Communicationes Breves

Once more: the oesophageal gland nuclei in the dorylaimoid nematodes

By

I. ANDRÁSSY*

Abstract. The significance of the oesophageal gland nuclei in morphological characterization of dorylaimoid nematodes is underlined. Maintaining the principles of Loof and Coomans (1970), a modified method and graphic diagrams are proposed in order to express and illustrate the arrangement of the nuclei.

In a fundamental paper on the oesophageal gland nuclei in the Dorylaimina, Loof and Coomans (1970) called attention to the importance of these nuclei in morphology and systematization. As they demonstrated with numerous examples, the location of the nuclei – their arrangement in the cylindrus and percentile position as compared to each other – is fairly constant within each species and, therefore, it may be considered good morphological character for both species and genera, or occasionally even for families.

In one of my recent publications (1998), I also tried to emphasize the significance of the oesophageal gland nuclei in the Dorylaimina. On this occasion, the subject shall be surveyed once more.

As it is known, there are embedded salivary or digestive glands in the oesophageal tissues of the dorylaimoid nematodes which pour their secretion into the the lumen of the oesophagus. These glands are always located in the posterior widened section of the oesophagus, the so-called cylindrus. They are five in number, but one or the other of them may occasionally be reduced. These glands are unicellular and have large, in most cases well discernible nuclei; owing to their definite figure and refraction they differ from the surrounding tissues. Often they can be seen also under low magnifying, sometimes, particularly in small animals, a higher magnification (immersion) is necessary to recognize them. The nuclei are generally round (better: globular), occasionally oblong, the „court" or „halo" around them is mostly oval, rarely round.

The nuclei are located not accidentally but in certain formula in the cylindrus. One of the five nuclei is unpaired, the other ones are more or less arranged in two pairs. The anteriormost nucleus stands alone and lies dorsal; it is generally the largest, either globular or oblong. This dorsal nucleus is located near the anterior end of the cylindrus and it is practically always present and conspicuous. It can be marked with a D (dorsal nucleus). The other four nuclei lie posterior to this D; their position is subventral or ventrosublateral. They are in almost every case distinctly smaller than the dorsal nucleus. The members of the first/anterior subventral pair can seldom be found close to one another, usually they lie at

*Dr. István Andrássy, ELTE Állatrendszertani és Ökológiai Tanszék, MTA Zootaxonómiai Kutatócsoport (Department of Systematic Zoology and Ecology of the Eötvös Loránd University, Zootaxonomy Research Group of the Hungarian Academy of Sciences), 1088 Budapest, Puskin u. 3, Hungary.

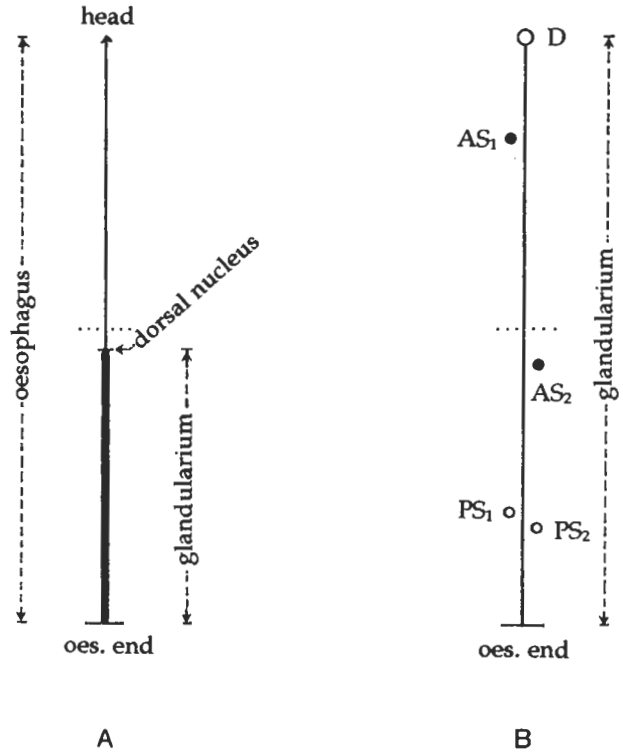

Fig. 1. A–B: A graphic method to illustrate the position of the oesophageal gland nuclei. A: Length of the glandularium (the posterior thicker section) in percentage of the total oesophagus length measured from head to posterior end of cylindrus. Beginning of the glandularium = location of the dorsal nucleus. B: Position of the subventral nuclei within the glandularium, in percentage of the length from dorsal nucleus to posterior end of cylindrus (• AS nuclei, o PS nuclei). Dotted lines indicate the middle (50 %) of both lengths

