ratio is about 1:1.46-1.63. Forebody is about one fourth of the total body length. The pharynx is globular, and measures 0.17-0.28 mm long by 0.19-0.33 mm wide. The oesophagus is short, 0.10-0.18 mm in length, and bifurcates at about the mid-way between suckers into two narrow intestinal caeca extending backwards to near the posterior extremity. The two testes are slightly lobed, slightly separated, oblique (in 18 specimens) or tandem (in 12 specimens), and situated post-equatorial or at the middle of the posterior half of body: anterior testis measures 0.39-0.65 mm long by 0.32-0.52 mm wide,

while the posterior one measures 0.42-0.65 mm long by 0.28-0.50 mm wide. The cirrus sac is well developed, overlapping the anterior border of acetabulum posteriorly, sigmoid (dextral in 20 specimens) or clavate (median in 10 specimens), and measures 0.56-0.95 mm long by 0.13-0.19 mm wide. It contains a slightly twisted seminal vesicle, a well developed prostatic complex, and a relatively long protrusible cirrus. The genital pore is median, just behind the intestinal bifurcation. The ovary is multi-lobed, situating sub-median to right, and contiguous with the anterior testis. The seminal receptacle is rounded, and occupies different positions anterior to the ovary. Laurer's canal is a direct continuation of the seminal receptacle, and opening dorsally near the median line at the level between the ovary and acetabulum. The uterus is relatively long, inter-caecal, winding between the ovary and acetabulum. The terminal uterine coil is muscular, and forms a distinct metraterm opening into the base of the genital atrium. The vitelline follicles are irregular in shape, small in size, numerous, and extend in the lateral fields from the level of pharynx to near the posterior extremity; confluent in post-testicular space. The eggs are thin-shelled, moderately large, 62-78 μm long by 40-54 μm wide, and provided with polar filaments 2-3 times the egg length. The excretory vesicle is saccular, extending anteriorly to near the acetabulum; the excretory pore is postero-terminal.

Helicometra marmoratae Nagaty and Abdel-Aal, 1962 was briefly described from one specimen and only compared with *H. hypodytis* Yamaguti, 1934 (now is a synonym of *H. pulchella*). Nagaty and Abdel-Aal (1962) mentioned that *H. marmoratae* is very similar to *H. hypodytis*, but differs in having oblique testes (instead of being tandem), a spherical seminal receptacle (instead of being oval), and a median genital pore situating immediately behind the intestinal bifurcation (instead of situating at the level of oesophagus). At that time, this comparison was inappropriate, since *H. pulchella* and *H. dochmosorchis* Manter and Pritchard, 1960 (now is a synonym of *H. pulchella*) shared these characteristics with *H. marmoratae*. Undoubtedly, many variations occur during relaxation, fixation, and further preparation of the specimens for study. For example, the tandem testes tend to be oblique during relaxation; the shape of seminal receptacle varies greatly depending upon its content (i.e., reflects its content); the position of genital pore may appear to be greatly affected by the state of contraction of the specimen. Accordingly, all the characteristics used by Nagaty and Abdel-Aal

(1962) were invalid specific differences in distinguishing *H. marmoratae* from *H. hypodytis*. However, Sekerak and Arai (1974) gave convincing evidences that the sucker ratio, the forebody length (the region between the anterior end of body and the anterior border of acetabulum, i.e. the position of acetabulum), the anterior extent of vitelline follicles, the posterior extent of the cirrus sac, and the egg size are the most important five taxonomic characters in separating species of the genus *Helicometra* from each others. In fact, *H. marmoratae* was poorly described from one specimen only by Nagaty and Abdel-Aal (1962). However, the given description includes some errors, for example, it stated that the posterior part of the cirrus sac was immediately pre-testicular, but the illustration (Fig. 3 of Nagaty and Abdel-Aal 1962) clearly shows the posterior part of the cirrus sac to overlap the anterior border of acetabulum. It should, therefore, be assumed that "pre-testicular" is an error and should be replaced by "pre-acetabular". In the present study, the description of *H. marmoratae* was broadened and critically compared with that of *H. pulchella* in Table (1). As shown in this table, *H. marmoratae* has no specific difference which would distinguish it from *H. pulchella* to establish its validity. However, all the characteristics of *H. marmoratae* are now overlapping those of *H. pulchella*. In view of the above information, it is concluded that *H. marmoratae* Nagaty and Abdel-Aal, 1962 is actually a synonym of *H. pulchella* (Rudolphi, 1819) Odhner, 1902 (the type species of the genus).

