PARACANTHOGALEA EGYPTENSIS N. GEN., N. SP. (DIGENEA: LEPOCREADIIDAE) FROM THE GRUNTER *TERAPON JARBUA* (PERCIFORMES: TERAPONTIDAE) FROM THE RED SEA

A Senior Honors Thesis

by

ELIZABETH ANNE GRAY

Submitted to the Office of Honors Programs
& Academic Scholarships
Texas A&M University
in partial fulfillment of the requirements of the

UNIVERSITY UNDERGRADUATE
RESEARCH FELLOWS

April 2003

Group:

LIFE SCIENCES I

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Approved as to style and content by:

Norman O. Dronen	Charles K. Blend	Edward A. Funkhouser
Fellows Advisor	Fellows Co-Advisor	Executive Director

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Group: LIFE SCIENCES I

ABSTRACT

Paracanthogalea egyptensis n. gen., n. sp., (Digenea: Lepocreadiidae)

from the grunter *Terapon jarbua* (Perciformes: Terapontidae)

from the Red Sea. (April 2003)

Elizabeth Anne Gray
Department of Biology
Texas A&M University

Fellows Advisor: Dr. Normen O. Dronen
Department of Wildlife and Fisheries Science

Paracanthogalea egyptensis n. gen., n. sp. is described from the fish *Therapon jarbua* (Forsskel, 1775) collected from November 10 to December 10, 1993 from the fishermen at Hurghada City, Egypt. The new species, *Paracanthogalea egyptensis,* has an elongate body, terminal oral sucker, ventral genital pore, and tandem testes located in the posterior third of the body with an immediately pretesticular ovary. The new genus most closely resembles species of *Acanthogalea* and *Clavogalea* from the subfamily Acanthogaleinae (Lepocreadiidae). Like species of *Clavogalea, P. egyptensis* has a single complete row of large accumiate circum-oral spines and a median genital pore, while maintaining the small scale-like body spines and lacking glandular organs in the genital atrium characteristic of species of *Acanthogalea.*

This thesis is dedicated to the guidance of my professors, advisors, friends, and family, without whom I would not have ever accomplished so much. To Dr. Norm Dronen for his willingness to answer questions and explain new things, as well as his willingness to take a chance on an eager student under questionable circumstances. To Dr. Charles Blend for his never-ending patience and desire to see his students succeed. To Dr. Merill Sweet for being a terrific mentor and advisor. To Dr. Brooks for giving me the strength and desire to keep fighting. To all those professors and researchers before me upon whom much of my own understanding is based. Finally to all my friends and family for their support and sacrifice - to you that have endured lectures, stress, schedules, and disappointments all to allow me the opportunity to chase my dreams.

ACKNOWLEDGMENTS

This research thesis is based on a project completed in the Spring of 2003 alongside Dr. Norm Dronen, Dr. Charles Blend, and Nahed El Abdou. The idea for the research was from a project by Dr. Dronen and Dr. Blend, from whom the characterization of the species and genus were created. Nahed El Abdou provided the collection of specimens for the project as well as their preservation and catalogue. The text was a collaborative effort between Dr. Dronen, Dr. Blend, and myself. Illustrations were created by Dr. Dronen, and the research was supervised by Dr. Charles Blend. As a collaborative work, authorship on any published papers should be given to Norman O. Dronen, Nahed El Abdou, Charles K. Blend, and Elizabeth A. Gray.

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INTRODUCTION

Studies that have focused on the parasites infecting species of the fish genus *Therapon* (Cuvier, 1816) have revealed that approximately half of the species studied were isolated from *Therapon theraps* (Cuvier, 1829), with the remaining parasite species studied infecting *Therapon jarbua* (Forsskel, 1775) (Syn. *Jarbua terapon; Pherapon jarbua; Therapon jarbua*) (See Table 1). Members of *Terapon* are known to be grunters, tigerperches or thornfishes, are considered to be generally omnivorous, demersal, catadromous species living at a depth of 20-290 m, and are indigenous to the Indo-Pacific (Froese and Pauly, 2003). Although most species are of minimal commercial value, *T. jarbua* from the Red Sea is an important food fish in Egypt.

