

STUDIES ON THE GENUS *Ganeo* Klein, 1905 (TREMATODA · LECITHODENDRIIDAE)

by

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(With 2 Text-figures)

Klein (1905) proposed the genus *Ganeo* with *G. glottoides* as the type species obtained from a frog, *Rana hexadactyla* from Tamil Nadu, India. He tentatively placed this genus under subfamily Pleurogenetinae Looss (1899). Odhner (1911) discussed its systematic position and assigned this genus to the subfamily Pleurogenetinae of the family Lecithodendriidae. Since the description of *G. glottoides* by Klein, *G. glottoides* var. *africana* Skrjabin (1922), *G. tigrinum* Mehra & Negi (1928), *G. glottoides* var. *madrasensis* Mehra & Negi (1928), *G. gastricus* Srivastava (1933), *G. attenuatum* Srivastava (1933), *G. korkei* Bhalerao (1936), *G. kumaonensis* Pande (1937), *G. lingnanensis* Li (1938), *G. srinagarensis* Kaw (1950), *G. gobindiu* Dayal & Gupta (1953), *G. panjabensis* Gupta, N. K. (1954), *G. bufonis* Fotedar (1959) and *G. gazipurensis* Pandey & Chakrabarti (1968) have been added to the genus *Ganeo*. Some workers have also extended the distribution of certain species.

MATERIAL AND METHOD

This paper is based on the study of 15 specimens of *G. kumaonensis* and 21 specimens of *G. tigrinum* collected by the author from Jaisalmer and Jodhpur districts of Rajasthan. In addition 4 examples of *Ganeo kumaonensis* and 14 of *G. tigrinum* present in the earlier collection of the Zoological Survey of India and 17 specimens of *G. tigrinum* in the collection of Dr. G. S. Thapar, acquired by the Survey, were also examined.

Genus *Ganeo* Klein, 1905

1905. *Ganeo* Klein, *Zool. Jahrb. Syst.*, 22 : 57-79, pl. 41, fig. 505.

In differentiating the species of the genus *Ganeo* various authors have used different characters. Some workers have considered certain characters as variations rather than of any specific value. A short resume of earlier workers follows.

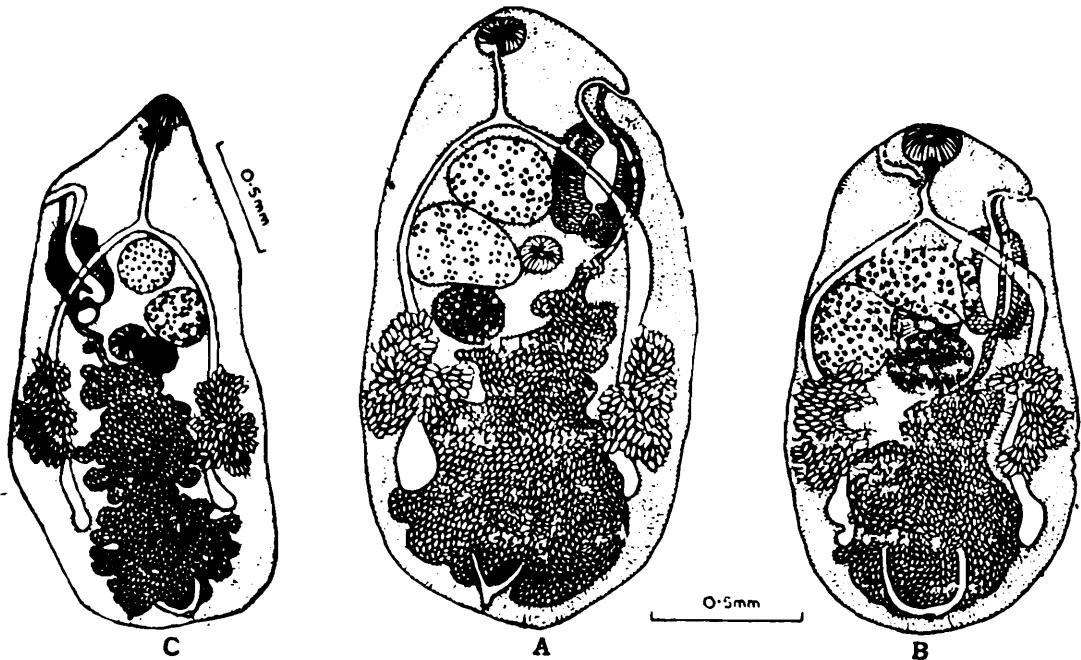
Skrjabin (1922) does not consider the extension of intestinal caeca of any specific value. Mehra and Negi (1928) do not consider the difference in the position of gonads of any importance because of the variations in the arrangement of gonads in *G. glottoides* var. *madrassensis* and *G. glottoides* var. *africana*. According to Mehra and Negi (1928) the shape of seminal vesicle is variable depending on the contents and condition at the time of preservation. According to Fotedar (1959) twisting of seminal vesicle brings about different shapes even among the members of the same species. Fotedar has recorded presence of metaterm in *G. tigrinum* although no mention of this structure was made by Mehra and Negi (1928), further he also agrees with Mehra and Negi in not assigning any value to slight variations in the position gonads.