different levels, not rarely rather far from one another. Thus, it may happen that one nucleus of the first pair lies closer to the dorsal nucleus than to its partner. In general, these nuclei are embedded in the middle region of the cylindrus, their concrete location varies however from species to species. They are symbolized as AS_1 (anterior subventral nucleus, *first*) and AS_2 (anterior subventral nucleus, *second*). It is common that AS_1 is smaller than AS_2, sometimes even invisible. AS_1 is generally globular, AS_2 either globular or ovoid. The second/posterior subventral pair lies in the posterior third or fourth of cylindrus. These nuclei are equal in size and shape, predominantly globular, distinct, and actually arranged in twos lying at the same level or nearly so. They may be symbolized as PS_1 (posterior subventral nucleus, *first*) and PS_2 (posterior subventral nucleus, *second*).

The juices of the glands flow through small canals into the oesophageal lumen. These canals are very fine and not or hardly discernible owing to the heavily striated-vesiculated structure of the oesophageal musculature. Their orifice is often conspicuous, but these minute apertures are mostly much less visible than the nuclei themselves. The orifice of the dorsal gland generally lies anterior to the nucleus, those of the other four glands can be found in the close vicinity of the corresponding nucleus.

Unfortunately, the authors dealing with dorylaims often do not pay attention properly to the oesophageal nuclei. True enough, the recognition of the nuclei and thus the definition of their exact position needs an accurate work, good eyes and, first of all, excellently fixed and well preserved animals. As for me, I have also taken these nuclei only for the late times into extra account. In the course of serious new observations, I have definitely been convinced of the importance of these nuclei in morphological characterization of dorylaimoid nematodes. I found that these small organella can frequently be recognized also in 20–30–40 years old nematode specimens.

Nowadays, the science of nematology, especially the taxonomic branch of it, is under heavy parturition. On the one hand, numerous new nematode species are being described and several new genera established. On the other hand, known species are being either synonymized or scattered in diverse genera, and old genera fused or, on the contrary, splitted. It happens that these taxonomic or nomenclatorial transactions or „non-appealable-verdicts" are merely based on subjective (maybe even not quite competent) opinions. Well, in order to reduce subjectivity in taxonomic operations as far as possible, the oesophageal gland nuclei, even if they can not solve every problem, but they may lend a true „helping hand" in morphological-taxonomical valuation of species and genera in Dorylaimina. The position, we may say „map" or pattern of the oesophagus nuclei, if precisely stated, is an absolutely concrete character, it is out of any subjectivity. However, one thing is very important: the location of the nuclei must not be given but as a result of quite precise measurements only! Should someone be not completely sure in the position of one or the other nucleus, then to say nothing is much better than to give some unprecise information.

Loof and Coomans (1970) gave diagrams or representation in order to express the position of the gland nuclei. Keeping the principles, I suggested most recently (1998) a somewhat modified method for representing the nuclei. While the two authors gave the position of all the five gland nuclei as percentage of the total oesophagus length (from head to posterior end of oesophagus), I proposed only the dorsal nucleus to be determined as a percentage of this length, the other four nuclei, however, should be localized as a percentage of the distance from the dorsal nucleus to the posterior end of cylindrus. The dorsal nucleus is big enough to be recognized even under low magnification and its position is easily specified in relation to the entire length of oesophagus. The position of the subventral nuclei is however very characteristic just within the cylindrus and much more advisable to be expressed in percentile relations to each other or to the dorsal nucleus than in relation of the total oesophagus length. (Percentage values of the subventral nuclei are unadvisable to be given in the length of cylindrus since in determining this distance certain subjectivity may occur: the anterior end of the cylindrus is namely difficult to determine accurately.)

