

RESULTS OF THE AUSTRIAN-CEYLONESE HYDROBIOLOGICAL MISSION 1970 OF THE 1ST ZOOLOGICAL INSTITUTE OF THE UNIVERSITY OF VIENNA (AUSTRIA) AND THE DEPARTMENT OF ZOOLOGY OF THE VIDYALANKARA UNIVERSITY OF CEYLON, KELANIYA

Part X: Freshwater Triclad (Turbellaria, Tricladida) from Ceylon

by

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INTRODUCTION

The collection of Triclad from the Austrian-Ceylonese Hydrobiological Mission 1970 (Prof. Dr. H. H. COSTA and Prof. Dr. F. STARMUHLNER) originate from 23 streams in the mountains of the South of Ceylon. All collected animals are of the *Dugesia gonocephala* (DUG.) type. Unfortunately the determinable mature animals were very rare in the samples. But it seems certain that all the Triclad, found by the mission, belong to *Dugesia nannophallus*, described by BALL in 1970 after two individuals from Dunhinda, Badulla (Prov. Uva, Ceylon).

List of the stations

FC 1b/9.11.1970—Meda-Dola, an origin of Gin-Ganga, Sinharaja Range, under stones from the bank ; 1 specimen ; 4 mm.

FC 3c/10.11.1970—Hola-Dola, near Deniyaya, under stones in the cascade-zone ; 3 specimens, very dark : 6 mm. and 4 small individuals.

FC 5f/11.11.1970—Campden-Hill-Dola, near Deniyaya, under stones ; 20 specimens, the biggest being 7 mm.

FC 6d/11.11.1970—Kiriwel-Dola, near the Enselwatte tea-factory, under stones near the banks : 15-30 ind./1/16m ; 1 specimen, 8mm×2mm, 3 small individuals.

FC 8/13.11.1970—Nagahaketa-Dola, origin of Nilvala-Ganga near Deniyaya, under stones ; 2 very small individuals.

FC 9e/17.11.1970—Bodathpitiya-Ela, near Ratnapura, under stones near the banks (current : 30-50cm/sec) : 15-30 ind./1/16 in ; 6 specimens with 4mm, 1 very small.

FC 10b/18.11.1970—Katugas-Ela, an origin of Kalu-Ganga, near Ratnapura, under stones near the banks, current slow 1 specimen, 2mm.

FC 11b/19.11.1970—Rajanawa-Dola, near Ratnapura, under stones near the banks : 15 ind./1/6 m, 1 big specimen and 7 small.

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FC 12b/20.11.1970—Kalu-Ganga near the town of Ratnapura, under stones near the banks (30-50cm/sec) ; some specimens being 5mm and one was very small.

FC 14a/22.11.1970—Up'er reaches of the Kalu-Ganga, near Adam's Peak, Carney Estate, under stones near the banks (10-30cm/sec) : 15-30 ind./1/6m. ; 3 specimens being 4mm, 3 very small.

FC 15b, f/23.11.1970—Ira-Handha-Pana-Ela, affluent of Kalu-Ganga, under stones near the banks (30cm/sec) ; 2 very small individuals.

FC 16b/28.11.1970—Mocha-Dola, Adam's Peak Estate near the Maskeliya barrage, under stones and gravel near the banks (50 cm/sec) : very rare ; only 1 specimen.

FC 18b/30.11.1970—Gartmore-River, crossing the Gartmore Estate after the big waterfall, under stones (50cm-1m/sec.!) 15-30 ind./1/16—m² ; 15 specimens from 6-7mm, the others being very small.

FC 19b/30.11.1970—Tributary of the Gartmore-River, a torrent near the Manager's Bungalow of Gartmore Estate, very frequent under stones near the banks (10-30cm/sec) : 30-60 (!) ind./1/16—m² ; 30 specimens : 10mm.

FC 20b/1.12.1970—Maskeliya-Dola near the Adam's Peak, before barrage, under stones near the banks very frequent (30cm/sec) : 20-30(!) ind./1/16—m², 17 specimens between 6mm. and 7mm.

FC2 1c, d/2.12.1970—Hakgala-Dola, Nuwara Eliya, under stones near the banks (10-30cm/sec) : 15-30(!) ind./1/16—m² ; one specimen being 10mm, another 5mm and 5 were very small.