***Helicomentra nasae* Nagaty and Abdel-Aal, 1962 (Fig. 2B)**

Out of 26 *Epinephelus fasciatus* examined, 7 individuals (26.92%) were found parasitized by the intestinal trematode *Helicometra nasae* Nagaty and Abdel-Aal, 1962. The following description of this species is based on 45 mounted specimens:

The body is elongate, dorso-ventrally flattened (lateral margins are nearly parallel), unspined, and measures 2.90-5.83 mm long by 0.38-0.65 mm wide at its middle. The oral sucker is sub-terminal, spherical and measures 0.16-0.26 mm in diameter. The acetabulum is spherical, 0.19-0.32 mm in diameter, and situated posteriorly in the anterior fourth of the body. Sucker ratio is about 1 : 1.18-1.23. Forebody is about one fifth of the total body length. The pharynx is globular, and measures 0.08-0.14 mm long by 0.11-0.16 mm wide.

The oesophagus is moderately long, 0.12-0.18 mm in length, and bifurcates at about the mid-way between suckers into two narrow intestinal caeca extending backwards to near the posterior extremity. The two testes are tetra-lobed, tandem, slightly separated, and situated anteriorly in the posterior half of the body; anterior testis measures 0.29-0.52 mm long by 0.24-0.46 mm wide, while the posterior one measures 0.33-0.61 mm long by 0.23-0.50 mm wide. The vasa deferentia arise from the testes are united anterior to the ovary to form a common vas deferens opening into the base of the cirrus sac. The later organ is sinistral, 0.60-1.22 mm in length, and contains a slightly widening seminal vesicle, a well developed prostatic complex and a relatively long protrusible cirrus. The genital pore is nearly median, ventral to the oesophagus. In some specimens (especially the small ones), the cirrus sac seemed to be sigmoid and extending posteriorly to the mid-way between the acetabulum and ovary, but in the other specimens (large ones), the cirrus sac seemed to be slightly curved and extending posteriorly to about one third of the distance between the acetabulum and ovary. The ovary is tetra-lobed, median, situated at a short distance anterior to the testes, and measures 0.19-0.33 mm long by 0.21-0.37 mm wide. The seminal receptacle is oval in shape, and lies immediately in front of the ovary. Laurer's canal originates directly from the seminal receptacle, and opens medially on the dorsal side of the body. The uterus is relatively long, inter-caecal, and coiled between the ovary and acetabulum. The terminal uterine coil is nearly straight and extending along the median line to open into the genital atrium. The vitelline follicles are numerous, irregular in shape, and extending anteriorly to near the posterior border of acetabulum; confluent in post-testicular space. At the ovarian level, a transverse vitelline duct coming from the vitellaria of each side to open into a saccular vitelline reservoir situating ventral to the ovary. The eggs are thin-shelled, 45-55 μm long by 28-35 μm wide, and provided with polar filaments slightly longer than the egg length. The excretory vesicle is tubular, extending anteriorly to near the ovary; the excretory pore is postero-terminal.