Table 1: Literature Survey for the Genus *Therapon*:

Therapon theraps	39.7%
Terapon jarbua	39.7%
Therapon oxyrhynchus	2.9%
Therapon bidyanus	1.5%
Therapon unicolor	1.5%
Therapon puta	1.5%
Terapon plumbeus	1.5%
India	70%
Kuwait	5.8%
Australia	4.4%
China	4.4%
Philippines	2.9%
Vietnam	2.9%
Japan	2.9%
Fiji	1.5%
Pakistan	1.5%
South Africa	1.5%
Egypt	1.5%

This thesis follows the style and format of the *Journal of Parasitology*.

Surveys for parasites within species of *Therapon* have traditionally been centered in the Indian Ocean around the Bay of Bengal (See Table 1). Landmark studies in this area include Ahamad (1983a), who studied the digenetic trematodes of fish collected from the Arabian Sea near Bombay and described subsequently new species of trematodes from *T. theraps,* and Gupta & Tiwari (1985), who studied the trematode parasites of marine fishes and described *Bucephalus fischthali* (Gupta & Tiwari, 1985) from *T. theraps* from the Bay of Bengal at Madras. Only one parasite study (Abdou, 2001) of species of *Therapon* has been performed in Egypt, which centered on the surface topography of the hemiurid *Erilepturus hamati* (Manter, 1947). No members of Acanthogaleinae Gibson, 1976 (Lepocreadiidae Ohdner, 1905) have been reported from either species of *Terapon* or from Red Sea fishes. This study describes a new genus of trematode found from a species of *Therapon* collected near Egypt in the Red Sea, represending both a new host record for members of Acanthogaleinae, as well as a new geographic record of the subfamily.

Table 2. Previous parasite records for species of *Terapon.*

Host	Parasite	Locality	Reference
Therapon puta	*Lepidotrema kuwaitensis* (Kritsky et al, 2000)	Persian Gulf, Kuwait	Kritsky et al, 2000
Therapon theraps (Cuvier, 1829)	*Diplectanum undulicirrosum* (Zhang et al, 2000)	Guangdong Province, China	Zhang et al, 2000
Terapon jarbua (Forsskal, 1775)	*Caligus rotundigenitalis* (Yu, 1933)	Taiwan	Ho et al, 2000
Therapon jarbua (Forsskal, 1775)	*Empleurosoma pyriforme* (Johnston & Tiegs, 1922)	India	Ramasamy & Brennan, 2000
Therapon puta	*Pseudogomtiotrema caranxi* (Gupta & Jain, 1991)	Bay of Bengal, Puri, India	Gupta & Jain, 1991
Terapon plumbeus (Kner, 1864)	*Lernaea cyprinacea* (Linnaeus,1758), *L. lophiara* (Harding, 1950)	Philippines	Vallejo, 1985