FC 22/2.12.1970—Nuwara Eliya-Dola in the town, polluted (!) under stones (50cm/sec) : 30-60 ind. /1/16—m² (!) ; 10 specimens : length 6mm.

FC 24/7.12.1970—Belihul-Oya near the Resthouse at Belihuloya, under stones ; 3 specimens : length 5mm.

FC 26b/8.12.1970—Veli-Oya, near Belihuloya, branch of Walawe-Ganga, under stones near the banks, rare ; 2 specimens : 5 and 3mm respectively.

FC 28b/9.12.1970 Wetakei-Ela, a branch of Kirindi-Ganga, near Wellawaya, under stones near the banks, very rare ; 1 specimen ; very small.

FC 35b/27.12.1970—Hal-Oya, near Ginigathhena, an origin of the Kelani-Ganga, very rare under stones near the banks ; one small specimen.

FC 36b/27.12.1970—Rambukpoth-Oya, Pitawela near Kitulgala, an origin of Kelani-Ganga, very rare under stones near the banks ; 1 very small specimen.

FC 37b/28.12.1970—Kelani-Ganga near the Resthouse at Kitulgala, under stones near the banks, little polluted : 5-10 ind./1/16m² ; 1 specimen length 5mm, 2 were very small.

Anatomical Remarks

The general appearance of the animals is characteristic. The colour is a uniform brown little more or little less in the different localities. Most individuals are curved due to fixation and on the head the typical auricles ("ears") are recognizable only in a few specimens.

The eyes are situated closely to one another at the edges, a little distance from the point. The largest animals in the collection have a length of 10 mm. out the majority are between 4mm. and 7mm. All the animals were extended brightened and studied "in toto". Only two individuals appeared to be mature, but a study of the cross-sections showed that they too were not perfectly mature. But another animal showed mature and determinable genitals in the cross-sections. I will be describing in this study the details of this specimen and will be comparing the results with those of BALL 1970 and the results of other authors.

This curved specimen, 2mm. broad, was collected at station FC 26/8.12.1970, Veli-Oya, a branch of Walawe-Ganga at approximately 700m. altitude, near the Resthouse at Belihuloya. The animal was sectioned sagittally. On the dorsal side are the rhabdites which are very frequent, the layers of diagonal muscles are few and are separated from the longitudinal muscles. The structure of the pharynx is the same as that described for *Dugesia nannophallus* by BALL 1970.

The ovary which is little developed, is situated moderately below (in the vertical orientation) like on the type BALL, 1970), but not near to the point of the insertion of the pharynx. The complete absence of the testicles is remarkable although the sexual apparatus (genitals) is developed and the sperms are present in the ducts : In the places where the testicles would have been only accumulations of small nuclei could be made out which are hardly distinguishable from the nuclei of the neighbouring glands !

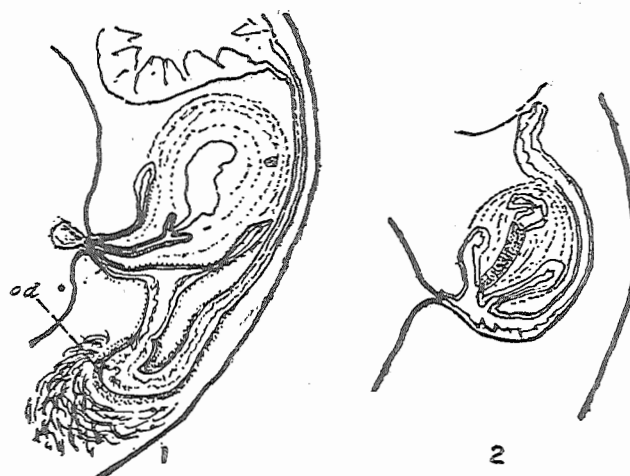


Fig. 1. *Dugesia nannophallus*
BALL 1970 Diagrammatic
sagittal sections of the
genitals of mature
animal (od : oviduct.)

Fig. 2. *Dugesia nannophallus*
BALL 1970 : Section analo-
gous to Fig. 1. from
rudimentary genitals.