Helicometra nasae Nagaty and Abdel-Aal, 1962 was briefly described from 10 specimens and only compared with *H. boseli* Nagaty, 1956 (now is a synonym of *H. equilata*). Nagaty and Abdel-Aal (1962) mentioned that *H. nasae* is similar to *H. boseli*, but the former differs in having a cirrus sac extending well posterior to the acetabulum, vitelline follicles extending anteriorly to the posterior edge of acetabulum, and an ovary situating some distance in front of

the anterior testis. Except the posterior extension of the cirrus sac, the other two characteristics used by Nagaty and Abdel-Aal (1962) were no longer useful in distinguishing *H. nasae* from *H. boseli*. However, at that time this comparison is inappropriate, since *H. equilata* (Manter, 1933) Siddiqi and Cable, 1960 shared these characteristics with *H. nasae*, but Nagaty and Abdel-Aal (1962) seemed unaware of the study of Siddiqi and Cable (1960). In fact, *H. nasae* was poorly described by Nagaty and Abdel-Aal (1962). Also, the given description includes some errors, for example, it stated that "the acetabulum is located nearly in the anterior third of the body length", but the illustration (Fig. 2 of Nagaty and Abdel-Aal 1962) clearly shows the acetabulum to locate in the anterior fifth of the body. Skerak and Arai (1974) preferred to keep *H. nasae* Nagaty and Abdel-Aal, 1962 as a valid species and stated that the only difference between *H. nasae* and *H. equilata* is the characteristic of the cirrus sac. In the former, the cirrus sac is slightly curved and extends posteriorly to about one third of the distance between the acetabulum and ovary, but in the second, the cirrus sac is sigmoid and extending to the mid-way between the acetabulum and ovary. This characteristic seems questionable, since Pritchard (1966) reported sigmoid to slightly curved cirrus sacs in her specimens of *H. boseli* (now is a synonym of *H. equilata*). However, it has been demonstrated in *H. pulchella* and *H. equilata* that considerable intraspecific variations occur in the shape of the cirrus sac and its orientation with respect to the acetabulum (Sekerak and Arai, 1974). In the present study, the description of *H. nasae* was broadened to reveal that in small specimens the cirrus sac is usually sigmoid, and extends posteriorly to the mid-way between the acetabulum and ovary; but in large specimens, the cirrus sac is slightly curved and extends posteriorly to about one third of the distance between the acetabulum and ovary. Thus, the shape and posterior extent of the cirrus sac are herein considered as invalid specific characteristics if the description is not broadened. The present description of *H. nasae* was compared critically with that of *H. equilata* in Table (2). As shown in this table, *H. nasae* has no specific difference which would distinguish it from *H. equilata* to establish its validity. However, all the characteristics of *H. nasae* are now overlapping those of *H. equilata*. Accordingly, it is concluded that *H. nasae* Nagaty and Abdel-Aal, 1962 is actually a synonym of *H. equilata* (Manter, 1933) Siddiqi and Cable, 1960.

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Table (1): A comparison between *Helicometra marmoratae* & *H. pulchella*.

Character	<i>H. pulchella</i> (Kudolph, 1819) Oshner, 1982. All reports & synonyms	<i>H. marmoratae</i> Nagaty & Abdel-Aal, 1962	<i>H. marmoratae</i> The present description
Body shape	Elongate, dorso-ventrally flattened	Elongate, dorso-ventrally flattened	Elongate, dorso-ventrally flattened
Body length	0.41-0.47 mm	0.32 mm	0.20-0.10 mm
Forebody/total body length	1/4-1/3	1/4	1/4
Oral sucker diameter	0.07-0.29 mm	0.44 mm	0.26-0.43 mm
Acetabulum diameter	0.10-0.48 mm	0.72 mm	0.38 - 0.70 mm
Sucker ratio	1 : 1.0-2.4	1 : 1.6	1 : 1.46-1.63
Testes			
Shape:	Entire to deeply lobed	Slightly lobed	Slightly lobed
Arrangement:	Tandem or oblique	Oblique	Oblique
Cirrus sac			
Shape:	Clavate or sigmoid	Sigmoid	Clavate or sigmoid
Posterior extent:	Overlapping the anterior border of acetabulum	Overlapping the anterior border of acetabulum	Overlapping the anterior border of acetabulum
Genital pore			
Shape:	Median or sub-median, at the level of pharynx or immediately behind the intestinal bifurcation	Median, immediately behind the intestinal bifurcation	Median, immediately behind the intestinal bifurcation
Ovary			
Shape:	Multi-lobed	Multi-lobed	Multi-lobed
Position:	Sub-median, contiguous with the anterior testis	Sub-median, contiguous with the anterior testis	Sub-median, contiguous with the anterior testis
Anterior extent of vitellaria	To the level of pharynx or slightly behind	To the level of pharynx	To the level of pharynx
Egg size	30-100 X 11-42 µm	80 X 50 µm	62-78 X 40-54 µm