Therapon puta	*Hysterothylacium reliquens* (Norris & Overstreet, 1975),	Kuwait City	Petter & Sey, 1997
Therapon jarbua	*Prosorhynchus sp.* (Manter, 1964)	Chilka Lake, Orissa, India	Madhavi et al, 1994
Therapon jarbua	*Sphaeromyxa ganapatii* (Kalavati & Vaidehi, 1991)	Satpada, Chilka Lake, Orissa, India	Kalavati & Vaidehi, 1991
Therapon jarbua	*Helicometra gibsoni* (Meenakshi et al, 1993)	Bay of Bengal, India	Meenakshi et al, 1993
Therapon jarbua	*Opegaster anguilli* (Harshey, 1933)	Chilka Lake, Orissa, India	Rukmini & Madhavi, 1987
Therapon theraps	*Neolasiotocus brayi* (Ahmad, 1991)	Arabian Sea, Panjim Coast, India	Ahmad, 1991
Therapon theraps	*Allodecemtestis odeningi* (Ahmad, 1988)	Bay of Bengal, Puri, Orissa, India	Ahmad, 1988
Therapon theraps	*Pseudopecoelus dollfusi* (Ahmad & Dharr, 1987)	Puri Coast, India	Ahmad & Dharr, 1987
Therapon theraps	*Neonotoporus skrjabini* (Ahmad, 1987)	Puri Coast, Orissa, India	Ahmad, 1987
Therapon theraps	*Timonia nahhasi* (Ahmad, 1985)	Coast of Bombay	Ahmad, 1985
Therapon jarbua	*Galactosomum ussuriense* (Oshmarin, 1963)	Bheemunipatnam , Andhra Pradesh, India	Rekharani & Madhavi, 1985
Therapon theraps	*Rhipidocotyle theraponi* (Gupta & Tandon, 1985)	Quilon, Kerala, Arabian Sea; and Puri, Orissa, India	Gupta & Tandon, 1985
Therapon theraps	*Bucephalus fischthali* (Gupta & Tiwari, 1983)	Bay of Bengal, Madras, India	Gupta & Tiwari, 1983
Therapon theraps	*Paropecoelus overstreeti* (Ahmad, 1983)	Puri Coast, Bay of Bengal, India	Ahmad, 1983(a)
Therapon theraps	*Preptetos pritchardae* (Ahmad, 1984)	Panaji Coast, Arabian Sea	Ahmad, 1984
Therapon theraps	*Trifoliovarium bombayensis* (Ahmad, 1983)	Bombay coast, Arabian Sea, India	Ahmad, 1983 (b)
Therapon jarbua	*Chloromyxum tripathii and C. mitchelli* (Kalavati & Narasimhamurti, 1984)	Visakhapatnam, Andhra Pradesh, India	Kalavati & Narasimhamurti, 1984
Therapon theraps	*Aponurus orientalis* (Ahmad, 1981)	Bay of Bengal, Puri Coast, Orissa, India	Ahmad, 1981
Therapon theraps	*Rhipidocotyle theraponi* (Tandon, 1982)	Puri, Orissa, India	Tandon, 1982

Therapon jarbua	*Atheria zakiae* (Hafeezullah, 1975)	Bay of Bengal, India	Hafeezullah, 1975
Therapon jarbua	*Karyakartia sp.* (Hafeezullah, 1979)	Machilipatnam, India	Hafeezullah, 1979
Therapon theraps	*Pseudopecoelina puriensis* (Ahmad, 1978)	Puri Coast, Orissa, India	Ahmad, 1978
Therapon theraps	*Stephanostomum theraponi* (Gupta & Ahmad, 1979)	Puri Coast, Orissa, India	Gupta & Ahmad, 1979
Therapon theraps	*Camallanus marinus* (Schmidt & Kuntz, 1969)	Philippine Sea, Pacific Ocean	Kataitseva, 1975
Therapon theraps	*Godavaritrema marina* (Karyakarte & Yadev, 1976)	Paithan, Maharashtra, India	Karyakarte & Yadev, 1976
Therapon jarbua	*Intracotyle caballeroi* (Mamev, 1977)	Arabian Sea	Mamev, 1977
Therapon theraps	*Hamatopeduncularia theraponi* (Karyakarte & Das, 1972)	Ratnagiri, India	Karyakarte & Das, 1972
Therapon theraps	*Camallanus therapsi* (Srivastava & Gupta, 1975)	Puri Coast, Orissa, India	Srivastava & Gupta, 1975
Therapon theraps	*Allopodocotyle yamagutii* (Gupta & Ahamad, 1977)	Puri Coast, Orissa, India	Gupta & Ahamad, 1977
Therapon theraps	*Paropecoelus theraponi* (Gupta & Ahmad, 1977.)	Bay of Bengal, India	Gupta & Ahmad, 1977
Therapon jarbua	*Podocotyloides parupenei* (Manter, 1963)	Waltair Coast, Bay of Bengal, India	Madhavi, 1975
Therapon jarbua	*Diplectanum jerbuae* (Gupta & Khanna, 1974)	Port Blair, Andaman, and Nicobar Islands, India	Gupta & Khanna, 1974
Therapon jarbua	*Protogyrodactylus gussevi*, *P. solidus*, *P. marinoides*, and *P. perforatus* (Bykhovskii & Nagibina, 1974)	South China Sea	Bykhovskii & Nagibina, 1974
Therapon jarbua	*Protogyrodactylus marinus* (Gussev, 1973)	Lunawa Lagoon, Sri Lanka, and Moreton Bay, Aust.	Gussev,, 1973
Therapon jarbua	*Pseudorhadinorhynchus ernakulensis* (Gupta 7 Gupta, 1971)	Ernakulam, India	Gupta & Gupta, 1971
Therapon jarbua	*Paracamallanus theraponis* (Kalyankar, 1971)	Vizag, Andhra Pradesh, India	Kalyankar, 1971
Therapon sp.	*Gyrodactylus eutheraponsis* (Venkatanarsaiah & Kulkarni, 1980)	Gosthani estuary, India	Madhavi, 2000
Therapon jarbua	*Erilepturus hamati* (Manter,	Red Sea, Egypt	Abdou, 2001