A careful study of the shape of excretory vesicle in various species of *Ganeo* has revealed valuable information. Earlier workers have described it as 'U', 'V' and 'Y' shaped but a close scrutiny of this structure shows a remarkable resemblance. It is found in all cases to be 'Y' shaped, having either a very short (sometimes almost negligible) or slightly to fairly long median stem. In species having a broad posterior end, showing maximum contraction, the excretory vesicle is reported as 'U' shaped, e.g. *G. gastricus* and *G. linganensis*. In specimens with moderate stage of extension the excretory vesicle is variously described 'U', 'V' and 'Y' shaped with or without a median stem—'U' shaped in *G. tigrinum*, *G. panjabensis*, *G. kumaonensis* and *G. srinagarensis*; 'V' shaped in *G. korkei* and *G. gobindia* and 'Y' shaped in *G. attenuatum*.

Some species of the genus *Ganeo* have been distinguished on the basis of position and distribution of vitellaria in relation to gonads, ventral sucker and termini of intestinal caeca. Views of Mehra and Negi (1928) and Fotedar (1959) have been stated above for not giving importance to slight variations in the position of gonads. Similarly these species should not be differentiated on the basis of distribution of vitellaria in relation to gonads and the ventral sucker. It is observed that distribution of vitelline follicles in relation to body length provides a fairly stable character.

Text-fig. 1 A-C shows some of the variations occurring in *G. tigrinum* obtained from *Rana cyanophlyctis* from Jaisalmer and Jodhpur districts of Rajasthan in India. In two specimens (Text-fig. 1A and B) the testes are apposed to each other and in the third specimen (Text-fig. 1C) they are separately situated. The ovary is occupying a position clearly behind the ventral sucker and the posterior testis in one specimen (Text-fig. 1A), where as it is partly in level with the posterior testis and the ventral sucker in other two specimens. The excretory vesicle is showing all the three types of 'U', 'V' and 'Y' shaped structures.

Here relative size of oral and ventral suckers, position of gonads in relation to the ventral sucker, laterality of testes and extension of vitelline foellcles in relation to body length have been utilized as stable characters for differentiating species of the genus *Ganeo*.



Text-fig. 1. A-C. Mature specimens of *Ganeo tigrinum* showing variations of different characters.

1. *Ganeo tigrinum* Mehra & Negi, 1928

1928. *Ganeo tigrinum* Mehra & Negi, *Allahabad Univ. Stud.*, 4 : 66-80.

1926. *Ganeo glottoides*, Bhalerao, *Parasitology*, 18 : 154-159.

New synonyms

1933. *Ganeo attenuatum* Srivastava, *Bull. Acad. Sci. U. P.*, 3 : 103-108.

1938. *Ganeo linganensis* Li, *Lingnan Sci. J.*, 17 : 221-223.

1953. *Ganeo gobindia* Dayal & Gupta, *Thapar Comm. Vol.* : 63-68.

1954. *Ganeo panjabensis* Gupta, N. K., *Res. Bull. Punjab Univ.*, No. 55 : 125-129.

1959. *Ganeo bufonis* Fotedar, *J. Helminth.*, 33 : 151-160.

Srivastava (1933) differentiated *G. attenuatum* from *G. tigrinum* on the basis of attenuated shape of body, position, shape and size of suckers, shape of receptaculum seminis, shape of vesicula seminalis length of vitellaria, presence of metraterm and configuration of uterine coils. The omission of metraterm in the description by Mehra and Negi (1928) should not be treated as a positive statement about its absence in *G. tigrinum*. Further, *Ganeo bufonis*, *G. panjabensis* and *G. lingnanensis* which will be discussed below and are treated synonyms of *G. tigrinum*, give an indication about presence of metraterm. A few specimens in Dr. G. S. Thapar's collection, obtained from the gut of *Rana cyanophlyctis* at Lucknow and identified by this author as *G. tigrinum*, show presence of metraterm. The receptaculum seminis is flask shaped both in *G. tigrinum* and *G. attenuatum*. As mentioned above, Mehra

