

***Himalaya pauriensis* Gen. et Sp. Nov., as a Representative of the Family Himalayidae Nov. with a Revised Definition of the Order Anoplocephalidea**

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Key words: *Himalaya pauriensis*, Himalayidae, Anoplocephalidea, *Oryctolagus cuniculus*, Phylogeny

Introduction

Blanchard (1891) had proposed Anoplocephalinae as a subfamily of Anoplocephalidae. Fuhrmann (1907) had erected two new subfamilies—Linstowiinae and Thysanosominae. Skrjabin (1926) had proposed a new family Stilesiidae to include subfamilies Stilesiinae and Thysanosominae. Stunkard (1961) synonymised the subfamily Stilesiinae with Thysanosominae. Spassky (1951) had recognized four families viz. Anoplocephalidae, Avitellinidae Spassky, 1950, Linstowiidae (Mola, 1929) Spassky, 1949, and Catenotaeniidae Spassky, 1950, under the suborder Anoplocephalata Skrjabin, 1933. Stunkard (1961) had recognized four sub-families within the family Anoplocephalidae, viz. Anoplocephalinae Blanchard (1891), Catenotaeniinae Spassky (1949), Linstowiinae Fuhrmann (1907), and Thysanosominae Fuhrmann (1907). Wardle, McLeod and Radinovsky (1974) had

erected a new order Anoplocephalidea and included therein families—Anoplocephalidae, Thysanosomiidae Fuhrmann (1907), and Triplotaeniidae Yamaguti (1959) and removed Catenotaeniidae from the order Anoplocephalidea to the order Cyclophyllidea.

The distinguishing features of the present form viz. a rostellum, a rostellar sac, transverse, lobed and saccular uterus and pyriform organ in ova separate it from other referred families by Wardle *et al.* (1974). Hence it warrants the erection of a new family Himalayidae with type genus *Himalaya* gen. et sp. nov.

