Book Review

E. S. Turlygina & V. N. Chizhov. «The reproductive biology of plant parasitic nematodes.» Nauka, Moscow, 1991, 112 pp.

The book consists of 2 separate sections: 1) Vladimir N. Chizhov «Morphology of the female reproductive system of free-living and plant-parasitic nematodes» and 2) Elena S. Turlygina «The reproductive biology of plant-parasitic nematodes». The section written by V. Chizhov is a compendium on the comparative morphology of the female reproductive system of soil and plant parasitic nematodes. This summary is accompanied by a considerable amount of the author's personal data. The structure of the female reproductive system in the orders Enoplida, Mononchida, Dorylaimida, Chromodorida, Monhysterida, Araeolaimida, Rhabditida (including Diplogasteridae), Aphelenchida and Tylenchida is described in detail. A general review of the diversity and homologies in the different parts of the female genital system is presented. The largest amount of original data and interpretations are contained in the chapter on the morphology of the reproductive system of the order Tylenchida. The author considers the structure of the genital system of *Psilenchus* to be the most primitive in the order. The structure of the reproductive system in hexatylins - *Deladenus* and *Hexatylus* are also considered to be very primitive. An absence of a spermatheca in the latter is considered by the author as an ancestral character for the order Tylenchida, which corresponds to the same feature found in the primitive Rhabditidae. Thus, according to V. Chizhov the spermatheca has arisen in Tylenchida independently from the other Rhabditia-orders. The multi-cellular two-rowed arrangement of the post-ovarial mouth and the elongated uteri also are considered as primitive characters for the order. Differences of the genital systems of higher plant parasitic nematodes in the families Anguinidae, Heteroderidae, Meloidogynidae are reviewed in detail. The pre-uteral glands in higher plant nematodes are hypertrophied and the number of cellular rows is enlarged. In *Anguina, Heteroanguina, Cactodera, Globodera, Meloidoderita* a polycolumella develops and the number of cells and rows of cells increases. The uterine gland becomes more complex and differentiates in two sections. These developments favour an increase in egg production. The spermatheca of *Meloidogyne* functions as the shell gland. The author presents a diagram of the phylogenetic relationships within the order Tylenchida based on the morphology of the female reproductive system.

The author discusses the origin and evolution of the female genital system of Nematoda. The ovaries of the first nematodes were antidromous - i.e. were turned through a 180 degrees relative the oviduct axis. This structure was an effective locking device, which allowed only the last (mature) oocyte into the oviduct. Such ovaries are typical for many taxa of contemporary nematodes which have low fertility. Nematodes with homodromous ovaries have developed from these taxa. In these nematodes the ovary connects directly to the oviduct without reflexure. The straightening of the reproductive system promotes a rise in egg production and is correlated with increasing differentiation of oviduct sections involved in fecundity and egg shell formation. This differentiation takes place especially in the structure of the uterus and the pre-uteral gland. These processes are accompanied by a decrease in egg dimensions relative to the female body dimension. Another secondary transformation, which is general for Nematoda, is a reduction of one of the two branches of the reproductive system. This reduction has arisen independently in different taxa and favours an increase in the mobility of females.

Within Nematoda V. Chizhov distinguishes two lines of female reproductive system evolution. The

first, within the subclass Enoplia, is characterized by the single-row arrangement of cells of the postovarial opening. In this line there is an increase in the number of cells in the postovarial opening, an increase of the length of the latter, a displacement of the ovary-oviduct junction from the anterior one third to its posterior margin and increasing differentiation of the oviduct section take place. The second line of evolution, within the subclasses Chromadoria and Rhabditia, is characterized by the postovarial opening consisting of 2-3 rows of cells. In Chromadoria there are 3 rows of cells, in the subclass Rhabditia (orders Rhabditida and Tylenchida) there are 2 rows in the postovarial opening. The diversity of the reproductive system in the subclass Rhabditia is considered as being derived from the genital system of Plectidae (Chromadoria). The author traces the 2-rowed postovarial opening of Rhabditia from the postovarial opening of Plectidae, where cells are arranged without distinct rows. The spermatheca in Rhabditia is considered to be homologous with the widened part of the Plectidae oviduct, having the same 3-rowed arrangement of cells. Pre-uteral glands in Plectidae and Rhabditida are thought to be homologous. A diagram of the evolution of the female genital system (p. 55, fig. 19) coincides with the phylogeny of the class Nematoda proposed by Malakhov, 1986. Such detailed comparative morphological investigations represent a new generalized view on the diversity of the female genital system in Nematoda and its evolution.