and Negi (1928) consider shape of vesicula seminalis as a variable character. The vitellaria occupy 1/5th instead of 1/4th of body length as reported by Mehra & Negi in case of *G. tigrinum*. The extended condition of the specimen described by Srivastava appears to have resulted in the characteristic shape and configuration of uterine ccils. The ventral sucker is larger than the oral sucker, although not in the ratio of exactly 3:2 as in the case of *G. tigrinum*. In view of the similarities between the two species it will be better to treat *G. attenuatum* as synonym of *G. tigrinum*.

Li (1938) differentiated *G. lingnanensis* from *G. tigrinum* on the basis of presence of metraterm, shape of pars prostatica and position of anterior testis. The presence of metraterm in *G. tigrinum* has been mentioned while dealing with *G. attenuatum*. The remaining characters are not sufficient to distinguish *G. lingnanensis* from *G. tigrinum*. Fotedar (1959) has also inferred similarly.

Dayal and Gupta (1953) distinguished *Ganeo gobindia* on the basis of differences in the structure of the excretory vesicle which is stated to be 'V' shaped in *G. gobindia* and 'U' shaped (actually 'Y' shaped) in *G. tigrinum*. The occurrence of *G. gobindia* in *Wallago attu* (Bloch), a piscine host appears to be accidental since the hitherto known other species are from amphibian host with the exception of another case when Simha (1958) has reported occurrence of *G. tigrinum* from the intestine of *Chamaeleon zeylanicus*. The difference in the shape of excretory vesicle could be explained by the observations made above. Of the ten specimens studied by Dayal and Gupta, only one is mature but its stunted growth is apparent from the extremely small number of ova in the uterus. The stunted growth due to accidental nature of infection is a common phenomenon. One specimen (Z.S.I. registration number W 4165/1) collected from a toad, closely resembles *G. gobindia* but differs from it in the shape of testes and vesicula seminalis. Therefore on the basis of other resemblances between the two species, *G. gobindia* should be treated as a synonym of *G. tigrinum*.

Ganeo panjabensis Gupta, (N. K.) 1954 has 'U' shaped excretory vesicle with a median stem, vitelline follicles extending to caecal termini and occupying the third quarter of body length, covering less than 1/4th of the body length and intestinal caeca extending behind the vitellaria. The 'U' shaped excretory vesicle with a median stem—basically 'Y' shaped, has been described by Mehra and Negi in case of *G. tigrinum*. Singh (1954) has recorded the variation of caeca not extending behind vitellaria in case of *G. kumaonensis*. The vitelline follicles in *G. panjabensis* show a range of distribution resembling that of *G. tigrinum*. *Ganeo panjabensis* so closely resembles *G. tigrinum* in having oral sucker smaller than the ventral, absence of pseudocirrus sac, position of genital

opening, arrangement of gonads and their position in relation to the ventral sucker and vitelline follicles commencing behind the ovary, that it will be desirable to treat *G. panjabensis* as a synonym of *G. tigrinum*.

Ganeo bufonis Fotedar (1959) is based on a single specimen. It is distinguished from other species on the basis of both the vitellaria being situated on left side of body. Fotedar (1959) has cited a number of examples to justify creation of this species. Ciurea (1933) has reported atrophy of both the testes and vitellarium of the left side in case of *Metagonimus yokogawai*. A similar case with vitellaria on one side has been reported by Kaw (1950) in case of *Ganeo* sp. Dawes (1946) has stressed that such abnormalities should not be treated as of any systematic value. Since *G. bufonis* resembles *G. tigrinum* in other characters, it is considered as a synonym of the latter species.

2. *Ganeo korkei* Bhalerao, 1936

1936. *Ganeo korkei* Bhalerao, *J. Helminth.*, 14 : 208-211.

Bhalerao (1936) has described vitelline follicles arranged in five groups on the left side and seven groups on the right side. Mehra and Negi (1928) have stated in case of *G. tigrinum* that the vitellaria are not arranged in groups. No other species of this genus has vitelline follicles arranged in groups. It is felt that Bhalerao (1936) has possibly made an erroneous statement about grouped arrangement of vitelline follicles. Also the position of ventral sucker has not been shown by Bhalerao (1936) in the figure for *G. korkei*.

3. *Ganeo kumaonensis* Pande, 1937

1937. *Ganeo kumaonensis* Pande, *Proc. Indian Acad. Sci.*, B, 6 : 109-120.

