J.K.A.U.: Sci., vol. 3, pp. 65-90 (1411 A.H. / 1991 A.D.)

Hofstenia arabiensis Nov. Sp. (Hofsteniidae): A New Species of Acoelan Turbellaria from the Red Sea North of Jeddah

S. BELTAGI and A.S. MANDURA
Department of Marine Biology, Faculty of Marine Science, King Abdulaziz University, Jeddah, Saudi Arabia

ABSTRACT. A new Acoelan worm, *Hofstenia arabiensis* was found alive on the brown algae *Sargassum vulgare* (J.G. Agardh), and *Cystoseira myrica*, in the reef flat shoreward of the fringing reef in front of the Old King's Palace, North of Jeddah (Saudi Arabia).

It is elongated having an anterior tip and a blunt posterior end. The color of the body is nearly yellowish red. The living worm is about 5 mm long and its breadth reaches about 1.25 mm.

Nearly 35 specimens of this worm were collected during the months of May and June 1986. Reconstructions of the new species were drawn from the median sagittal position by the examination of transverse, longitudinal and frontal sections of the worm stained by Haematoxylin-eosin and Mallory stain.

This worm is related to the genus *Hofstenia* due to the fact that it has an integumentary nerve plexus. The mouth aperture is subterminal. The pharynx is strongly muscular. Vesicula seminalis is present and the ovary is follicular. It is a new species due to the fact that the worm is tubular, having a rounded anterior tip and a blunt and smooth posterior end. It has a yellowish red color. The worm has a network subepidermal nerve plexus extending from the anterior tip of the body till the end of its first half, moreover, the central brain mass surrounding the statocyst is totally absent. The penis bulb is provided with only 4 chitinised spines. The sunk epithelial layer of the pharynx is unciliated and the oesophagus is missing.

Introduction

Many scientists studied flattened worms, especially Acoelan Turbellarians, namely Luther[1], Westblad[2], Karling[3], Faubel[4], and others, while few scientists had

worked on Turbellarians in the Red Sea, such as Palombi[5], Melouk[6], Antonius[7], Beltagi[8], Beltagi and Khafaji[9].

Concerning the previous work which was done upon species of the genus *Hofstenia*[10] Bock discovered a new Acoelan Turbellaria *Hofstenia atroviridis*[10]. Palombi[5] collected a new species *Hofstenia minuta* from the Suez canal.

In 1960, Correa found *Hofstenia miamia*[11] in the shallow water of Florida beach. Also, he collected the same species in 1963[12] from the caribbean sea. Otto Steinbock had established in 1966, a new species of Acoelan Turbellaria *Hofstenia beltagii* from Ghardaqa station in the west-north part of the Red Sea, Egypt[13]. Besides, he discovered *Hofstenia giselae*[13] near the marine laboratory, Bimini, Bahamas.

Material and Methods

In May and June 1986, 35 specimens of this worm had been collected from the brown Algae *Sargassum vulgare* and *Cystoseira myrica*, living on the sandy bottom of the reef flat, north of Jeddah at the Red Sea in Saudi Arabia. It was gathered from a depth ranging between 50-170 cm at low tide. Reconstructions of this new species were drawn from the median, sagittal, frontal, longitudinal and transverse sections of the worm, stained by haematoxylin-eosin. Also, Mallory stain was used, giving good results.

Systematic Position

Phylum	Platyhelminthes
Class	Turbellaria
Order	Acoela,[14,15]
Family	Hofsteniidae[13]
Genus	*Hofstenia*[10]
	Hofstenia arabiensis nov. sp.

Results

External Features (Fig. 1)

The worm is somewhat elongated, having a round anterior tip and a blunt posterior end, thus differing from *Hofstenia beltagii*[13]. The color of the body is nearly yellowish red. In fresh life, one can observe some of the internal organs, such as the pharynx which is situated at the anterior third part of the body. At the second third part of the body, big ripe eggs are extending from the end of the first third part of the body till the last part of the second third region of the body. Eggs have a light brown coloration.

The living worm is about 5 mm long and its breadth reaches about 1.25 mm, thus differing from *Hofstenia giselae*[13]. Symbiotic algae are totally absent. The eyes are also missing. The statocyst (Fig. 1, 2 - Pl. 2 st) is situated near the anterior end. It is small in size and has a diameter of about 21 μ.

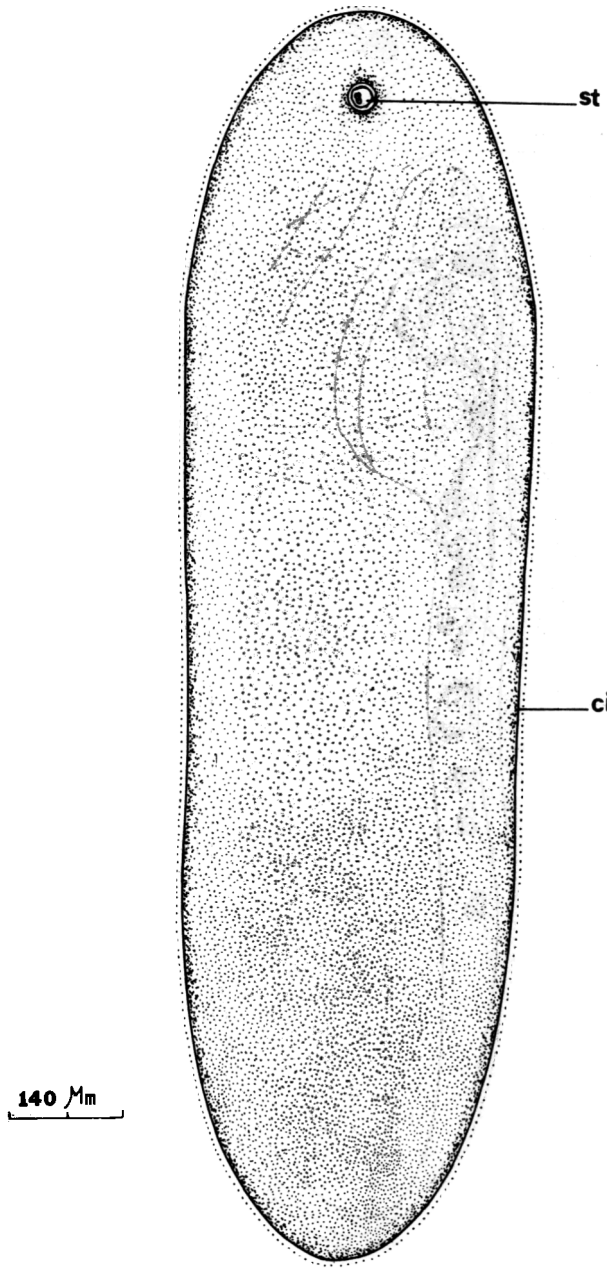


FIG. 1. *Hofstenia arabiensis* nov. sp. – External features.