	1947)		
Therapon jarbua	*Helicometrina indica* (Linton, 1910)	Andhra Pradesh, Bay of Bengal, India	Dhanumkumari , 1999
Therapon theraps	*Telorhynchus cameroni* (Gupta & Jain, 1993)	Puri Coast, Orissa, India	Gupta & Jain, 1993
Therapon jarbua	*Sphaeromyxa ganapatii* (Kalavati & Vaidehi, 1991)	Chilka Lake, India	Kalavati & Vaidehi, 1991
Therapon jarbua	*Ganeo tigrinum* (Mehra and Negi, 1928)	Bay of Bengal, India	Hafeezullah & Dutta, 1985
Therapon theraps	*Serrasentis socialis* (Leidy-1851)	Bay of Bengal, India	Gupta & Jain, 1985
Therapon theraps	*Bucephalus fischthali* (Gupta & Tiwari, 1985)	Bay of Bengal, India	Gupta & Tiwari, 1985
Therapon jarbua	*Galactosomum ussuriense* (Oshmarin, 1963)	Bay of Bengal, India	Rekharani & Madhavi, 1983
Therapon sp.	*Joryma sawayah* (Bowman & Tareen, 1983)	Persian Gulf, Kuwait	Bowman & Tareen, 1983
Therapon theraps	*Allopodocotyle upeneusi* (Gupta & Ahamad, 1978)	Puri Coast, Bay of Bengal, India	Gupta & Ahamad, 1978
Therapon oxyrhynchus (Temminck & Schlegel, 1842)	*Daicocus peterseni* (Nyström,1887)	Japan Sea, Japanese Coast	Ho & Perkins, 1980
Therapon gerbua (Forsskal, 1775)	*Lepidapedon genge* (Yamaguti, 1938)	Pakistan, Arabian Sea	Zaidi & Kahn, 1977
Terapon jarbua	*Opecoelus rhadinotus* (Manter, 1963), *Opecoelus mutu* (Yamaguti, 1940)	Fiji	Manter, 1963
Terapon jarbua	*Gussevstrema amacleithrium* (Price & McClellan, 1969)	Natal, S. Africa	Price & McClellan, 1969
Therapon bidyanus (Mitchell, 1838)	*Lepidetrema bidyana* (Murray,1931)	Queensland, Australia	Young, 1969
Therapon puta	*Mehratrema skrjabini* (Karyakarte, 1969)	Indian Ocean, Pamban, Madras, India	Karyakarte, 1969
Therapon puta	*Polocotyloides parupenei* (Manter, 1963)	Madras, Bay of Bengal, and Tuticorin, Gulf of Manaar	Hefeezullah, 1971
Therapon puta	*Acanthostomum pambanense* (Karyakarte, 1968)	Indian Ocean, Pamban, Madras, India	Karyakarte, 1968

Therapon unicolor (Gunther, 1859)	*Lepidotrema angusta* (Johnston & Tiegs, 1922)	Queensland, Australia	Young, 1969
Therapon oxyrhynchus (Temminck & Schlegel, 1842)	*Heterophyes nocens* (Von Siebold,1852)	Japan	Komiya & Suzuki, 1966
Therapon puta	*Caligus diaphanous* (Nordmann, 1832)	Aripu, Ceylon	Thompson & Scott, 1903.
Therapon theraps	*Ectenurus theraponae and O. vixigastera* (Oshmarin, 1965), *Opecoelina vixiintestina* (Oshmarin, 1965)	North Vietnam	Oshmarin, 1965
Therapon theraps	*Complexobursa vjetnamensis* (Oshmarin, 1963)	North Vietnam	Oshmarin, 1963
Terapon jarbua	*Bucephalus polygonurplus* (Bravo & Grocott, 1913)	Ernakulam, South India	Gupta & Mehrota, 1971
Therapon jarbua	*Heliocometrina orientalis* (Strivastava, 1936)	India	Lakshimi & Rao, 1978.