1950. *Ganeo* sp. Kaw, *Indian J. Helminth.*, 2 : 91, 92.

New synonyms

1959. *Ganeo tigrinum*, Fotedar, *J. Helminth.*, 33 : 151-160.

1968. *Ganeo gazipurensis* Pandey and Chakrabarti, *Sci. & Cult.*, 34 : 218, 219.

The distribution of vitelline follicles in *G. kumaonensis*, being about 1/3rd in relation to body length, is most extensive. In *Ganeo korkei* they occupy slightly less than 1/3rd of body length. The excretory vesicle has a median stem in both the species but it is described as 'U' shaped in *G. kumaonensis* and 'V' shaped in *G. korkei*. These two species resemble each other so closely in the extension of intestinal caeca, arrangement of testes, position of ovary, the basic 'Y' shaped excretory vesicle and ventral sucker being larger than the oral sucker that slight difference in the distribution of vitelline follicles may not be sufficient to distinguish *G. kumaonensis* and *G. korkei*. A study of the life history of these parasites may further elucidate this point. However, the two species are tentatively treated here distinct from each other.

Singh (1954) has reported occurrence of *G. kumaonensis* from Lucknow (U.P.). These forms show certain interesting variations of caeca not extending behind vitelline follicles, size of testes and ovary, absence of spines from the metraterm. However, Singh's form resembles *G. korkei* in the distribution of vitellaria compared to body length.

Fotedar (1959) has reported the occurrence of *G. tigrinum* from *Bufo viridis* in Kashmir. This form resembles *G. kumaonensis* of Singh (1954). Fotedar's material show the extension of vitelline follicles to approximately 1/3 rd of body length whereas it is 1/5th in *G. tigrinum*. These specimens support the similarity between *G. korkei* and *G. kumaonensis* as mentioned above. It is helpful to consider this point in view of the occurrence of *G. kumaonensis* in Kashmir reported by Kaw (1950), who has observed variations in the shape of body, size of testes, ovary, vitellaria and excretory vesicle.

Ganeo gazipurensis Pandey and Chakrabarti (1968) has been distinguished by its authors from *G. bufonis* which has been shown above as a synonym of *G. tigrinum*. Similarly *G. gazipurensis* is to be treated as a synonym of *G. kumaonensis* due to their similarity in the extension of vitelline follicles, location and arrangement of gonads and length of intestinal caeca. Kaw (1950) had similarly treated *Ganeo* sp. in considering the location of vitellaria on one side only as an aberration.

In view of the synonymies of *G. tigrinum* indicated above, the emended diagnosis of this species is given below.

Emended diagnosis of *Ganeo tigrinum* Mehra & Negi : Body, 0.9—3.7 mm. in length and 0.53—1.63 mm. in width, is highly contractile. Cuticle spinose. Suckers nearly spherical or slightly transversely elongated. Oral sucker smaller than the ventral sucker. Prepharynx very small. Intestinal caeca extending 3/4th to 4/5th of body length in mature specimens and about 5/6th in immature specimens. They may or may not extend behind the vitelline follicles. Sometimes caecum of one side may be slightly longer than the other. Gonads very closely situated; their position greatly variable in relation to one another. Testes obliquely situated and ovary is post-testicular. Vesicula seminalis variously coiled. Uterus intercaecal and post acetabular, metraterm present. Vitellaria occupying middle portion of body, covering 1/5th to 1/4th body length. Excretory vesicle 'Y' shaped, capable of changing with contraction or extension of body.

Key to the species of the genus *Ganeo*

- | | |
|--|--------------------|
| 1. Pseudocirrus sac present | 2 |
| Pseudocirrus sac absent | 4 |
| 2. Ventral sucker smaller than oral sucker | 3 |
| Ventral sucker equal to oral sucker | <i>G. africana</i> |