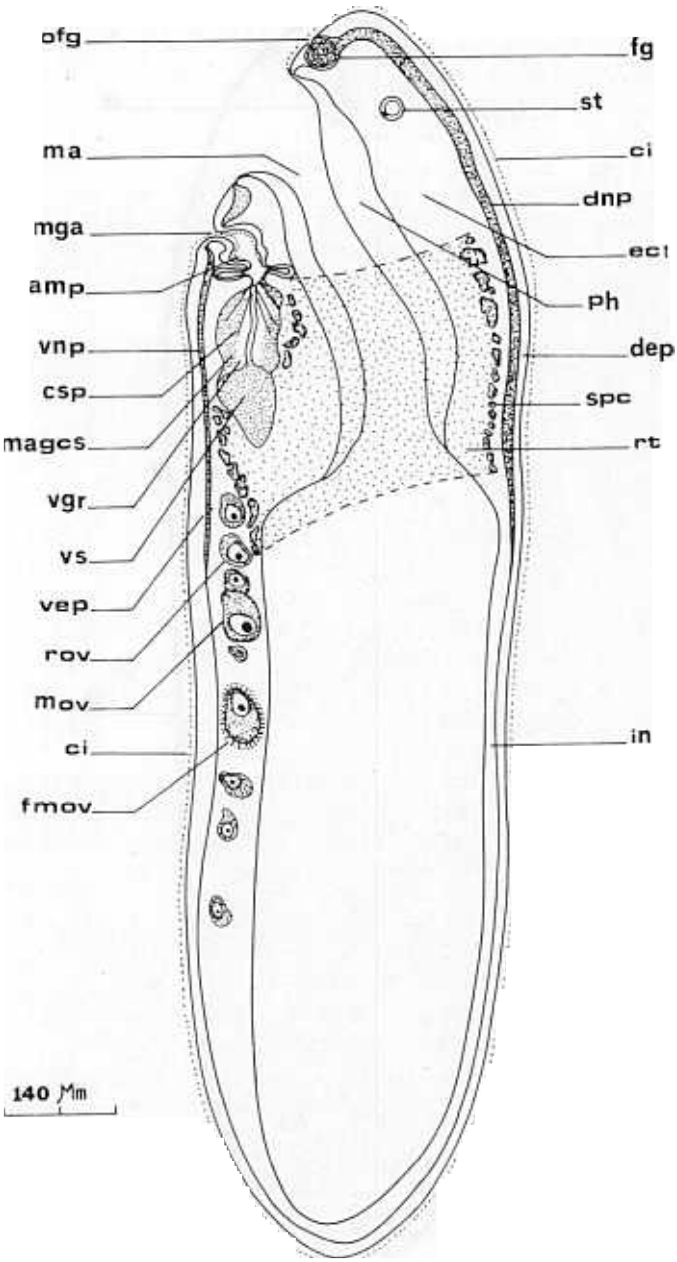


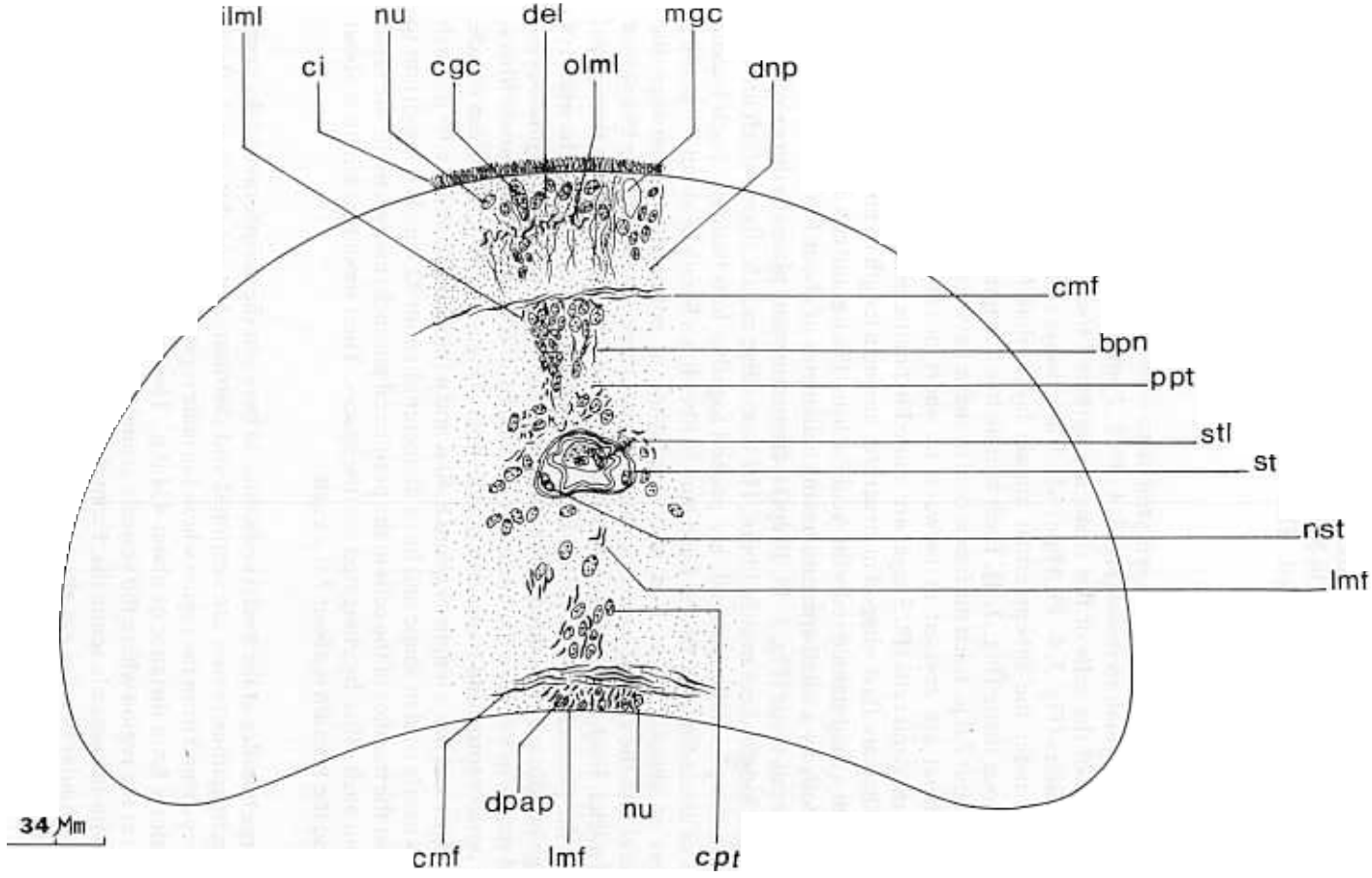
FIG. 2. *Hofstenia arabiensis* nov. sp.
– Reconstruction of internal organisation.

As this new species is found for the first time in the Red Sea near Jeddah, thus it is important to describe the worm in full detail and to compare its internal structure with the known species described. The animal has a great importance from the phylogenetical point of view.

Ectocytium

The parenchymatous tissue is a syncytial tissue which is formed of a peripheral and a central parenchymatous tissue (Fig. 3, 4 - Pl. 1, 2 ppt, cpt). The most striking fact is that the nuclei of the cells of this tissue are gathered together forming enormous number of bundles (Fig. 3, 4 - Pl. 3 bpn) which are always elongated and are situated immediately under the subepidermal muscle layer, thus forming the peripheral parenchymatous tissue (Fig. 3, 4). Each bundle has a length of about 28.0 μ and a breadth of about 7.0 μ. Each nucleus is oval in shape having a diameter of about 4.2 μ. These nuclei are corssed in between by short dorso-ventral muscle fibers. Eosinophilous gland cells (Pl. 3 esgc) are embedded in the peripheral parenchymatous tissue. They are flask-shaped in structure, having a length of about 35.0 μ, and are filled with a fluid stained red with Acid Fuchsin. Each gland cell opens at the surface of the body by a small aperture having a diameter of about 1.40 μ. The central parenchymatous tissue (Fig. 3 - Pl. 10 cpt) is crossed in many places by dorso-ventral, circular and longitudinal muscle fibers. The transverse muscle fibers which are embedded in the plasmatic material, are packed together into bundles. Each bundle consists of about 6 muscle fibers. Each muscle fiber has a length of about 7.0 μ and a thickness of about 1.70 μ. It is also worthwhile to notice that in between the peripheral and the central parenchymatous tissue, there are located big bundles of packed nuclei. Each nucleus is nearly oval in shape and bigger in size than the normal nuclei of the parenchymatous tissue. It has a diameter of about 5.6 μ. The nuclei of this large bundle are embedded in the plasmatic material of the parenchymatous tissue and spaces in between the nuclei are crossed by different types of muscle fibers, mainly dorso-ventral and transverse muscle fibers (Fig. 4 - dvmf, cmf). Each muscle fiber is short and has a length of about 8.40 μ and a thickness of about 1.05 μ. Each bundle is nearly oval in shape and has a diameter of about 42.0 μ. It is important to notice that the bundles of the cells in the peripheral parenchymatous tissue are separated from each other by elongated narrow spaces. Their moderate length is about 28.0 μ and the breadth is about 7.0 μ each.

The large bundles of the nuclei embedded in between the peripheral and the central parenchymatous tissues are scattered and distributed at the dorsal and lateral sides. They extend from the region where the male reproductive aperture is lying and go posteriorly for a distance of about 434.0 μ. They reach their maximal number, about 25, at the region where the vesicula granulorum (Fig.2, 5 - Pl. 14 vgr) starts to connect with the vesicula seminalis. From this latter region posteriorly, it is noticed that the glandular bundles are also situated at the ventral as well as the lateral sides and then they disappear from the dorsal side gradually.



IG. 3. *Hofstenia arabiensis* nov. sp.
– Dorsal nerve plexus, epicytium, parenchyme and statocyst as seen in (T.S.

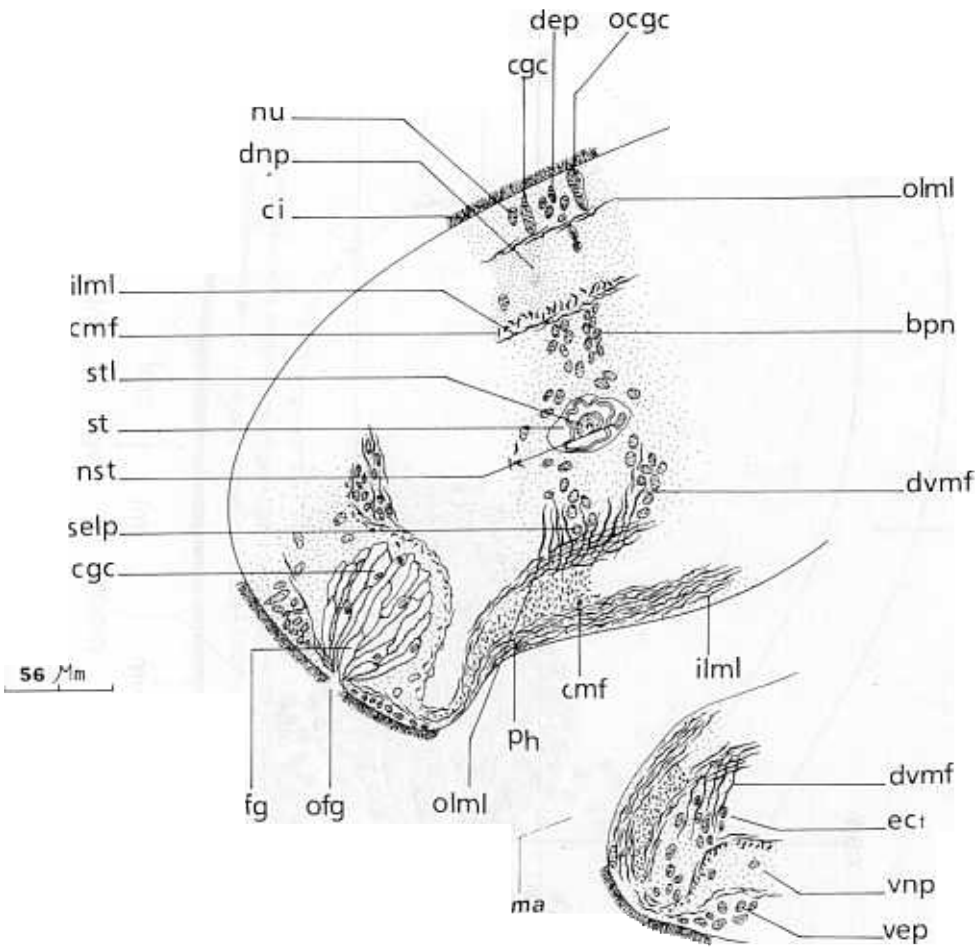


FIG. 4. *Hofstenia arabiensis* nov. sp.
– Frontal gland, statocyst, and pharynx, as seen in (L.S.).

The structure of these glandular cells has a great similarity to that of the cells forming the glandular part of the vesicula granulorum. In our opinion, they are representing the follicular testis (Fig. 2 - ft) at its first stage of development.