MATERIALS AND METHODS

Ten specimens of *T. jarbua* purchased from fishermen at Hurghada City, Egypt, from November 10 to December 10, 1993, were transported on ice to nearby Gohar Laboratory and immediately examined for metazoan parasites. Endohelminths used for light microscopy were relaxed in physiological saline (.07%), fixed in 10% buffered formalin, stained in Semichon's carmine, and mounted in Canada balsam. Specimens used for scanning electron microscopy were washed in physiological saline, fixed in 7% formalin, postfixed in 1% aqueous osmium tetroxide for two hours, washed in distilled water, dehydrated in a graded series of ethanol with a final rinse in acetone, critical point dried, and coated with gold. Drawings were done with the aid of a drawing tube. Measurements are in micrometers (μm) with the mean followed by the range in parentheses, unless otherwise stated. Fish classification and authorities follow FishBase 2003 (Froese and Pauly, 2003). Abbreviations: BMNH is for the Natural History Museum, London, UK; USNPC is for the United States National Parasite Collection, Beltsville, Maryland, USA; and HWML is for the Harold W. Manter Laboratory, University of Nebraska, Lincoln, Nebraska, USA.

DESCRIPTION

PARACANTHOGALEA N.GEN.

Lepocreadiidae: Acanthogaleinae. Body of trematode elongate, covered with characteristic scale-like spines. Single row of acuminate circum-oral spines present.

Oral sucker terminal, funnel-shaped. Prepharynx long; pharynx situated at middle of forebody. Esophagus short. Ceca bifurcating immediately posterior to esophagus, uniting with excretory bladder near posterior extremity to form uroproct. Acetabulum in anterior third of body.

Testes tandem in the posterior third of body. Cirrus sac claviform, situated between cecal bifurcation and middle of acetabulum, containing a tripartite internal seminal vesicle surrounded by prostate cells, pars prostatica, and unspined cirrus. External seminal vesicle large and usually tripartite. Genital pore ventral, immediately posterior to cecal bifurcation on midline of body with no associated glandular organs. Ovary oval, pretesticular on the midline of the body. Seminal receptacle canalicular, overlaying ovary dorsally. Laurer's canal present. Ootype immediately preovarian, near midline of body. Vitelline follicles in lateral fields extending from ovary anteriorly to midway between ovary and acetabulum. Uterus entirely preovarian, eggs operculate. Excretory vesicle I-shaped; excretory pore terminal. A taxonomic summary of the new genus, *Paracanthogalea*, can be found in table 3.

Table 3: Taxonomic Summary *Paracanthogalea* n. gen

Type Species:	*Paracanthogalea egyptensis* n. sp.
Etymology:	The genus designation reflects the superficial similarity of the new genus to members of the genus *Acanthogalea* (Gibson, 1976).

PARACANTHOGALEA EGYPTENSIS N. SP.

(Figures 1-7)

Based on ten adult specimens, with all characteristics of genus. Body of trematode measured at 2,850 (2300-3200) long 460(410-560) wide, with multi-digitate spines covering tegument from anterior end posteriorly to level of interesteistcular region. Single row of twenty similar-size, circum-oral spines, 51 (48-54) long 22 (20-23) wide at base. Forebody 660 (610-760) long. Remnants of cercarial eyespots usually apparent at level of juncture of esophagus and pharynx. Oral sucker 270 (260-280) long 210 (190-240) wide. Acetabulum 175 (160-200) long170 (150-200) wide; prepharynx 135 (90-175) long 210 (190-250) wide. Ratio of transverse diameter of acetabulum to oral sucker is 1:1.2.

Two testes, tandem in posterior half of body. Posterior testis 275 (240-310) long 240 (220-265) wide. Cirrus sac 260 (200-305) long 145 (130-170) wide. Length of external seminal vesicle variable, approximately 300-500 long. Genital pore with muscular opening; genital atrium small, distinct.