Modified diagrams shall also be proposed to make the position of the nuclei graphic. They are easy to perceive as illustrated in Fig. 1. This diagram of each nematode specimen consists of two elements (columns): the one (the left hand column; Fig. 1 A) shows the length of the glandularium in percentage of the total oesophagus length, the other (the right hand column; Fig. 1 B) illustrates the location of the nuclei within this glandularium. As seen, a new technical term, *glandularium*, is suggested (from the Latin, *glandula* = gland, *glandularium* = a holder or receptacle for glands, or so). It expresses in a single word the distance between dorsal nucleus and posterior margin of cylindrus, or in other way, glandularium is that part of the oesophagus, more closely: of the cylindrus, that comprises the whole glandular apparatus. The anterior end of the glandularium coincides with the dorsal nucleus, thus, it indicates the exact position of that. The dotted lines in the diagram indicate the middle (50 %) of both the oesophagus length and glandularium, and they help in conceiving the arrangement of the nuclei.

Summing up, on the basis of older and newer observations the conclusion can be drawn that each species (and probably genus as well) of dorylaimoid nematodes has its own special

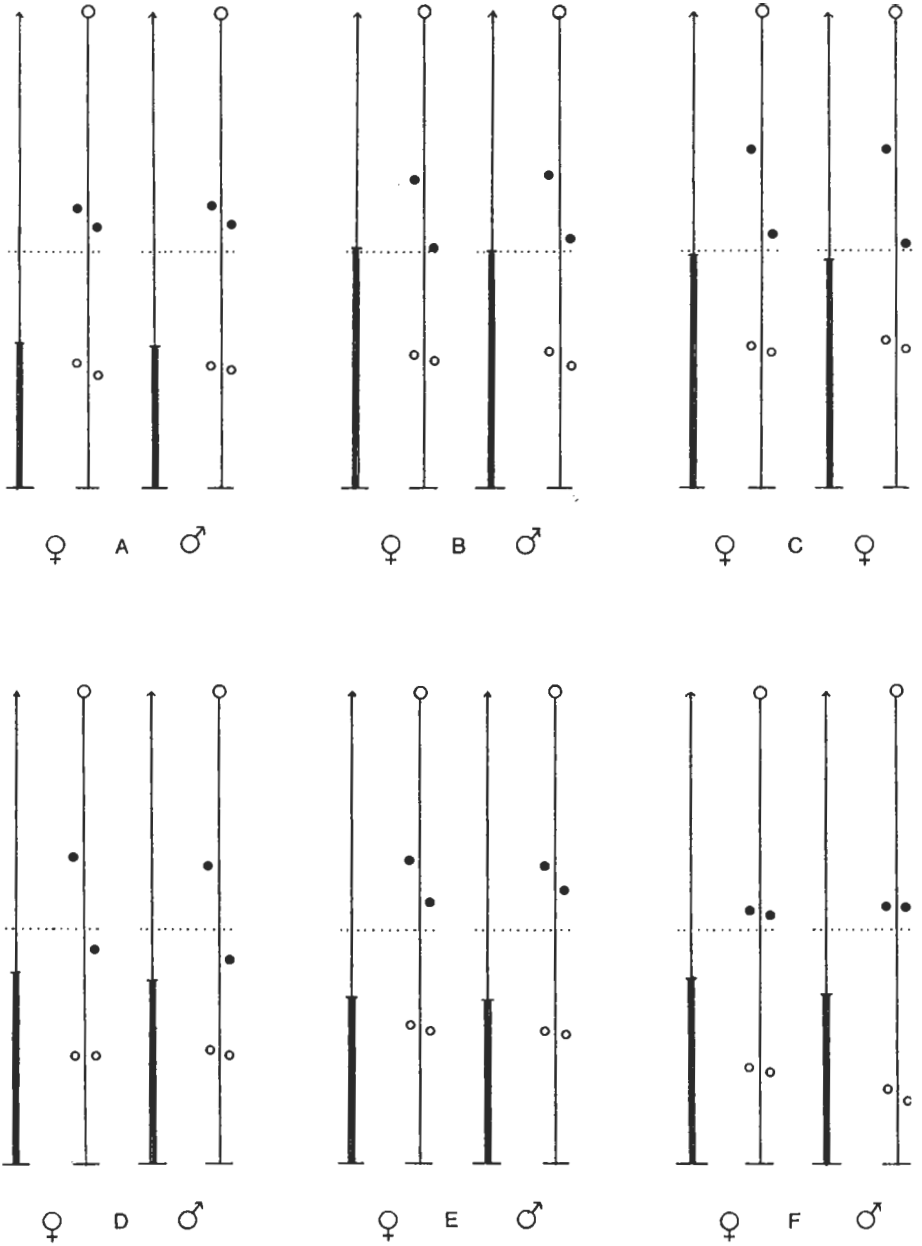

Fig. 2. A–F. Position of oesophageal gland nuclei in some species of Dorylaimina. A: Thorniidae: *Nygolaimoides borborophilus* (de Man, 1876), a female and a male from Hungary. B: Dorylaimidae: *Dorylaimus fodori* Andrássy, 1988, a female and a male from India. C: Dorylaimidae: *Laimydorus prolificus* (Thorne & Swanger, 1936), two females from Slovakia. D: Dorylaimidae: *Mesodorylaimus plicatus* Andrássy, 1986, a female and a male from Ecuador. E: Qudsianematidae: *Allodorylaimus septentrionalis* (Kreis, 1963), a female and a male from Hungary. F: Qudsianematidae: *Eudorylaimus acuticauda* (de Man, 1880), a female and a male from Poland