Materials and Methods

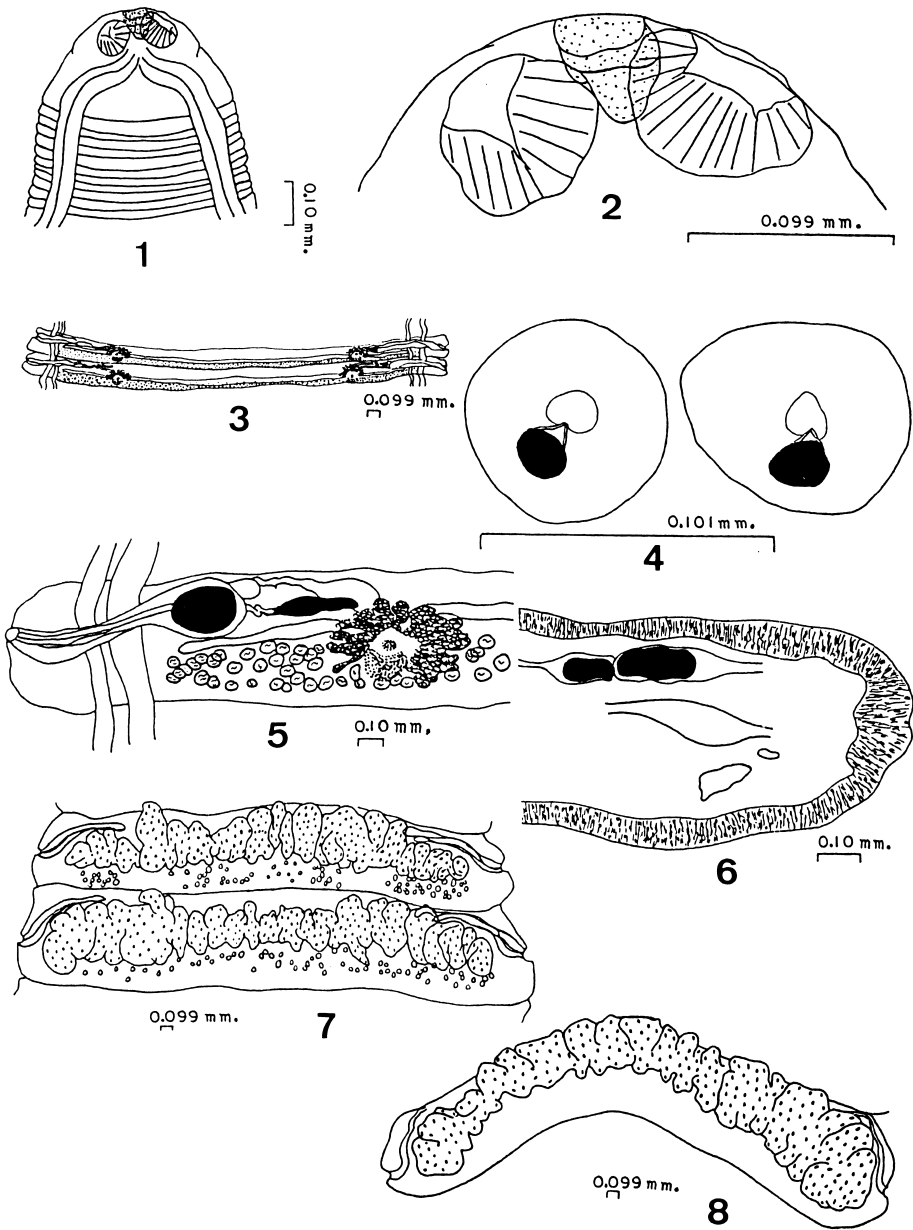
During a UGC research project survey on chemotaxonomy of cyclophyllidean cestodes, more than 300 mammalian hosts were examined at 325–1800 mASL in Grahwal Himalayas. Out of these one infected rabbit, *Oryctolagus cuniculus* [Mammalia:Lagomorpha: Leporidae], harboured five worms in its small intestines. The worms were properly stretched and fixed in aqueous Bouin's solution. Whole mounts were stained with Meyer's haemalum, dehydrated, cleared in xylol and mounted in canada balsam. Transverse sections of proglottides were cut at 10 μ m and stained

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Figs. 1-8. *Himalaya pauiensis* gen. et sp. n.

1. Scolex.
2. Scolex (magnified).
3. Mature proglottides.
4. Eggs with pyriform organ.
5. Genital organ system of mature proglottid.
6. Transverse section of a proglottid showing relation of genital ducts with excretory vessels.
7. Early gravid proglottid.
8. Late gravid proglottid.

in Harris haematoxylin and eosin. Drawings were made with the aid of camera lucida. Measurements have been expressed as length by width and include the mean followed by the ranges within parentheses. All measurements are in millimeters unless otherwise indicated.

Order: Anoplocephalidea Wardle, McLeod and Radinovsky, 1974 (Redescribed)
 Diagnosis: Eucestoda; The holdfast small and globular, with four suckers being flush with its surface, with or without rostellum, hooks, spines, bothridia and accessory suckers.*

Himalaya pauriensis sp. nov.
 (Figs. 1-8)

Description (based on five specimens): The worms attain a length of 75.5 (63 to 79) and 9.0 in maximum breadth met within gravid proglottides. Strobila composed of 927 (825 to 1063) proglottides. All proglottides broader than long. Scolex small, 0.199 (0.105 to 0.202) by 0.283 (0.249 to 0.299), not sharply demarcated from strobila. Rostellum unarmed showing an anterior muscular disc and a small conical rostellar sac. The rostellar disc measured 0.033 (0.026 to 0.053) by 0.038 (0.03 to 0.076) and rostellar sac, 0.045 (0.028 to 0.053) by 0.046 (0.035 to 0.078). Suckers small, unarmed, oval, 0.074 (0.044 to 0.078) by 0.091 (0.057 to 0.094). Neck short, 0.143 (0.126 to 0.158) by 0.464 (0.269 to 0.473). Proglottides craspedote. Immature, mature and gravid proglottides measured 0.077 (0.055 to 0.13) by 1.619 (1.402 to 2.184); 0.209 (0.096 to 0.662) by 2.919 (2.561 to 3.398) and 0.991 (0.273 to 1.45) by 6.725 (3.224 to 9.0), respectively. Proglottides markedly extended transversely with a short velum. Testes 209 (198 to 215) in number in each proglottid. Testes mainly intravascular in medullary field, but occasionally postovarian and in extravascu-