The Nervous System (Fig. 2-5 - Pl. 3)

It is mainly formed of a sub-epidermal nerve plexus as described by Sixten Bock, concerning *Hofstenia atroviridis*[10]. This nerve plexus is not all together connected, it is formed of a network structure, thus beginning from the anterior end till nearly a distance of about 770.9 µ. The thickness of the nerve mass is about 19.6 µ. It is formed of separated blocks of nerve tissues in some parts of it. The basal nerve tissue

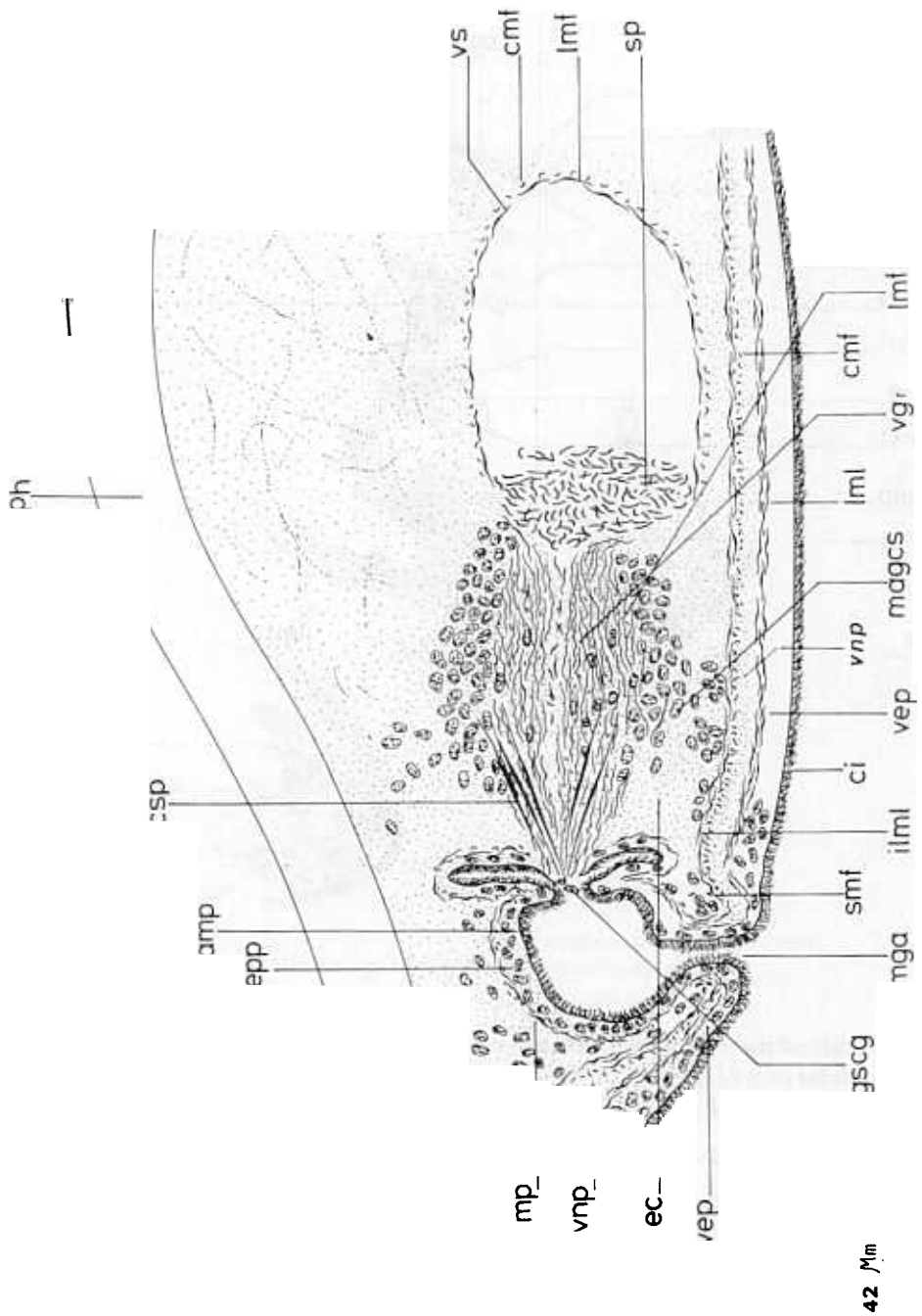


FIG 5. *Hofstenia arabiensis* nov. sp. – Male genital system (L.S.)

is formed inside the epidermal plasmatic material. The breadth of the nerve block is 21.0 μ. In a transverse section, it can be observed that the nerve block is quite separated from the other neighbouring ones. The distance separating is about 14.0 μ and it is occupied by the plasma of the epidermal layer filled with its nuclei. In the other section following it posteriorly, it is noticed that the distance separating it from the other block disappears. From this latter condition, it can be assured that the whole subepidermal nerve tissue is connected together, forming a network structure. The subepidermal nerve tissue sends very fine nerve fibers crossing the plasmatic material of the epidermal layer till the basis of the cilia. These nerve fibers are acting as neuro-sensory fibers. The thickness of each nerve fibre is about 1.05 μ. In this respect, Sixten Bock description, concerning *Hofstenia*[10], has not mentioned these neuro-sensory fibers. The plasmodium of the sub-epidermal nerve plexus is densely fibrillated. The nerve tissue is always placed under the dorsal and the lateral epithelial layer, and is totally absent at the ventral anterior epidermal layer at the region before the mouth opening.

The subepidermal nerve plexus or tissue is limited from its outer surface by a well developed muscle layer which is formed of thick longitudinal muscle fibers, each having a thickness of about 1.4 μ.

The thickness of the outer longitudinal muscle layer (Fig. 3, 4 - olml) is about 5.6 μ while the inner subepidermal muscle layer reaches about 7.0 μ, which is composed of an outer circular muscle layer and an inner longitudinal muscle layer (Fig. 3, 4 - cmf, ilml). The thickness of the nerve tissue gets narrower towards the posterior end, until it disappears completely a little distance from the middle part of the body (Fig. 2 - dnp, vnp). Immediately after the end of the basal nervous plexus, the outer longitudinal muscle fibers are totally disappeared and it is only the circular and the inner longitudinal muscle fibers which exist.

The statocyst (Fig. 1, 2, 3, 4, - Pl. 1, 2 - st) is formed of an outer wall of thickness 7.0 μ. The inner part belongs to the statolith (Fig. 3, 4 - Pl. 1, 2 - stl) which is somewhat thicker than the first wall of the statocyst, having a thickness of about 1.05 μ. The wall is somewhat shrunk inwards, especially from both lateral sides, right and left. The statolith is big in size, having a convex dorsal side and a slightly concave ventral one. It is oval in shape having a diameter of about 15.4 μ. The nucleus of the statolith (Fig. 3, 4 - nst) is large and oval in shape with a diameter of 7.0 μ. It is embedded in the plasmatic material of the statolith. Small rounded granules are found in the plasmodium of the statolith stained with a violet color by Mallory's method of staining.

The frontal gland (Fig. 2, 4 - fg) is situated at the anterior end of the body, slightly directed to the ventral surface, just very near to mouth aperture. It is formed of a group of elongated and cylindrical cyanophilous gland cells which have a common aperture (Fig. 2, 4 - ofg). It is surrounded by the tissue of the dorsal nerve plexus (Fig. 4 - Pl. 3 - dnp). It is located in between the outer longitudinal muscle layer, the circular muscle and the inner longitudinal muscle layer of the subepidermal musculature (Fig. 4 - olml, dnp, cmf, ilml).

The Endocytium

The mouth aperture (Fig. 2, 4 - ma) is considered to be a subterminal type. The body is covered externally with cilia (Fig. 1, 2, 3, 4, 5 - Pl 6 - Ci) of about 5.60 in length. The thickness of the dorsal epidermal layer (Fig. 2, 3, 4 - Pl. 6, 7 dep) is about 18.2 μ. The nuclei of the epithelial are large in number nearly having an oval shape. Each nucleus (Fig. 3, 4 - nu) has a diameter of about 4.20 μ. At the anterior region of the body, there is also the cyanophilous type of gland cells, (Fig. 3, 4 - cgc) which are oval in shape of about 14.0 μ in length and a breadth of about 7.0 μ. They are mostly filled with a granular secretion which is stained blue by Mallory. Each gland cell opens to the outside at the basis of the cilia by a small outlet with a diameter of about 1.40 μ. It is worthwhile to notice that this type of cyanophilous gland cell is more concentrated at the dorsal epidermal layer than at the ventral one, especially at the anterior part of the body. Another type of gland cells scattered in the epidermal layer, is the eosinophilous type of gland cells (Fig. 4 - esgc). They are greater in number at the dorsal than at the ventral surface of the body. The eosinophilous gland cells have a flask-shaped structure with a length of about 21.0 μ and a breadth about 5.60 μ. They are filled with homogenous secretion taking a pink red coloration with Acid Fuchsin. Each gland cell opens externally by a small aperture having a diameter of about 1.40 μ.

The mouth opening leads directly to the pharynx (Fig. 2, 4, 5 - Pl. 1, 2, 3, 6 - Ph) which is of the simplest type (tubiformis). In this worm, the epithelial layer of the pharynx (Fig. 4 - Pl. 3 - selp) is sunk and penetrated by the inner longitudinal muscle fibers.

The thickness of this muscle layer is about 14.0 μ. This is considered the maximal thickness of the ventral inner longitudinal muscle layer of the pharynx, while it reaches about 21.0 μ in thickness at the dorsal part of the pharynx. The nuclei of the epithelial layer of the pharynx are embedded in between the muscle fibers together with the nuclei of the muscle cells. Each nucleus is oval in shape but smaller in size than the nuclei of the epithelial layer, and has a diameter of about 3.50 μ. Following the inner longitudinal muscle layer, there is a circular muscle layer having a maximum thickness of about 28.0 μ at the dorsal part of the pharynx, while it possesses about 21.0 μ at the ventral part of the pharynx. The thickness of the inner longitudinal muscle fibre is about 1.40 μ. It is worthwhile to notice that the nerve tissue placed in between the outer longitudinal muscle layer and the circular muscle layer described by Sixten Bock concerning *Hofstenia atroviridis*[10] is totally absent in this worm. The outer longitudinal muscle layer is placed outwards the circular muscle layer. The muscle fibers of the outer longitudinal muscle layer are scattered in the central parenchymatous tissue and they are not compact. The diameter of thickness of the muscle fiber is about 1.40 μ. Diagonal muscle fibers which had been mentioned by Sixten Bock concerning *Hofstenia atroviridis*[10] are totally missing. In addition to that, it is observed that the well developed radial muscle fibers (Pl. 6 - rmf) which extend from beneath the subepidermal muscle layer are penetrating the parenchymatous tissue till the end at the outer margin of the circular muscle layer.