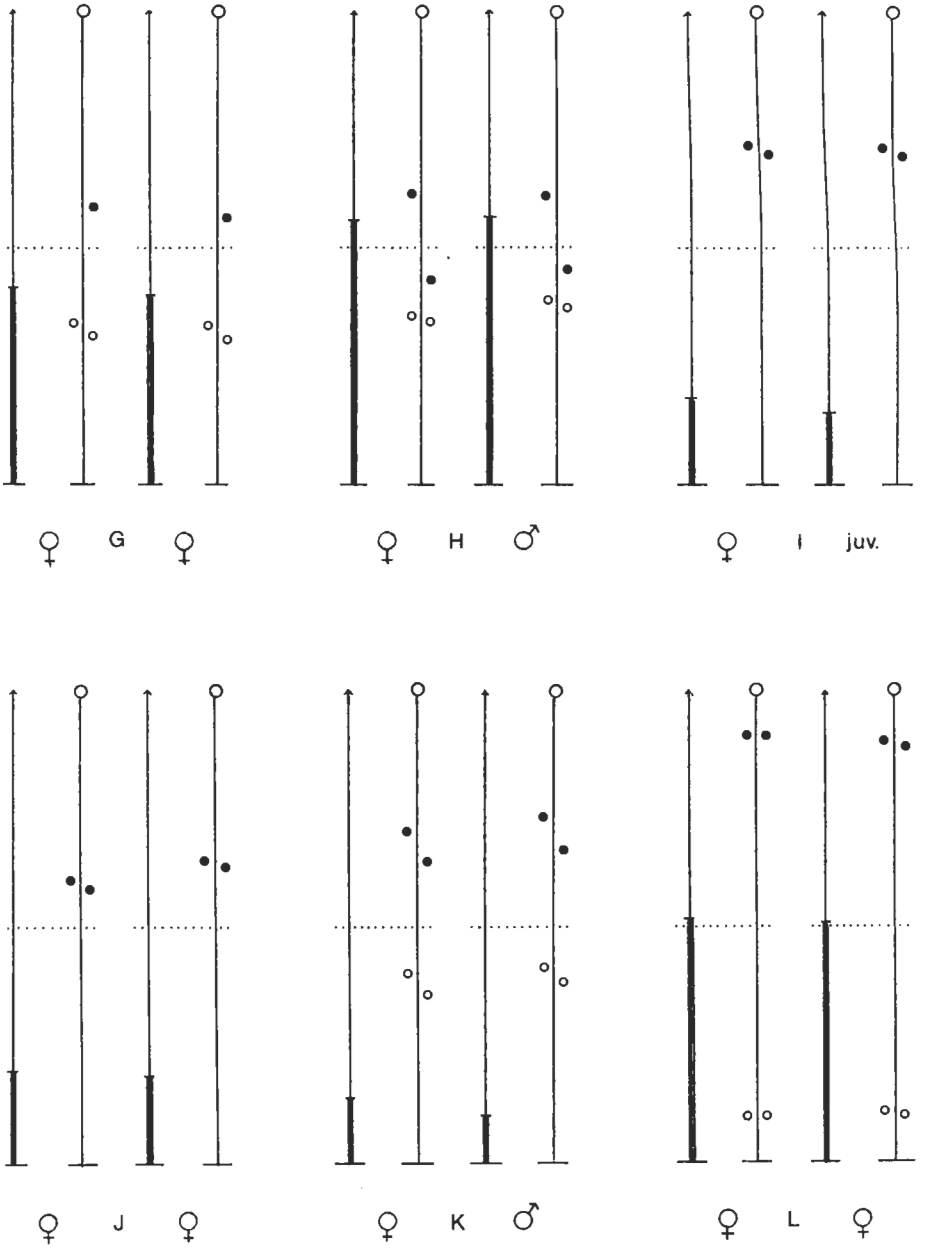

Fig. 2. G–L. Position of oesophageal gland nuclei in some species of Dorylaimina. G: Qudsianematidae: *Boreolaimus borealis* Andrássy, 1998, two females from Norway. H: Aporcelaimidae: *Aporcelaimus declinatoaculeatus* (Kreis, 1924), a female and a male from Hungary. I: Longidoridae: *Paralongidorus rex* Andrássy, 1986, a female and a juvenile from Hungary. J: Longidoridae *Xiphinema index* Thorne & Allen, 1950, two females from France. K: Tylencholaimellidae: *Tylencholaimellus neotropicus* Andrássy, 1997, a female and a male from Ecuador. L: Nygolaimidae: *Clavicaudoides trophurus* (Heyns, 1968), two females from South Africa

nuclear arrangement in the oesophageal cylindrus. In Figs. 2 A–F and 2 G–L, some examples are given in order to illustrate how multifarious the „map" of oesophageal nuclei can be in Dorylaimina, as well as to help in comprehending and using the method proposed. After a short practice, it is easy to characterize and compare dorylaimoid nematode species on the basis of their glandularium.

REFERENCES

1. ANDRÁSSY, I. (1998): The genus Boreolaimus gen. n. and its six species (Dorylaimida: Qudsianematidae), nematodes from the European Arctic. – Fundam. Appl. Nematol., 21: 553–567.
2. LOOF, P. A. A. & COOMANS, A. (1970): On the development and location of the oesophageal gland nuclei in the Dorylaimina. – Proc. IXth Intern. Nematol. Symposium. Warsaw, 1967: 79–161.