lar fields. Testes spherical to oval, 0.059 (0.012 to 0.078) by 0.074 (0.013 to 0.104). Vas deferens, 0.028 (0.005 to 0.029) in diameter. Cirrus pouch cylindrical, 0.808 (0.241 to 0.984) by 0.094 (0.025 to 0.254) running parallel to the anterior border of proglottides and crossing poral excretory vessels. External vesicula seminalis, 0.218 (0.098 to 0.448) by 0.099 (0.047 to 0.128). Internal vesicula seminalis oval, 0.187 (0.039 to 0.282) by 0.088 (0.065 to 0.194). Cirrus unarmed, 0.01 (0.009 to 0.013) in diameter.

Female genitalia double per proglottid. Ovaries close to excretory vessels. Ovary fan-shaped with finger-like small acini, 0.293 (0.015 to 0.313) by 0.443 (0.14 to 0.668). Rudiments of genitalia appearing from 5th-6th proglottid. Female genitalia 1.562 (1.218 to 1.6) from edge of the proglottides and 0.693 (0.278 to 0.768) from poral excretory vessels. Vagina distinguishable into a couplatory part, 0.577 (0.26 to 0.991) by 0.038 (0.012 to 0.091) and a tubular conducting part, 0.03 (0.007 to 0.046) in diameter. Copulatory part located behind cirrus pouch. Vagina opening posteroventral to cirrus pouch into a common genital atrium. Receptaculum seminis prominent, 0.112 (0.029 to 0.241) by 0.250 (0.156 to 0.371). Vitelline gland compact, postovarian, 0.07 (0.023 to 0.119) by 0.169 (0.056 to 0.182). Shell gland small, located between ovary and vitelline gland, 0.057 (0.02 to 0.085) by 0.12 (0.024 to 0.143). Uterus single, persistent, 0.532 (0.007 to 1.404) by 6.083 (2.266 to 8.329). Initially it appearing as a transverse tube, 0.058 (0.007 to 0.079) in diameter in late mature proglottides and extending dorsally to excretory vessels. The uterus in late gravid proglottides exhibiting 20 (18 to 20) blind anterior and posterior pouches. Finally uterus in last few proglottides appearing as a sac. Eggs spherical to oval, 0.035 (0.013 to 0.085) by 0.056 (0.013 to 0.098) with atypical pyriform organ. The cap of

* Other details similar as given by Wardle, McLeod and Radinovsky (1974).

pyriform organ, 0.009 (0.004 to 0.017) by 0.014 (0.007 to 0.018); horns, 0.062 (0.005 to 0.066) by 0.002 (0.001 to 0.003) and bulb, 0.043 (0.042 to 0.046) by 0.057 (0.049 to 0.064). Onchosphere, 0.021 (0.011 to 0.032) by 0.023 (0.012 to 0.032).

Genital atrium, 0.028 (0.009 to 0.053) deep and 0.032 (0.013 to 0.0139) wide, located in anterior lateral half of proglottid margin. Excretory vessels two pairs per proglottides, at 0.056 (0.033 to 0.094) distance from proglottid margin in the neck and 0.275 (0.152 to 0.458) in strobila. Dorsal excretory vessel, 0.028 (0.012 to 0.089) and ventral excretory vessel, 0.096 (0.013 to 0.139) in diameter.