They are found in between the outer longitudinal muscle fibers forming a network like structure. The maximal length of the radial muscle fiber is about 28.0 μ and its thickness is about 1.05 μ. The radial muscle fibers including dorso-ventral muscle fibers and lateral muscle fibers are highly developed in a cross-section, especially in the middle part of the pharyngeal region. It is observed that these radial muscle fibers are arranged into thin long bundles extending from the inner surface of the subepidermal nerve tissue and crossing the peripheral and central parenchymatous tissues, until it reaches the outer part of the circular muscle layer. On the other hand, the radial muscle fibers act as retractors for the muscle tube of the pharynx; as soon as the food enters the mouth aperture, in this moment, these radial muscle fibers play a great role in the neuro-sensory function, as it acts as conductors of the stimuli to the subepidermal nervous plexus. Thus, they act as dilatators of the pharynx. Each radial muscle bundle is separated from the other neighboring muscle bundle by a distance of about 21.0 μ. Sometimes, these muscle bundles are connected to each other by very fine branches of muscle fibers. The posterior part of the pharynx leads to the intestinal tissue (Fig. 2 - Pl. 5, 7 - in) which is syncytial in structure and very loose. There is no muscle layer surrounding this tissue. It is directly connected to the parenchymatous tissue surrounding it from outside. The plasmodium of the digestive parenchymatous tissue possesses very few scattered nuclei. Amoeboid cells or gland cells are totally absent in this tissue. Short sausage-like structures are often seen scattered in the endocytial tissue which may be considered as migrating sperms. Each has a thickness of about 1.40 μ and a length about 4.20 μ. Large and small vacuoles are observed in the endocytial tissue including copepods (Pl. 5 cr). The breadth of the food vacuole reaches about 70.0 μ.

The Reproductive System

1. *Female Genital System* (Fig. 2, 6 - Pl. 7, 8, 9, 10, 11 - fmov, nmov, rov, lov)

It is formed of right and left ovaries (Fig. 2, 6 - Pl. 4, 7, 10, rov, lov) which are embedded in the ventral peripheral parenchymatous tissue, serially arranged. Both right and left ovaries extend a little distance behind the vesicula seminalis (Fig. 2 - sv) and end at the beginning of the last fourth part of the body. The mature ovum (Fig. 2, 6 - Pl. 9, 10 - mov) is oval in shape having a diameter of about 74 μ and its nucleus (Pl. 8 nmov) reaches about 28 μ. The nucleolus is about 11 μ in diameter. The mature ovum is encircled by a ring of large follicular cells (Fig. 2.6 - Pl. 11 - fmov).

2. *Male Genital System* (Fig. 2, 5 - Pl. 13, 14, 15, 16, 17)

It is formed of right and left testes (Fig. 5 - Pl. 6, 13, 15- rt, lt) which are connected dorsally. The male copulatory apparatus (Fig. 2.5) begins with an oval ventral vesicula seminalis (Fig. 2, 5 - Pl. 12, 13, 15 - vs) having a length of about 125 μ. It is surrounded by a thin muscular layer, an outer circular muscle fibers and an inner longitudinal muscle fibers (Fig. 5 - Pl. 12, 17 - cmf, lmf). It is filled by thick and short sperms, having a moderate length of 7 μ each. A strongly muscularised elongated vesicula granulorum (Fig. 2, 5 - Pl. 14 - vgr) is existing. It is filled with sperms and granular secretion of the cyanophilous gland cells (Fig. 5 - Pl. 12, 13 - sp, gscp). Its

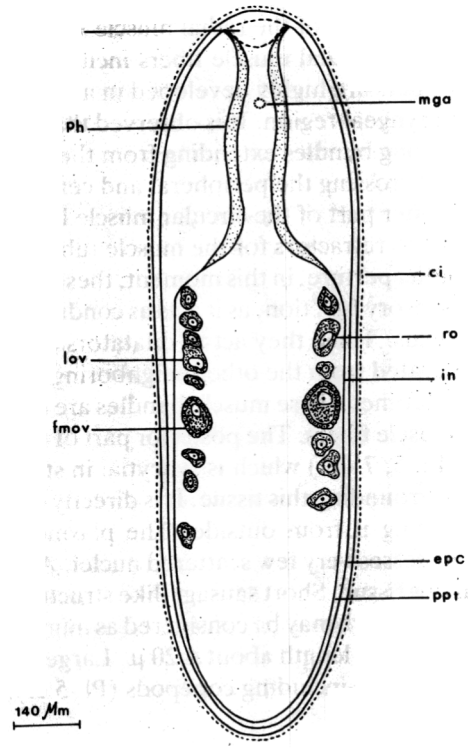


FIG. 6. *Hofstenia arabiensis* nov. sp.
– Reconstruction of the female genital system, dorsal view.

wall is formed of intermingled circular and longitudinal muscle fibers (Fig. 5 - cmf, lmf). The vesicula granulorum is surrounded by a thick mantle of male accessory gland cells (Fig. 2, 5 - Pl. 14 magc).

It leads anteriorly to the penial sac (Fig. 5 - ps) which has a narow ciliated epithelial layer (Fig. 5 - Pl. 16, 17 - epp) provided by four chitinised spines of the penis (Fig. 5 - Pl. 16, 17 - csp), and thus it differs from all other known species of the genus *Hofstenia*. Each chitinised spine has a length of 56 μ, and a moderate thickness of 0.9 μ, projecting into the ciliated antrum musculinum of the penis (Fig. 5 - Pl. 16 - amp), which opens dorso-ventrally into the male genital pore (Fig. 2, 5 - mga). The male genital pore is situated mid-ventrally, just behind the mouth aperture, by a distance of about 84 μ. A sphincter muscle (Fig. 5 - smf) encircles the male genital pore.

Discussion

It is worthwhile to compare this worm with the other known species related to the genus *Hofstenia* from the morphological and anatomical points of view.

This worm has a yellowish red coloration, thus it differs from *Hofstenia atroviridis*[10], *Hofstenia miamia*[11] and *Hofstenia beltagii*[13].

Concerning the subepidermal nerve plexus of this worm, it differs from what Sixten Bock had mentioned in *Hofstenia atroviridis*[10], *Hofstenia miamia*[11], and *Hofstenia beltagii*[13].

Concerning the subepidermal nerve plexus of this worm, it differs from what Sixten Bock had mentioned in *Hofstenia atroviridis*[10] where this outer longitudinal muscle layer is totally missing and in the same case, it differs from the basal type of nerve plexus, which Steinbock had described in *Nemertoderma bathycola*[17], also from *Hofstenia tinga*[18], *Meara stichopi*[19], *Myostomella pulchellum*[20], *Convoluta agilis Convoluta karlingi, Stylifera veridipunctata*[2], and *Otocelis gullarensis*[9].

In relation to the musculature surrounding the subepidermal nerve plexus, this worm differs obviously from *Hofstenia beltagii*[13] and it is similar to *Meara stichopi*[19], where there is no real brain mass and there are no inner nerve roots, also the same as in *Hofstenia tinga*[18], *Xenoturbella bocki*[19], *Nemertoderma bathycola*[17] and *Hofstenia miamia*[11].

It differs from *Hofstenia atroviridis*[10] concerning its subterminal mouth aperture and also the structure of its pharynx tubiforms.

In relation to the presence of radial muscle fibers of the pharynx, this worm differs from *Hofstenia tinga*[18], *Hofstenia minuta*[5] where they are missing. Also, it differs from the two mentioned species, due to the fact that the posterior part of pharynx leads to the intestinal tissue which is syncytial in structure and very loose. There is no muscle layer surrounding the intestine, thus it differs from *Hofstenia atroviridis*[10].

Regarding the structure of the female genital system, this worm differs from *Hofstenia giselae* and *Hofstenia beltagii*[13], but in the same case, it resembles, *Hofstenia atroviridis*[10] and *Hofsteniola pardii*[16].

It resembles *Hofstenia miamia*[11] regarding the structure and arrangement of the right and left testes. It differs also from all the known species of the genus *Hofstenia*, as its penial sac is provided by 4 chitinised spines.

Differential Diagnosis

The animal is related to the family Hofsteniidae[13] for the following reasons :

1. It has a subepidermal nerve plexus.
2. The mouth aperture is situated ventrally near the anterior tip of the body or terminal.
3. Pharynxs is very long and of the type tubiformis with strong musculature.
4. Testes are of the diffuse type.
5. Vesicula seminalis may be absent.
6. Vesicula granulorum is connected with the penis which is provided by chitinous rod-shaped stylet.

7. The male genital aperture is situated nearly behind the mouth aperture and leads to antrum musculinum.
8. Ovaries are situated ventrally, either paired or single, and follicular.
9. Female accessory organ is missing.

It is related to the genus *Hofstenia*[10] due to the following :

1. It has an integumentary nerve plexus.
2. Mouth aperture is subterminal.
3. Pharynx is strongly muscular.
4. Vesicula seminalis is present.
5. Ovary is follicular.