Table (2): A comparison between *Helicometra nasae* & *H. equitata*.

Character	<i>H. equitata</i> (Manter, 1933) Siddiqui & Cable, 1960. All reports & synonyms	<i>H. nasae</i> Nagaty & Abdel-Aal, 1962	<i>H. nasae</i> The present description
Body shape	Elongate, dorso-ventrally flattened, with nearly parallel lateral margins.	Elongate, dorso-ventrally flattened, with nearly parallel lateral margins.	Elongate, dorso-ventrally flattened, with nearly parallel lateral margins
Body length	0.87-3.32 mm	3.15-6.30 mm	2.9-5.83 mm
Forebody/total body length	1/5	1/5	1/5
Oral sucker diameter	0.09-0.40 mm	0.20-0.30 mm	0.16-0.26 mm
Acetabulum diameter	0.11-0.60	0.23-0.35	0.19-0.32
Sucker ratio	1 : 1.2-2.2	1 : 1.2	1 : 1.18-1.23
Testes			
Shape:	Tetra-lobed	Tetra-lobed	Tetra-lobed
Arrangement:	Tandem	Tandem	Tandem
Cirrus sac			
Shape:	Sigmoid or slightly curved	Slightly curved	Sigmoid or slightly curved
Posterior Extent:	To the mid-way between the acetabulum and ovary	To about one third of the distance between the acetabulum and ovary	In small specimens to about the mid-way between acetabulum and ovary. In large specimens, to one third of the distance between acetabulum and ovary.
Genital pore			
Shape:	Nearly median, ventral to the oesophagus	Nearly median, ventral to the oesophagus	Nearly median, ventral to the oesophagus
Ovary			
Shape:	Tetra-lobed	Tetra-lobed	Tetra-lobed
Position:	Median, some distance in front of the anterior testis	Median, some distance in front of the anterior testis	Median, some distance in front of the anterior testis
Anterior extent of vitellaria	To near the posterior border of acetabulum	To near the posterior border of acetabulum	To near the posterior border of acetabulum
Eggs	35-57 X 24-33 µm	50 X 30 µm	45-55 X 28-35 µm