The second section written by Elena S. Turlygina reviews the processes of reproduction in the life-cycles and the influence of the environmental factors on nematode fecundity. In the first chapter reproduction types are reviewed and the advantages of parthenogenesis over amphimixis are discussed. In the following chapters detailed reviews of copulation, fecundation and egg-deposition are given. Also, data on sex attractants and matricidial hatching are presented. The influence of different environmental factors on nematode fertility are reviewed as a potential means for nematode control. Information on the influence of the gas content, temperature, soil type, soil pH and the physiological state of the plant host are given. Original data from the author on the influence of the macroelements (N, P, K), microelements, and organic fertilizers (manures) on decreasing fecundity are of interest. E. Turlygina draws a conclusion that intensification of plant feeding leads to an increase of the stability to nematodes.

The comparative analysis of the fecundity of plant nematodes with that of animal parasites and free-living nematodes are of particular interest. Elena Turlugina draws a conclusion, that there are two maxima of fecundity within nematodes - in saprophagous rhabditids and in highly specialized plant parasites - Anguinidae and Heteroderidae. The highest fecundity of anguinids in comparison with Meloidogynidae and Heteroderidae is explained by the less protected position of anguinids galls, these being formed on the above-ground parts of plants. They therefore are more susceptible to the influence of unfavourable environmental factors. The author explains the relatively low fecundity of plant nematodes in comparison with animal parasites by the increase in their ability to find a host, by the long time which they spend with their hosts and by the relatively low-calorific food, which does not favour high fecundity (p. 74). This conclusion may be criticized from the general physiological principles. Fecundity is the total number of eggs produced by a single female during its life. High fecundity is conditional on the requirement of maximising the use of the host resources during the life of a single female. This condition is primarily affected by the low probability of the nematode finding a suitable host. Therefore, parasitic females of a specialized genetic line should have an increased fecundity. This can result from adaptation either to a narrow trophic specialization (anguinids, the majority of zooparasites) or to maximising the short time the food source is available (saprobionts).

The majority of animal parasites have a life cycle where the individual female produces many eggs but the resulting progeny have to find a new host. In contrast plant parasitic nematode females

individually produce many fewer progeny but these progeny may utilise the original host for their development. By the afore-mentioned reasons the reviewer does not share the conclusions on the problem of differences in fecundity between animal and plant parasites.

As a summary on the morphology and evolution of the reproductive system of plant parasitic nematodes and on the factors influencing nematode fecundity, the book is of interest to plant nematologists, soil zoologists, parasitologists and for specialists in the control of agricultural crop pests.

Alexander Ryss

V. G. Gagarin. «Free-living nematodes from fresh water of the USSR». Gidrometeoizdat, Sanct-Petersburg, 1992, 152 pp.

This book is the second part of the comprehensive work «Free-living nematodes from fresh water of the USSR», which was planned as an original key book for nonparasitic ring worms inhabiting different fresh water reservoirs. The first part contains the following orders: Monhysterida, Araeolaimida, Chromadorida, Enoplida, Mononchida. However, the publication of the first part has been delayed by the Publishing House of the Zoological Institute of the Russian Academy of Sciences.

The second part has appeared first and contains data on 100 species from the orders: Dorylaimida, Rhabditida, Diplogasterida, Tylenchida. The book begins with a systematic index of species. Most free-living species from these orders inhabit soil (often in humid condition), but they are also occasionally recorded from reservoirs together with typical hydrobionts. Only the most common species are included because of limited space. The morphological review is very short (detailed structures of nematodes are presented in the first part) and mostly devoted to dorylaimids and secernents. The systematic part or main part of this book contains the descriptions and figures of 100 species, 65 of them from Dorylaimida, 10 from Rhabditida, 14 from Diplagasterida and 11 from Tylenchida. Descriptions and figures of 51 species were made from original material whilst others were obtained from different sources. Data about interspecific morphological modifications of five species are listed. A diagnosis is presented for all the superspecific taxons up to class. Identification keys of families, genera and species are given.

Alexei Tchesunov