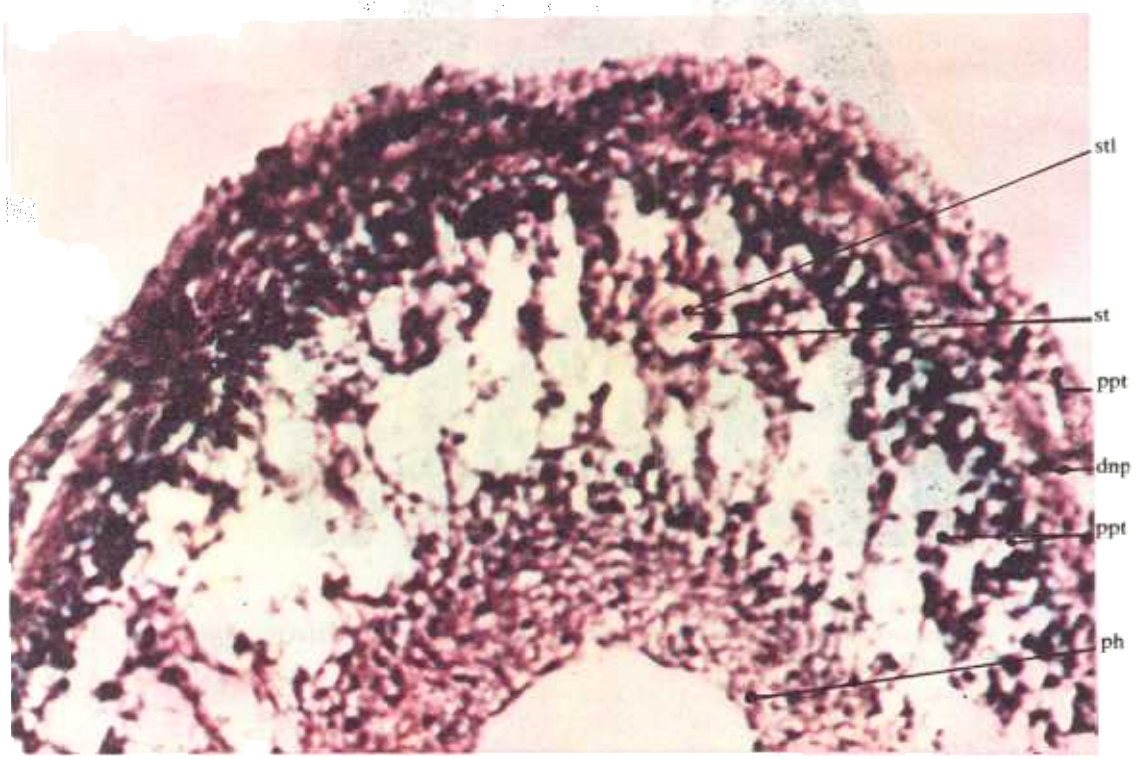
The worm is a new species, as it is quite different from the other known species related to the genus *Hofstenia,* due to these specific and principal characteristic features :

1. The worm is tubular, having a rounded anterior tip and a blunt smooth posterior end.
2. The coloration of the body is yellowish red.
3. The worm has a network subepidermal nerve plexus, extending from the anterior tip of the body till the end of its first half, moreover, the central brain mass surrounding the statocyst is totally absent.
4. The penis bulb is provided with only 4 chitinised spines.
5. The sunk epithelial layer of the pharynx is unciliated and oesophagus is missing.

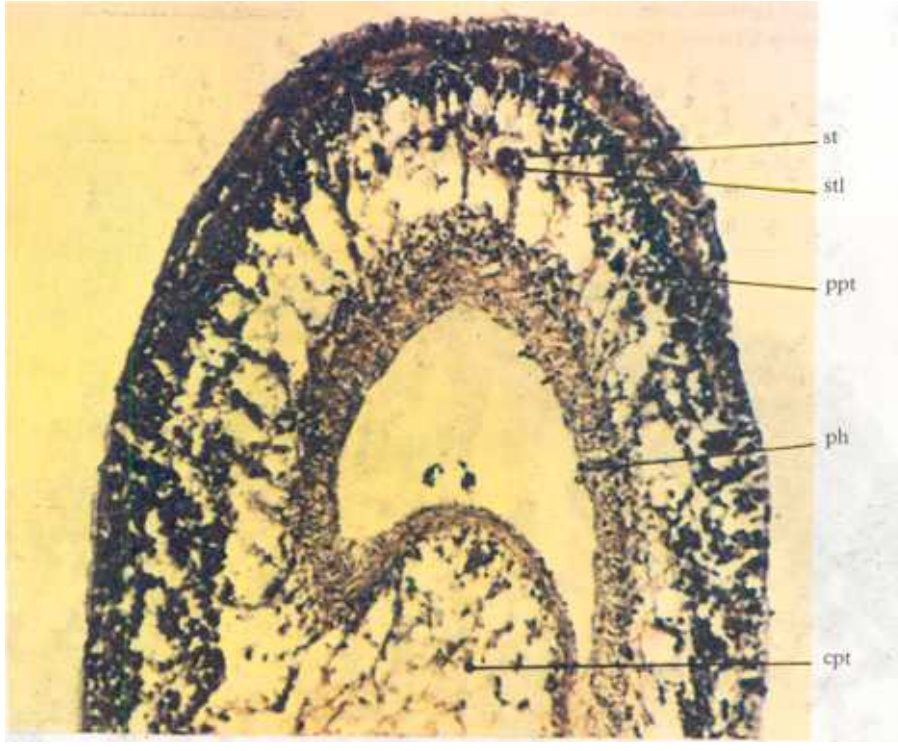
Abbreviations

amp	antrum musculinum of penis	fmov	follicular mature ovum
bpn	bundles of parenchymatous nuclei	fc	follicular cell
cgc	cyanophilous gland cell	gscg	granular secretion of cyanophilous gland cell
ci	cillia		
cpt	central parenchymatous tissue	ilml	inner longitudinal muscle layer
cmf	circular muscle fibre	in	intestine
cr	crustaceans	lml	longitudinal muscle layer
cps	chitinis-edpenis	lmf	longitudinal muscle fibre
csp	chitinised spine of penis	lt	left testis
del	dorsal epithelial layer	lov	left ovary
dep	dorsal epidermal layer	ma	mouth aperture
dip	digestive parenchyma	magcs	male accessory gland cells
dnp	dorsal nerve plexus	mga	male genital aperture
dpap	dorsal part of the anterior region of pharynx	mgc	mucus gland cell
		mov	mature ovum
dvmf	dorso-ventral muscle fibre	mp	muscular layer of penis
ect	ectocytium	nmov	nucleus of the mature ovum
ep	epidermis	nst	nucleus of statocyst
epc	epicytium	nu	nucleus
epp	epithelial layer of penis	ocgc	opening of cyanophilous gland cell
esgc	eosinophilous gland cell	oct	ovocyte
fg	frontal gland	ofg	opening of frontal gland
ft	follicular testis	olml	outer longitudinal muscle layer

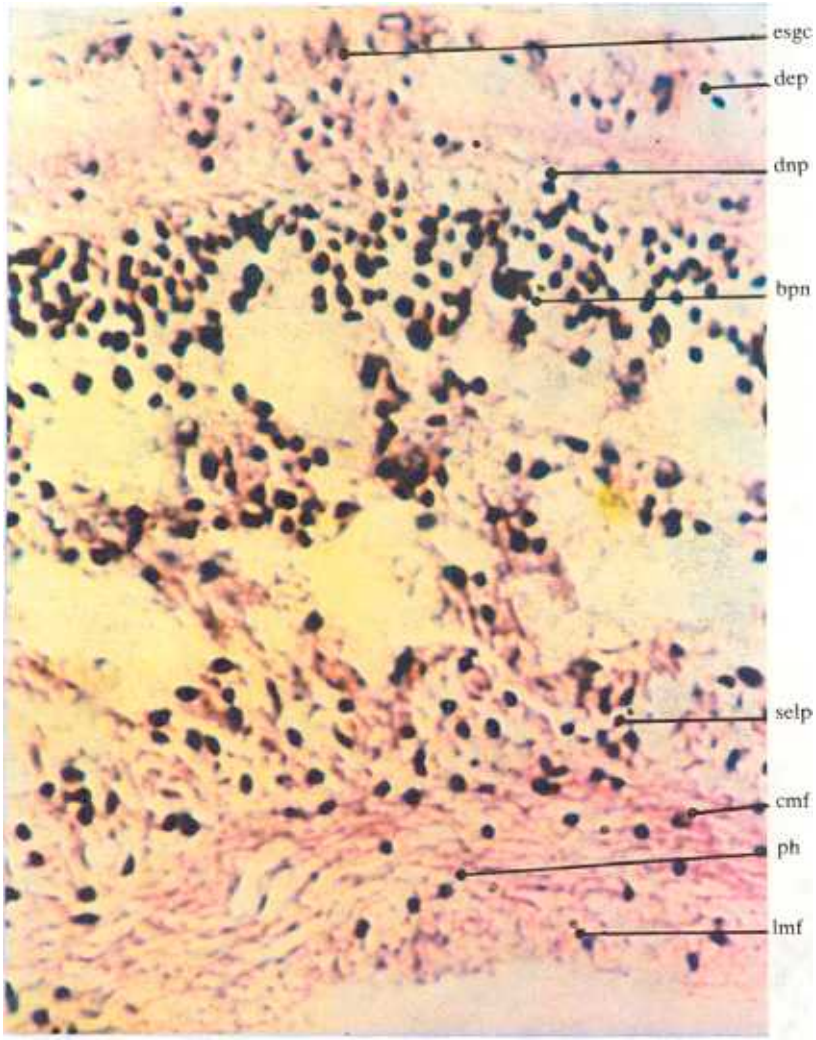
ov	ovary	sp	sperms
pe	penis	spc	spermatocytes
ph	pharynx	st	statocyst
ppt	peripheral parenchymatous tissue	stl	statolith
ps	penial sac	t	testis
rov	right ovary	vep	ventral epidermal layer
rt	right testis	vgr	vesicula granulorum
rmf	radial muscle fibre	vnp	ventral nerve plexus
selp	sunk epithelial layer of pharynx	vs	vesicula seminalis
smf	sphincter muscle fibres		



PL. 1. *Hofstenia arabiensis* nov. sp. (T.S.)
– Internal structure of the animal showing: statocyst (st), stl (statolith), dorsal nerve plexus (dnp), peripheral parenchymatous tissue (ppt), and pharynx (ph).