The penis at first sight is large as the scientific name "*nannophallus*" indicate ; the papilla is much larger than the bulb as a consequence of the protraction into the aperture of the atrium. The duct is on the same level, but rise above by a lobe, projecting from outside. The lobe represent the point of the organ and rise above the former on the dorsal side during the invaginated position. It appears in this position rather to the left as a consequence of torsion. The papilla shows a small layer of peripheral circular muscles which was not seen by BALL. The ducts leading our (ductus) deferens) with sperms pass laterally to reach the irregular bladder. The canalis ejaculatorius, which was extended and funner-shaped at the beginning (the "diaphragma" of some authors) and with an eosinophil epithelium, showed the typical structure in agreement with the secretion of a spermatophore. A part of a spermatophore indeed was recognizable.

The atrium with its pink coloured epithelium is not sub-divided and extend below to meet the duct of the bursa. This part appears in the series to be displaced to the left as a consequence of the imperfection or orientation in the cross-sections. This fusion is also marked by the thickness of the epithelium and the circular muscles. The duct forms a perfect arc, on the top of it adjoining the two very slender oviducts, and is surrounded by the glands of egg "shells". In the descending part is the duct of the bursa which is very small and it is very difficult to distinguish the epithelium in its wall. It is covered by layers of longitudinal and circular muscles. Above the penis it joins the small round bursa. This has a very thick epithelium and containing the rest of the spermatophore.

One animal-slightly curved on the both ends by fixation extends to 6mm. length, the pharynx being 1.5mm and the mouth 4m(from station FC 18a, river in the Gartmore-Estate, near Maskeliya). The genital ducts are small, but with many well developed testicles. Only the ovary was not so well developed just like in the animal from Veli-Oya (FC 26). The genital ducts appear to the juvenile with nearly no layers of muscles and a small conelike penis. To the vesicle follow a ductus ejaculatorius. This is not perforate, but shows already the characteristic tinge and limitation on the ventra side. The well developed duct of the bursa arise below it but, it is only a small tube, which lie near the sheath of the pharyns. Neither the oviducts nor glands of egg-"shells" are developed in this animal.

Lastly specimen from FC 24 (Belihul-Oya, an affluent of Walawe-Ganga) was studied. The size is 6mm × 2mm and the mouth 4mm. The sexual apparatus 5mm shows nearly mature in sections but they are not well formed: an oval and spacious vesicula still follow from an eosinophil ductus ejaculatorius in a papilla, which is not separated. This appears to be pressed against the ventral side of the male atrium, which is on the contrary spacious on the dorsal side. It is in communication by a narrow duct with the general atrium below. It opens by a pore, while the duct of the bursa comes from the dorsal side.

The oviducts and glands are absent or very difficult to be distinguished. The epithelium of the atrium is pink coloured. In this animal too the testicles cannot be recognized.

The cross-sections of a second specimen from station FC 18 (Gartmore-River, Maskeliya) and a specimen from the station FC 9 (Bodathpitiya-Ela near Ratnapura) does not show mature genitals. The second animal shows again the accumulation of basophil glands, opening on the ventral side above the pharynx. These glands are to be found in all the examined animals.

From an ethological point of view it is able to point out from this study that, the period of sexual reproduction for *Dugesia nannophallus* living in the mountain regions of South-Ceylon does not occur during the months of November and December. The animal collected during this time by the mission showed only feebly developed genitals. Also remarkable is the absence or the feeble development of the testicles in such individuals where sperms or genital ducts are to be found. It is to be believed that the regression of the testicles is very rapid. And it could be asked whether like in other Planarians—an asexual type of reproduction alternates with the sexual reproduction in these animals? But I have found in the samples only a few animals of very small size and in a state of regeneration so that it looks very accidental.

It is still very difficult to define the group of *Dugesia* type *gonocephala*. The referring of an isolated animal to any asiatic species, revised by BALL, 1970, is very uncertain. They form (after BALL 1970), a polytypic group, containing those, which possess adenodactyles or other special glands. DAHM 1971 arrived at similar conclusions for the african species of *Dugesia*, which are very closely

related. The length of the penis, the form of the vesicula, grade of separation of the atrium, exact diversion of the oviducts, local development of the muscle-layers etc., are very variable after age and the functionary statu.

The examined animals are very similar to the species described by BALL 1970 and are also related to *Dugesia indica* KAWAKATSU 1969. But additional genetic and caryological experiments, like the studies of BENAZZI and his school, are necessary for the confirmation of the anatomical reports.

SUMMARY

Dugesia nannophallus BALL 1970: is reported from 23 stations in current waters in the mountains of South-Ceylon. Some anatomical and histological data from cross-sections are given and the systematic position of the species is discussed.

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