Ovary situated immediately posterior to mid-body, 125 (110-150) long 150 (110-200) wide. Seminal receptacle, canalicular, 140 (105-190) long 85 (75-95). Laurer's canal arises from ventral surface of seminal receptacle opening on dorsal surface. Vitelline follicles beginning near junction of first and second thirds of body, confluent in preovarian and posttesticular regions. Uterus extends from level of ovary to level of the acetabulum; the metraterm is short and poorly developed Eggs 68 (65-70) long; 22 (20-23) wide. Excretory bladder extends anteriorly to the level of anterior testis.

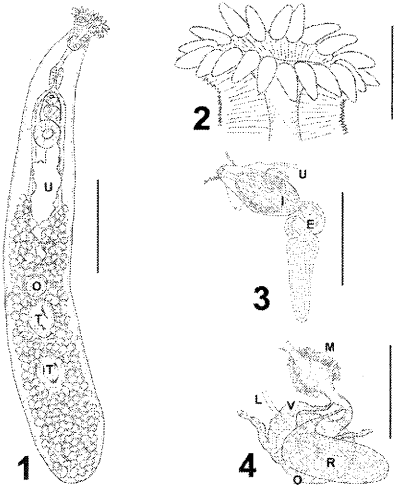


Figure 1: Major taxonomic characteristics of *P. egyptensis.* (Artist: Dr.Norm Dronen)
"T" testes; "O" ovaries; "U" uterus.

Figure 2: Detail of Oral Sucker. (Artist: Dr.Norm Dronen)
Present is a single row of large, acuminate, circum-oral spines characteristic of the species.

Figure 3: Detail of Male Reproductive System (Artist: Dr.Norm Dronen)
"U" uterus; "E" external seminal receptacle; "I" internal seminal receptacle.

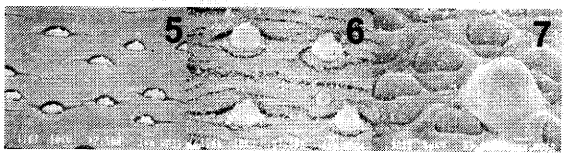
Figure 4: Detail of Female Reproductive System. (Artist: Dr.Norm Dronen)
"M" metraterm; "R" seminal receptacle; "O" ovary; "V" vitelline duct; "L" Laurer's canal.

A taxonomic summary of the new species, *Paracanthogalea egyptensis*, can be found in table 4. Electron micrographs of the surface structures of *Paracanthogalea egyptensis* can be found in figures 5, 6, and 7.

Table 4: Taxonomic Summary of *Paracanthogalea egyptensis* n. sp.

Type Host:	*Therapon jarbua* (Forsskel, 1775) (Syn. *Jarbua terapon; Pherapon jarbua; Therapon jarbua*)
Site of infection:	Upper and middle intestine
Type locality:	Hurghada, Egypt, on the Red Sea.
Prevalence and Intensity:	60%, 6 of 10 fish infected; 7 flukes per infected fish)
Etymology:	The species is named after the general geographic area, Egypt, where the host was collected.

Figures 5, 6, and 7: Surface Structures of *Paracanthogalea egyptensis.* Scanning Electron Micrograph (SEM) photographs displaying the varying scale sizes found on the surface of *Paracanthogalea egyptensis.*



SUMMARY AND CONCLUSIONS

At present the subfamily Acanthogaleinae contains two genera: *Acanthogalea* (Gibson 1976) and *Clavogalea* (Bray 1965), separated on the basis of spination, genital atrium, and location of the genital pore. Paracanthogalea contains characteristics of both genera as first proposed by Gibson, D. in "Monogenea and Digenea from fishes." *Discovery Reports*. 1976. These features are illustrated in Table 5. With these major differences, it is clear that though *Paracanthogalea* shares enough common features to be classified in the same family as species of *Acanthogalea* or *Clavogalea*, the taxonomic divergence necessitates that the two may not be placed into the same genus.

Table 5: Illustration of the distinguishing taxonomic features of genera of the subfamily Lepocreadiidae.