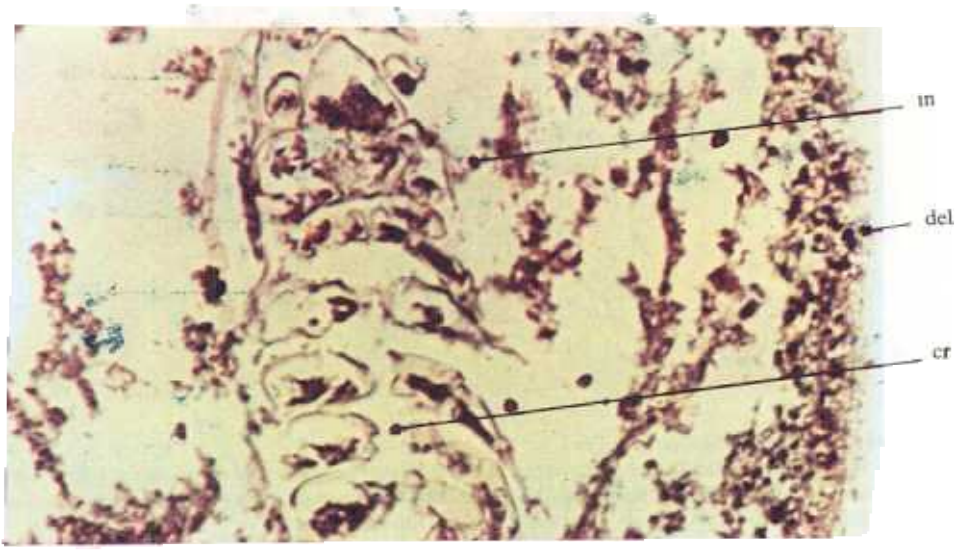


PL. 2. *Hofstenia arabiensis* nov. sp. (T.S.).
– Statocyst (st), statolith (stl), peripheral parenchymatous tissue (ppt), central parenchymatous tissue (cpt), and pharynx (ph).



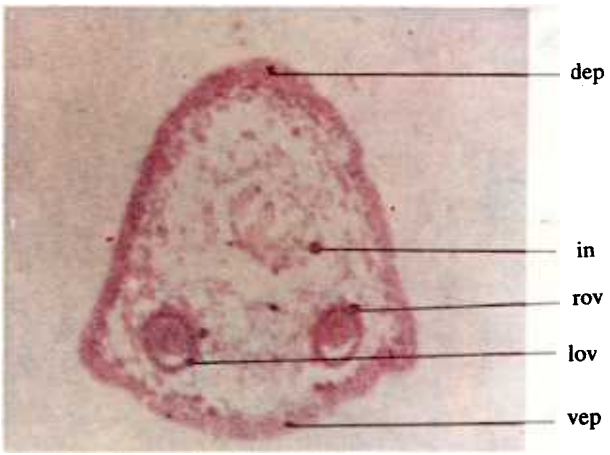
PL. 3. ***Hofstenia arabiensis*** **nov. sp. (T.S.).**
– Eosinophilous gland cell (esgc), dorsal epidermal layer (dep), dorsal nerve plexus (dnp), bundles of parenchymatous nuclei (bpn), sunk epithelial layer of pharynx (selp), pharynx (ph), longitudinal muscle fiber (lmf), and circular muscle fiber (cmf).

PL. 4. *Hofstenia arabiensis* nov. sp. (T.S.).
– Dorsal epithelial layer (del), crustacean food (cr), intestine (in), left ovary (lov), right ovary (rov).

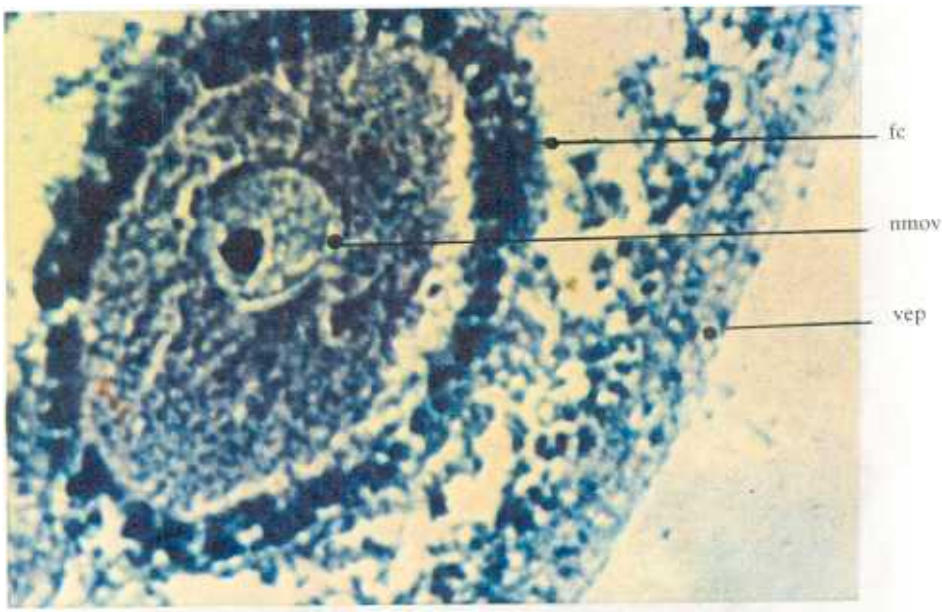


PL. 5. *Hofstenia arabiensis* nov. sp. (T.S.).
– Dorsal epithelial layer (del), intestine (in), crustacea (cr).

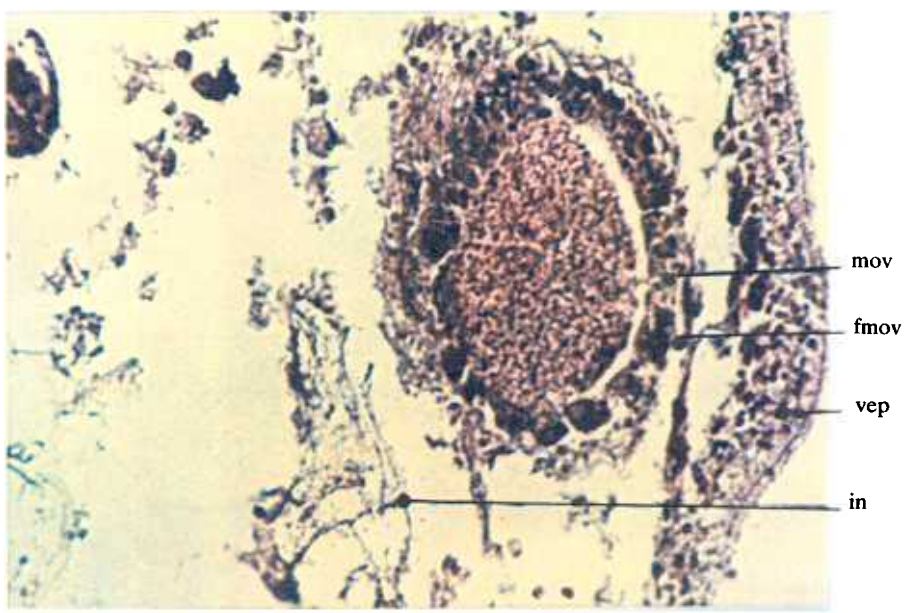
PL. 6. *Hofstenia arabiensis* nov. sp. (T.S.).
– Mucus gland cell (mgc), cilia (ci), dorsal epidermal layer (dep), pharynx (ph), radial muscle fibre (rmf), left testis (lt), and right testis (rt).



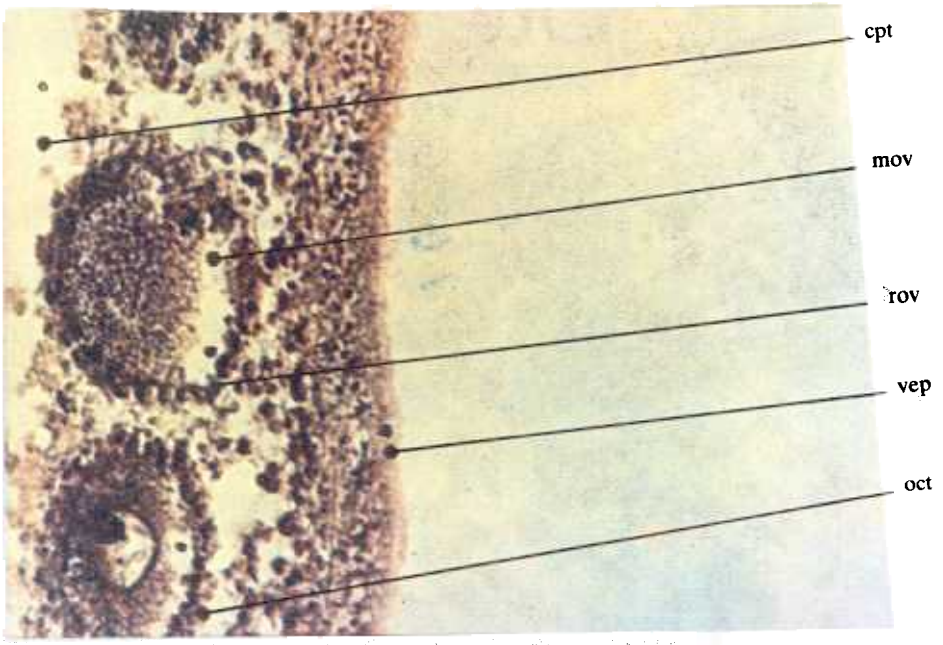
PL. 7. *Hofstenia arabiensis* nov. sp. (T.S.).
– Dorsal epidermal layer (dep), intestine (in), right ovary (rov), left ovary (lov), ventral epidermal layer (vep).