Percentile values of oesophageal gland nuclei in some species of Dorylaimina illustrated in Figs. 2 A–F and 2 G–L

Nygolaimoides borborophilus

D = 69–70%	AS_1 = 40–42%
	AS_2 = 44–45%
	PS_1 = 73–74%
K = 91–93%	PS_2 = 75–76%

Dorylaimus fodori

D = 49–50%	AS_1 = 34–35%
	AS_2 = 47–49%
	PS_1 = 71–72%
K = 71–72%	PS_2 = 73%

Laimydorus prolificus

D = 51–52%	AS_1 = 28%
	AS_2 = 47–48%
	PS_1 = 68–70%
K = 58–60%	PS_2 = 71%

Mesodorylaimus plicatus

D = 59–61%	AS_1 = 35–37%
	AS_2 = 54–56%
	PS_1 = 75–77%
K = 65–66%	PS_2 = 76–77%

Allodorylaimus septentrionalis

D = 63–65%	AS_1 = 35–37%
	AS_2 = 42–44%
	PS_1 = 70–71%
K = 83–84%	PS_2 = 71–72%

Eudorylaimus acuticauda

D = 60–63%	AS_1 = 45–46%
	AS_2 = 45–47%
	PS_1 = 79–83%
K = 98–100%	PS_2 = 80–86%

Boreolaimus borealis

D = 58–60%	AS_1 = lacking
	AS_2 = 42–44%
	PS_1 = 66–67%
K = no value	PS_2 = 68–69%

Aporcelaimus declinatoaculeatus

D = 43–44%	AS_1 = 38–39%
	AS_2 = 54–57%
	PS_1 = 72–74%
K = 68–70%	PS_2 = 73–75%

Paralongidorus rex

D = 82–84%	AS_1 = 28–29%
	AS_2 = 30–31%
	PS_1 = lacking
K = 93 %	PS_2 = lacking

Xiphinema index

D = 80–81%	AS_1 = 36–40%
	AS_2 = 37–42%
	PS_1 = lacking
K = 95–97 %	PS_2 = lacking

Tylencholaimellus neotropicus

D = 86–89%	AS_1 = 27–30%
	AS_2 = 33–36%
	PS_1 = 58–60%
K = 82–83%	PS_2 = 62–64%

Clavicaudoides trophurus

D = 48–49%	AS_1 = 10–11%
	AS_2 = 10–12%
	PS_1 = 88–90%
K = 92–100%	PS_2 = 89–90%

INDEX