Characteristic	*Acanthogalea* sp.	*Clavogalea* sp.	*Paracanthogalea* sp.
Circum-oral spines	Single complete row of large, acuminate spines	Two complete rows (plus two half rows) of peg-like spines	Single complete row of large, acuminate spines
Body spines	Large, acuminate	Small, scale-like	Small, scale-like
Genital atrium	Two large glandular organs associated	No glandular organs observed	No glandular organs observed
Genital pore	Median	Submedian, sinistral	Median

The major taxonomic features of the genus *Acanthogalea* include a single complete row of large, acuminate circum-oral spines. This characteristic matches with those spines found in the new genus *Paracanthogalea*. These two genera also possess the common trait of a median genital pore. However, *Paracanthogalea* differs from

Acanthogalea in two major taxonomic features: characteristically large and acuminate body spines from species of *Acanthogalea* are small and scale like on the new species of *Paracanthogalea*; and species of *Acanthogalea* have two glandular organs in the genital atrium, while the new species of *Paracanthogalea* lack these organs.

A similar contrast can be found with the comparision of species of *Paracanthogalea* to those of *Clavogalea*. Both *Clavogalea* and *Paracanthogalea* share small and scale-like body spines, and do not contain any glandular organs present in the genital atrium. However, the new species of *Paracanthogalea* maintains a single, complete row of large, acuminate circum-oral spines while species of *Clavogalea* maintain two complete rows (plus two half rows) of peg-like spines. Furthermore, the genital pore of *Clavogalea*. is submedian and sinistral as compared to the median genital pore of *Paracanthogalea*. These differences are sufficient to establish specimens within each genus into separate taxonomic categories.

That species of *Paracanthogalea* possess unique features which exclude them from categorization into the two existing genera, *Clavogalea* and *Paracanthogalea*, provides compelling evidence for the need of a new genus within the Acanthogaleninae. The placement of the new genus with lepocreadiidae is substantiated by the large amount of shared features among the genera.

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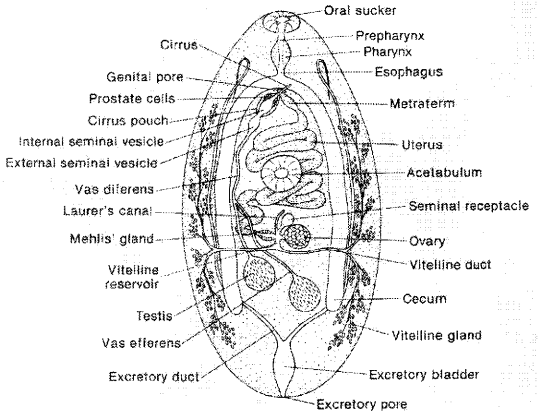
APPENDIX

Figure 8: Internal Structures of Trematode Parasites.
Displays the structures of a typical trematode, including taxonomic identifiers.
(From Schmidt, G., & L. Roberts, 1989. *Foundations of Parasitology, 4th Ed.* St. Louis: Times Mirror/Mosby College Publishing, 223)



VITA

Elizabeth Anne Gray

Education:

Bachelor of Arts in Biology
Texas A&M University, College Station, TX
Anticipated Graduation Date: December, 2003
Grade Point Average: 3.654

Permanent Address:

406 Timber Street
College Station, Texas
77840

Offices Held:

2002-2003 *Student Government Association, Texas A&M University*
Designed and implemented diversity training and initiatives within the entire Student Government Association. Coordinated and facilitated the training of all SGA committee members (approx. 2000 students) in diversity education and practice within the organizational setting.

2001-2003 *Aggie Leaders in Science, Texas A&M University*
Founded and lead the organization in order to bring science and engineering majors together to inspire future students, especially those from traditionally underrepresented backgrounds, for careers in science and engineering through mentoring and campus events.

Honors:

Texas A&M Valedictorian Scholarship
Joe Martin Scholarship for Academic Excellence
Summer Undergraduate Research Scholarship
Academic Honor Roll
Texas A&M Honors Program
University Undergraduate Research Fellow 2002-2003
Phi Eta Sigma National Honor Society
Golden Key National Honor Society
Tau Kappa Honor Society, Texas A&M

Additional Experience:

Laboratory Assistant, Dr. Merill Sweet: Texas A&M University
Laboratory Assistant, Dr. Norm Dronen: Texas A&M University
Student Researcher, Dr. Douglas Brooks: Texas A&M University
Docent, Houston Zoological Gardens: Houston, TX