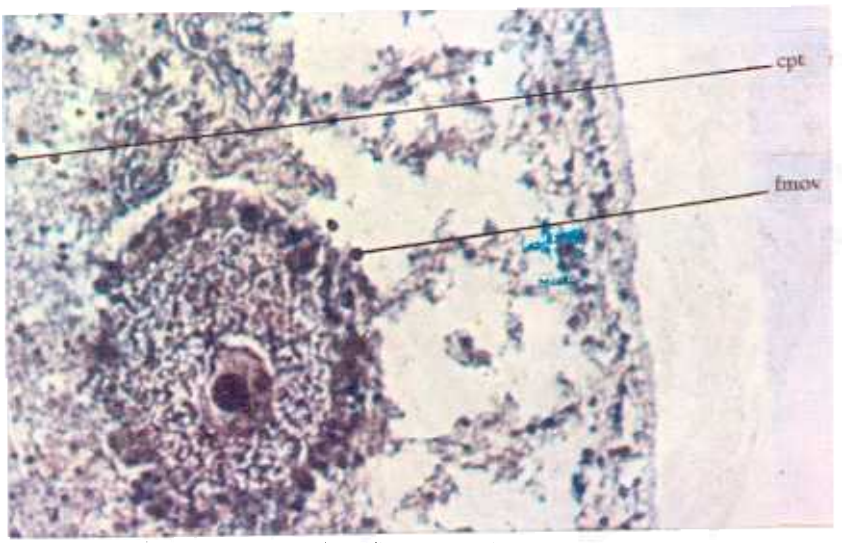
Pl. 8. *Hofstenia arabiensis* nov. sp.
– Follicular cell (fc), nucleus of the mature ovum (nmov), ventral epidermal layer (vep)



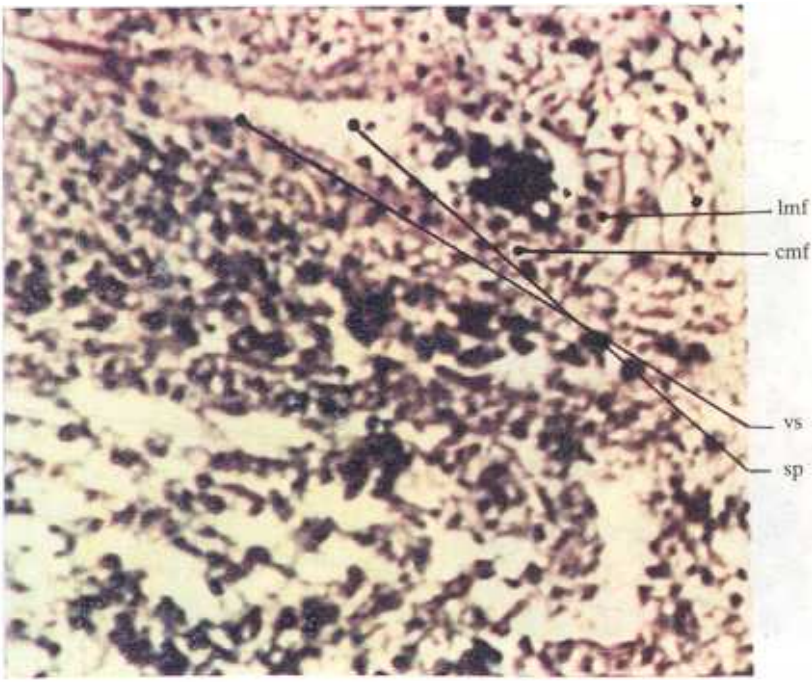
Pl. 9. *Hofstenia arabiensis* nov. sp. (L.S.).
– Mature ovum (mov), follicular mature ovum (fmov), ventral epidermal layer (vep), intestine (in).



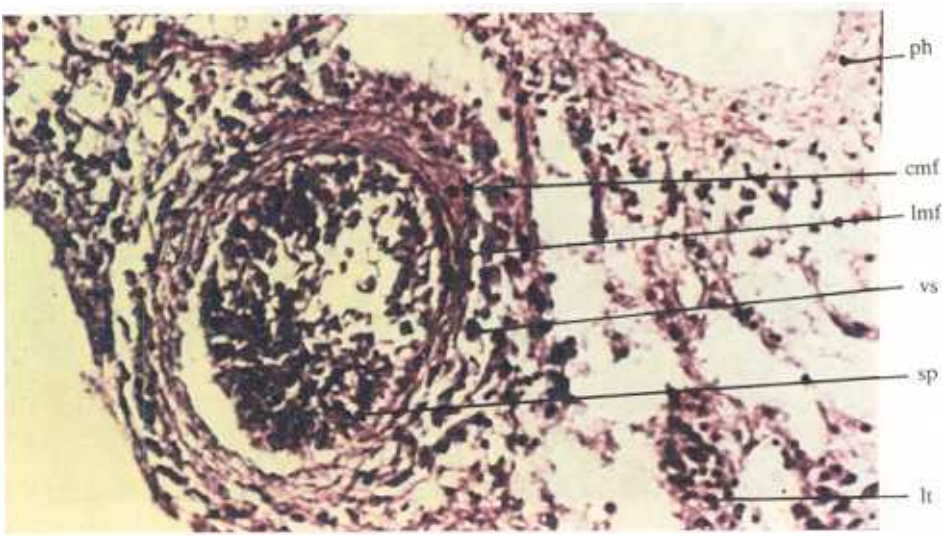
PL. 10. *Hofstenia arabiensis* nov. sp. (L.S.)
– Central parenchymatous tissue (cpt), mature ovum (mov), right ovary (rov), ventral epidermal layer (vep), and ovocyte (oct).



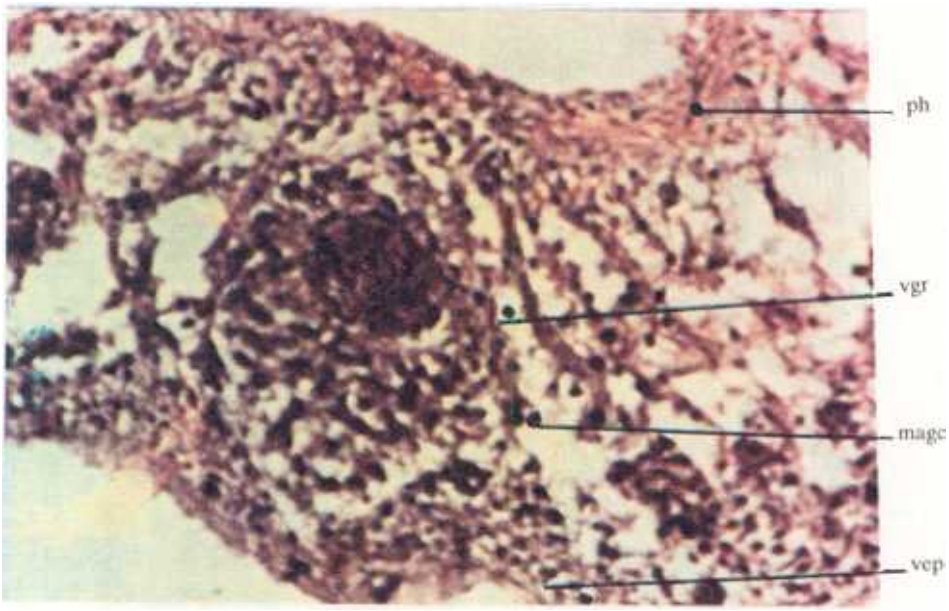
PL. 11. *Hofstenia arabiensis* nov. sp. (L.S.)
– Central parenchymatous tissue (cpt), follicular mature ovum (fmov).



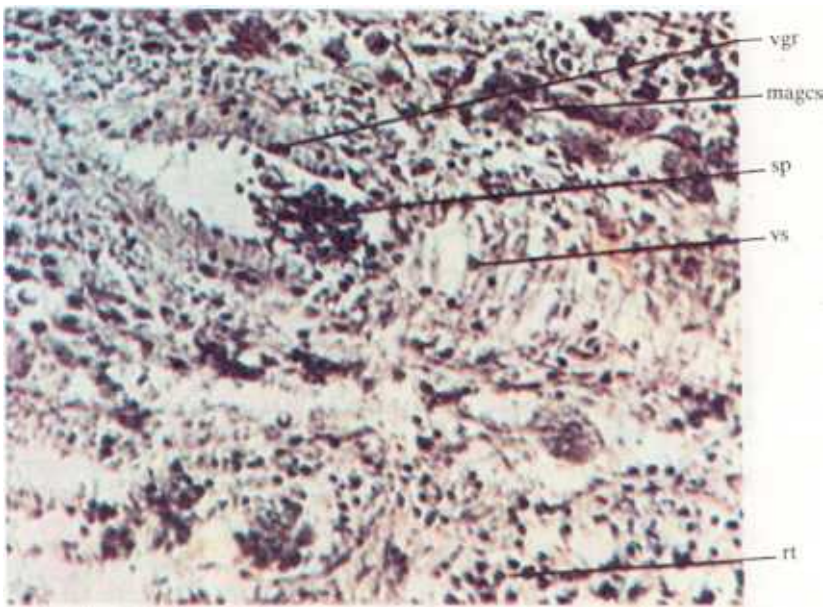
Pl. 12. *Hofstenia arabiensis* nov. sp. (L.S.)
– Right testis (rt), longitudinal muscle fiber (lmf), circular muscle fiber (cmf), vesicula seminalis (vs), sperms (sp).



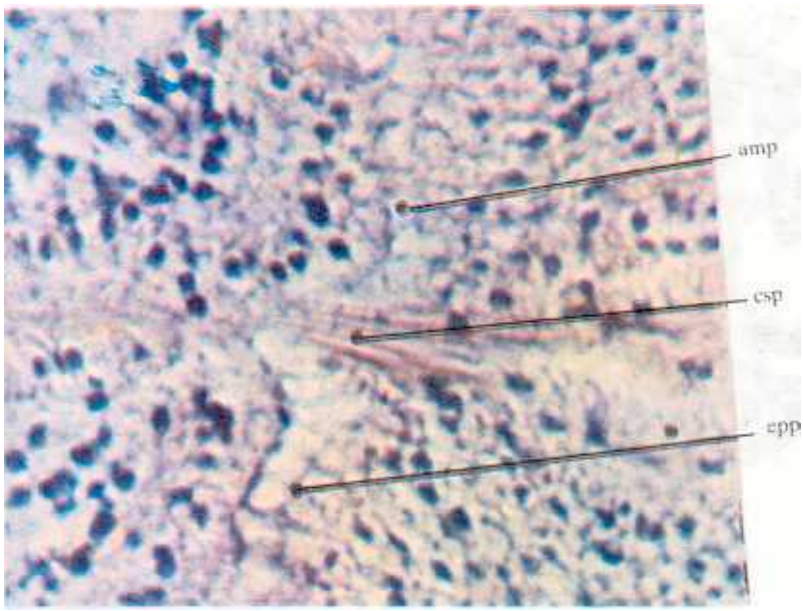
Pl. 13. *Hofstenia arabiensis* nov. sp. (T.S.)
– Pharynx (Ph), circular muscle fiber (cmf), longitudinal muscle fibre (lmf), left testis (lt), vesicula seminalis (vs), sperm (sp).