Discussion

The new cestode distinguished by its characters finds its place only in the order Anoplocephalida. It, however, shows partial resemblance with larvacysts of Catenotaeniidae (Order: Cyclophyllida) in respect of an apical organ on scolex, but differs from Catenotaeniidae in respect of an apical organ in scolex in adult and in presence of saccular uterus. Further, in the author's opinion Catenotaeniidae finds its better position in the order Taeniidea Wardle *et al.* (1974) as the family Catenotaeniidae shows median uterus with lateral branches, a typical character of Taeniidea. Hence the authors propose that the family Catenotaeniidae be transferred to order Taeniidea from order Cyclophyllida. However, with family Triplotaeniidae (Order Anoplocephalida Wardle *et al.* (1974), the new cestode only resembles in respect of pyriform organ, but differs entirely in respect of double holdfast, double strobila, number of testes and number of cirrus pouches. Finally with *Mosgovoyia pectinata* Spassky (1951) (Order: Anoplocephalida), it distinguishes itself by the presence of a rostellum, rostellar sac, differences in size of proglottides, vas deferens,

internal seminal vesicle, vagina, receptaculum seminis, uterus, pyriform organ, and ventral excretory vessel, in presence of an external seminal vesicle, extension of uterus and number of blind outpouches of uterus. The new family Himalayidae, therefore, differs entirely from Anoplocephalida in possession of a rostellum and a rostellar sac, and from Catenotaeniidae and Triplotaeniidae on characters described as above. Hence the authors feel justified to erect the new family Himalayidae to accommodate the new genus with its type and only species *Himalaya pauriensis* gen. et sp. nov. .

Himalayidae fam. nov.

Diagnosis: Anoplocephalida; Medium to small worms. Scolex with rostellum. Segmentation distinct. Proglottides craspedote, flattened, broader than long, anapolytic or apolytic. Double set of reproductive organ per proglottid. Testes numerous, medullary. Genital pores marginal. Ovary lobed or not. Vitelline compact, postovarian. Uterus transverse, with outpouchings; eggs with pyriform apparatus. Adults in mammals. Type genus: *Himalaya* gen. nov.

Himalaya gen. nov.

Diagnosis: Anoplocephalida; Himalayidae. Scolex with an apical rostellum and a rostellar sac. Genitalia double per proglottid. Testes forming an intravascular transverse band with some follicles postovarian and in extravascular fields. Uterus being a transverse tube surpassing excretory stems dorsally.

Type species: *Himalaya pauriensis* sp. nov.

Phylogeny

(Fig. 9)