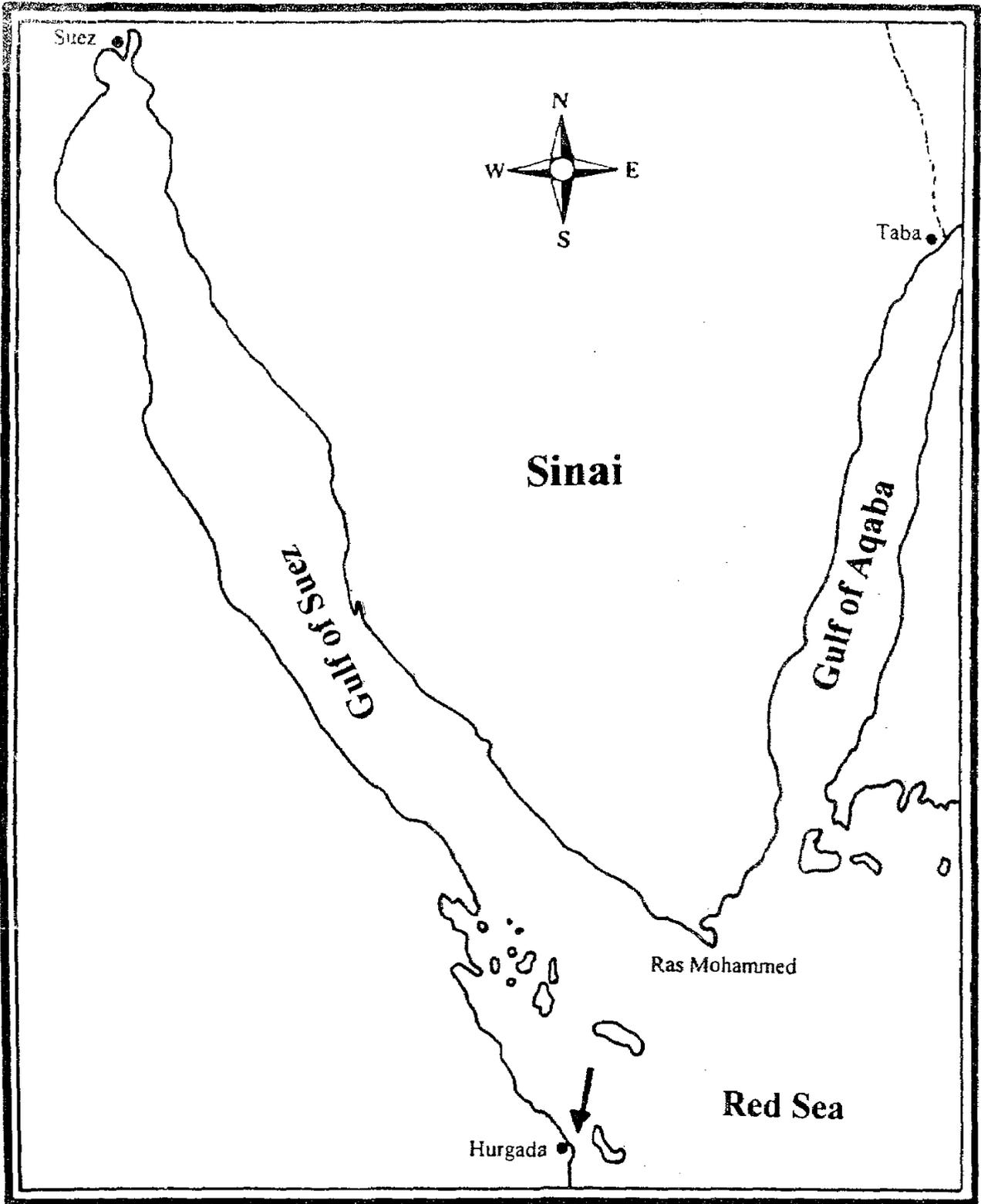


Fig. (1) : A map showing the locality of the examined fishes .