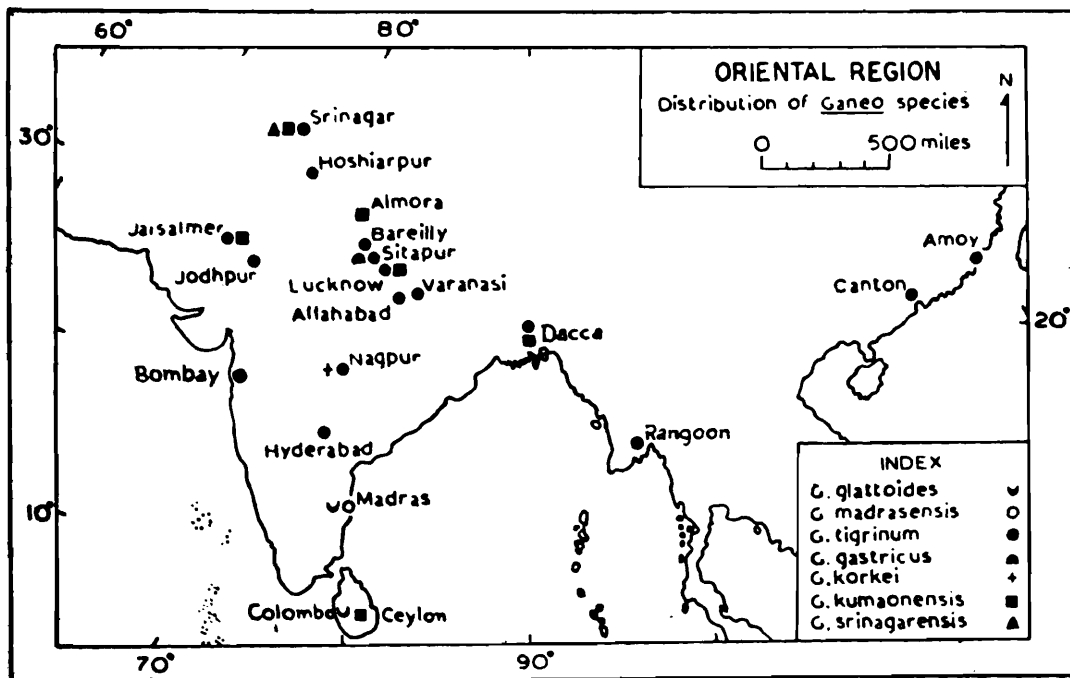
Key to the species of the genus *Ganeo* (cont.)

- | | |
|--|-------------------------|
| 3. Gonads entirely behind the ventral sucker,
and arranged in a triangular fashion. | <i>G. madrasensis</i> |
| Gonads arranged in linear fashion,
extending from pre to post acetabular
region | <i>G. glottoides</i> |
| 4. Testes one on each side | 5 |
| Testes obliquely situated | 6 |
| 5. Testes almost preacetabular, ovary behind the right testis | <i>G. gastricus</i> |
| Testes almost postacetabular, ovary between the testes | <i>G. srinagarensis</i> |
| 6. Vitellaria covering 1/5th to 1/4th of body length | <i>G. tigrinum</i> |
| Vitellaria covering nearly 1/3rd of body length | 7 |
| 7. Vitellaria occupying 1/3rd of body length | <i>G. kumaonensis</i> |
| Vitellaria occupying less than 1/3rd of body length | <i>G. korkei</i> |

Host and Geographical distribution of the genus *Ganeo*.

Almost all the species are parasites of frogs (*Rana*: Ranidae). In a few cases they have been reported from toads (*Bufo* : Bufonidae). *Ganeo tigrinum* has been recorded once from a piscine host, *Wallago attu* and on another occasion from a reptilian host, *Chamaeleon zeylanicus*.

Geographically the genus *Ganeo* is known practically from the Oriental Region (Text-fig. 2) with the exception of *G. africana* and *G. glottoides* occurring in Africa (Ehtiopian Region). The report of *G.*



Text-fig. 2. Map showing geographical distribution of *Ganeo* spp. in Oriental Region.

glottoides from Athieme (Dahomey) on the south western coast of Africa is interesting as this species is known from Tamil Nadu (southern India) and Sri Lanka. *Ganeo tigrinum* is the most widely distributed species occurring from eastern to the western limits of the Oriental Region.

SUMMARY

Ganeo glottoides of Bhalerao (1926), *G. attenuatum* Srivastava (1933), *G. lingnanensis* Li (1938), *G. gobindia* Dayal & Gupta. (1953), *G. panjabensis* Gupta (1954) and *G. bufonis* Fotedar (1959) have been considered synonyms of *G. tigrinum* Mehra & Negi, 1928.

Emended diagnosis of *G. tigrinum* has been furnished.

Certain discrepancies in the description of *G. korkei* Bhalerao, 1926 have been pointed out.

Probability of synonymy between *G. korkei* and *G. kumaonensis* has been hinted.

Ganeo tigrinum of Fotedar (1959) and *G. gazipurensis* Pandey & Chakrabarti (1968) have been assigned to *G. kumaonensis*.

Host and Geographical distribution of the genus *Ganeo* have been studied.

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