The phylogenetic tree of tapeworms (Loennberg, 1897) has remained basically

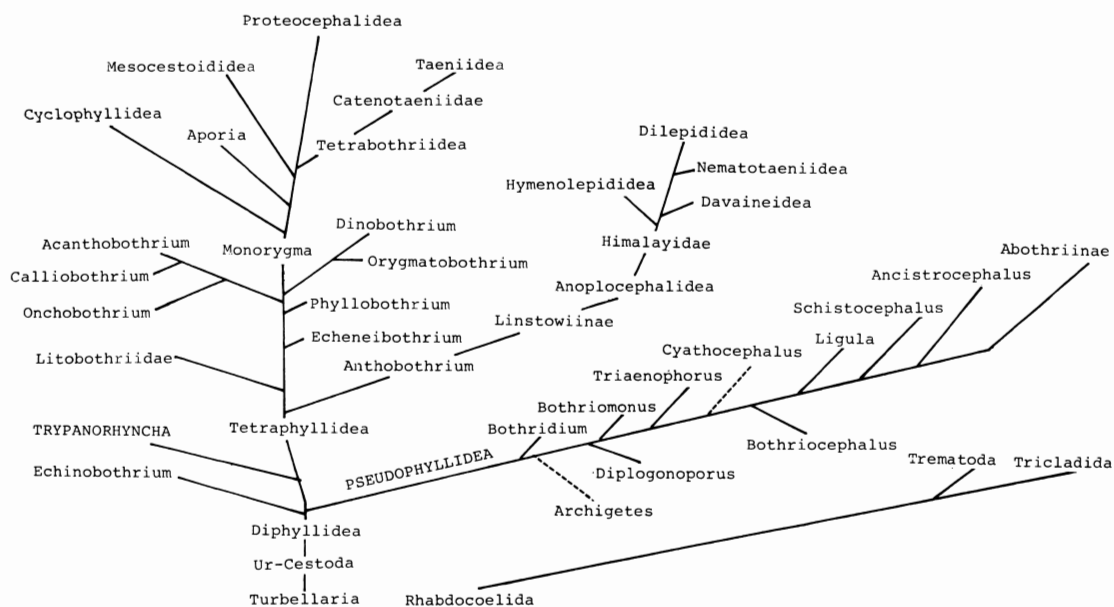


Fig. 9 Phylogeny of tapeworms (revised).

unaltered till date, though suggestions have been put forward by Wardle and McLeod (1952), Freze (1969), Wardle *et al.* (1974) and Spassky (1980). The authors herewith suggest that on one hand Tetraphyllidea through Anthobothrium gave rise to Anoplocephalidae which in turn through Himalayidae gave rise to Davaineidea Wardle *et al.* (1974), Dilepididea Wardle *et al.* (1974) and Hymenolepididea Wardle *et al.* (1974). On the other hand, Tetrabothriidea through Catenotaeniidae evolved present day Taeniidea.

A revised key to the families of the order Anoplocephalidea has been proposed as under:-

1. Scolex with rostellum
..... Himalayidae fam. nov.
- Scolex without rostellum 2
2. Worms with double holdfast, double strobila and single testis
..... Triplotaeniidae
- Worms with single holdfast, single strobila and several testes 3
3. Gravid uterus a transverse tube or

a network of tubes
..... Anoplocephalidae

Gravid uterus replaced by uterine capsule Linstowiidae

Gravid uterus replaced by paruterine pouches Thysanosomiidae

Host: *Oryctolagus cuniculus* [Mammalia : Lagomorpha : Leporidae]

Locality: Pauri (Garhwal), India

Type specimens: PCLS Holotype (063/81) deposited with the Parasitological Collections, Department of Zoology, University of Garhwal, Pauri Campus, Pauri (Garhwal).

Etymology: The generic name *Himalaya* is derived from the geographical area of collection viz. Garhwal Himalayas; the species is named after the locality of collection.

Summary

Himalaya pauriensis gen. et sp. nov., from *Oryctolagus cuniculus*, has been described as the type species of the new family Himalayidae fam. n. nov., on pre-

sence of a rostellum and a rostellar sac, an unusual character for the order Anoplocephalida Wardle, McLeod and Radinovsky (1974). The worm also shows internal and external vesicula seminales. Uterus extends beyond excretory vessels in gravid proglottides. A key to families of Anoplocephalida is given.

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改正された裸頭条虫目の定義を付記した，新科ヒマラヤ条虫科の
新属新種 *Himalaya pauriensis* について

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インドのガホールヒマラヤの標高 325~1800 m の山岳地帯に生息する 300 頭以上にのぼる哺乳類を捕獲して，寄生条虫の調査を実施した．その結果，1 頭の野兔 *Oryctolagus cuniculus* の小腸内に 5 隻の条虫の寄生を発見した．本条虫は裸頭条虫目の特徴を備えてはいるが，額嘴嚢を有する点で現在記載されている裸頭条虫目のいずれの科にも該当しないことが判明した．

そこで，新科ヒマラヤ条虫科および新属ヒマラヤ条虫属を創設し，その代表として本種を新属新種 *Himalaya pauriensis* とした．本条虫は内外両貯精嚢を有し，受胎片節では子宮が片節の両側野を縦走する排泄管を越えてのびている．さらに裸頭条虫目に含まれる科の新しい分類表を付記した．