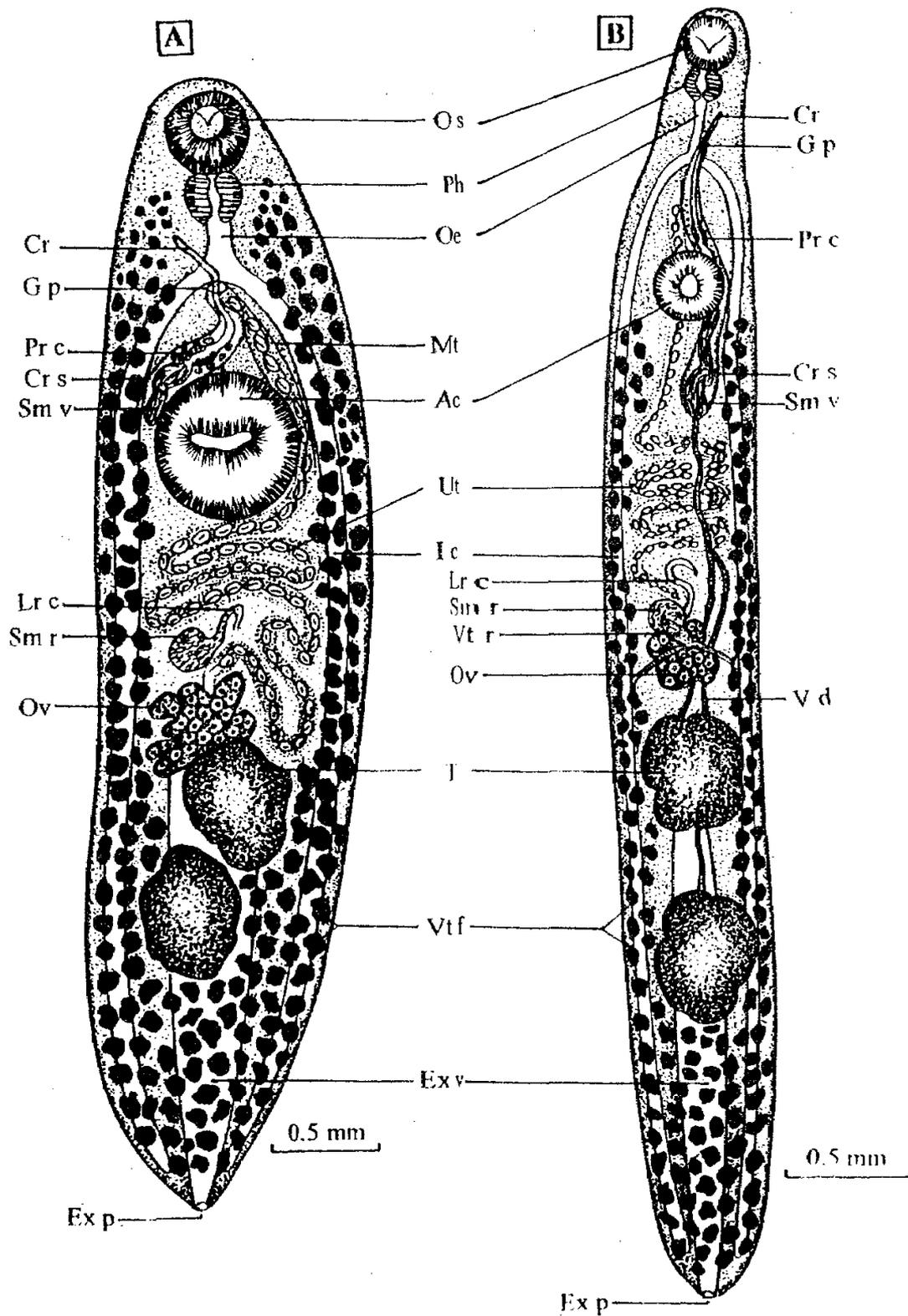


Fig.(2): A) *Helicometra marmoratae* Nagaty and Abdel-Aal, 1962 (ventral view).
 B) *Helicometra nasae* Nagaty and Abdel-Aal, 1962 (ventral view).
 Ac=Acetabulum, Cr=Cirrus, Cr s=Cirrus sac, Ex p=Excretory pore, Ex v=Excretory vesicle, G p= Genital pore, Ic=Intestinal caecum, L c =Laurer's canal, Mt=Metraterm, Oe=Oesophagus, O s=Oral sucker, Ov=Ovary, Ph=Pharynx, Pr c=Prostatic complex, Sm r=Seminal receptacle, Sm v=Seminal vesicle, T=Testis, Ut=Uterus, V d=Vas deferens, Vt f= Vitelline follicles, Vt r= Vitelline reservoir.