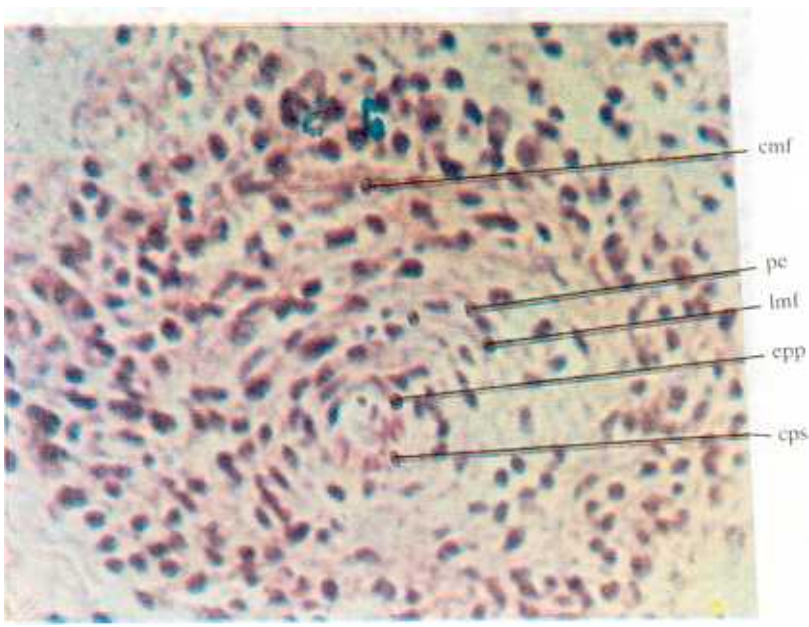
PL. 14. *Hofstenia arabiensis* nov. sp. (T.S.)
– Vesicula granulorum (vgr), male accessory gland cell (magc), ventral epidermal cell (vep).



PL. 15. *Hofstenia arabiensis* nov. sp. (L.S.)
– Sperms (sp), vesicula seminalis (vs), right testis (rt).



PL. 16. *Hofstenia arabiensis* nov. sp. (L.S.)
– Antrum musculinum of the penis (amp), chitinised spine of the penis (csp), epithelial layer of the penis (epp).



PL. 17. *Hofstenia arabiensis* nov. sp. (T.S.)
– Circular muscle fibre (cmf), penis (pe), longitudinal muscle fibre (lmf), epithelial layer of penis (epp), chitinised spine of penis (csp).

Acknowledgement

I wish to thank Dr. Ali Adnan Eshky, Head, Department of Marine Biology and the technicians, Mr. Al-Sawy Ali, Mr. Mohamed El-Saghir, and the sailor Mr. Yousef Moubarak, for their valuable assistance at various stages of this research work.

References

[1] **Luther, A.,** Studien uber acoele Turbellarien aus dem Finnischen Meerbusen, *Act. Soc. Fauna Flora Fenn.* **36** (5): 1-60 (1912).

[2] **Westblad, W.,** Studien uber skandinavische Turbellaria acela IV, V., Stockholm, *Ibid.* **38A** (1): 1-56 (1946).

[3] **Karling, T.G.,** Turbellarian fauna of the Baltic proper, *Fauna fenn.* **27:** 1-101 (1974).

[4] **Faubel, A.,** Microfauna des Meeres bodens Die Acoela (Turbellaria) eines Sandstrandes der Nordseeinsel Sylt, *Akad. Wiss. Lit. Mainz.* **32:** 1-58 (1974).

[5] **Palombi, A.,** Reports on the Turbellaria (Cambridge Exp. Suez Canal 1924). Part 5, Nr. 1.1, London, *Trans. Zool. Soc. London 22,* **1:** 579-631 (1928).

[6] **Melouk, M.A.,** A new Polyclad from the Red Sea, Cryptoballus aegypticus nov. sp., *Bull. Fac. Sci. Fouad I. Univ. Cairo,* **22:** 125-140 (1940).

[7] **Antonius, A.,** Faunistische am Roten Meer im winter 1961/62, Teil IV. Neue Convolutidae und eine bearbeitung des Verwandtschaftskreises Convoluta (Turbellaria acoela), *Zool. Syst.* **95:** 297-394 (1968).

[8] **Beltagi, S.,** *Anaperus trifurcatus* nov. sp. (Archoophora: Anaperidae). A new species of Acoelan Turbellaria from the Red Sea, *Journal of the Faculty of Marine Science, Jeddah,* **3:** 49-71 (1983).

[9] **Beltagi, S.** and **Khafaji, A.K.,** Amphiscolops marinelliensis nov. sp. (Archoophora: Convolutidae): A new species of Acoelan Turbellaria from the Red Sea, North of Jeddah, *Proc. Symp. Coral Reef Environ. Red Sea, Jeddah,* pp. 491-517 (1984).

[10] **Sixten Bock,** Uppsala Univ., Eine neue marine Turbellarien gattung aus Japan, Arsskrift Math. och Naturvetenskap I, pp. 1-55 (1923).

[11] **Correa, D.D.,** Two new marine Turbellaria from Florida, *Bull. Marine Sci. of the Gulf and Caribbean,* **10:** 208-216 (1960).

[12] ————. The Turbellarian *Hofstenia miamia* in the Caribbean Sea, *Stud. fauna Curacao and other Carib.* **74:** 38-40, Utrecht (1963).

[13] **Steinbock, K.O.,** Evolutions forschung, *Zeitschrift Zool. Syst.* **4** (1-2): 56-195 (1966).

[14] **Uljanin, W.,** Turbellaria der Bucht von Sewastopol, Arab. d. 2. Vers. russ. Naturf. zu Moskau 1869. 2 Abt. fruzool. Anat U. Physiol., Moskau (1870).

[15] **Graff, L.V.,** *Turbellaria,* I. *Acoela,* Das Tierreich, 24 p. (1905).

[16] **Papi, F.,** Sopra un nuovo Turbellario arcoofaro di particolare Significato filetico e sulla posizione della fam. Hofstenudae nel sistema dei Turbellari, *Staz, Zoolog. Napoli,* **30:** 132-148 (1957).

[17] **Steinbock, O.,** *Vid. Medd. f. Dansk naturh. Forengo,* Ergebnisse einer von E. Reisinger und O. Steinbock mit hilfe des Rask. Orsted Fonds durchgefuhrten Deise in gronland 1926 – 13-44 (1930-1931).

[18] **Marcus, E.,** On Turbellaria, *Dos Anais da academia Brasileira de Ciencas. Rio Janeiro,* Separata do Vol. **29** (1) (1957).

[19] **Westblad, W.,** *Ark. Zool.,* Studien uber Skandinavische Turbellaria acoela V. 41a, Nr. 7, pp. 1-82, t.1 Stockholm. (1949).

[20] **Riedl, R.,** Neue Turbellarian aus Mediterranem Felslitoral, *Zool. Jahrb. Syst., Jena,* **82:** 157-244 (1954).

« هوفشتينيا آرابينسيس » (عائلة هوفشتينيدي) : نوع جديد من ديدان التيربلاريا بالبحر الأحمر شمال جدة

سمير بلتاجي و عبد الله سراج مندورة
كلية علوم البحار ، جامعة الملك عبد العزيز
جدة ، المملكة العربية السعودية

المستخلص . لقد تم جمع نوع جديد من ديدان التيربلاريا اللاجوفية والتي تعيش على الطحالب البنية «سارجسم فالجار» و «سيستوسيرا مايريكا» والتي توجد بكثرة على المسطح الشعابي في اتجاه الشاطيء للشعاب الحافية أمام القصر الملكي القديم شمال مدينة جدة بالمملكة العربية السعودية ، وعلى عمق يتراوح ما بين ٥٠-١٢٠سم .

تمتاز هذه الدودة باستطالة جسمها ، وطرفيها المستديرين الأمامي والخلفي ، ولونها الأحمر المائل إلى الصفرة . يبلغ طول الدودة الحية ٥ مم تقريبا ، وعرضها ١,٢٥ مم .

وقد تم الحصول على ٣٥ عينة من هذه الدودة خلال شهري مايو ويونيو سنة ١٩٨٦م

تم تجهيز وإعداد الرسومات الخاصة بتركيب الأجهزة الداخلية لهذا النوع الجديد من ديدان التيربلاريا ، وذلك عن طريق فحص القطاعات العرضية والطولية بجسم الدودة ميكروسكوبيا والمصبوغة بالهيماتوكسيلين - إيوسين والتي أعطت نتائج طيبة .

وتتبع هذه الدودة جنس «هوفشتينيا» لأن لها ضفيرة عصبية تحت طبقة البشرة الخارجية ، وفتحة فم تحت طرفية أمامية ، وبلعومًا أنبوبيا بسيطًا مزودًا بعضلات قوية ، وحوصلةً منويةً ، ومبيضًا من النوع الحوصلي .

وتعتبر الدودة نوعًا جديدًا . ويرجع هذا إلى الأسباب التالية :

١ - الدودة أنبوبية الشكل ، وذات طرفين مستديرين أمامي وخلفي .

٢ - ذات لون أحمر يميل إلى الصفرة .

٣ - تمتاز الدودة بأن لها ضفيرة عصبية تحت البشرة تمتد من الطرف الأمامي للجسم حتى نهاية نصفها الأول .

٤ - ليس لها كتلة مُخية تحيط بحويصلة الاتزان .

٥ - القضيب مزود بأربعة أشواك كيتينية فقط .

٦ - المريء غير موجود وتتميز الطبقة الغائصة للبلعوم بأنها غير مهدبة .