



*Tor Karling*

*This volume is dedicated to Tor Karling*

50 y  
A br

Jan  
Dep

Key

T  
ogy  
Tor  
with  
cent  
atic  
are  
symp

W  
biog  
but a  
pape  
unde  
thos  
And  
has t  
As y  
full a  
hono  
give

K  
retir  
Swe  
of yo  
is the  
is no  
Hels  
who  
mor

In  
turb  
situa  
Han  
abou  
livin

Hydr  
© Dr

## 50 years of turbellarian research

*A brief biography of Tor G. Karling*

Jan Hendelberg

*Dept. of Zoology, University of Göteborg, Box 25059, S-400 31 Göteborg, Sweden*

**Keywords:** Turbellaria, T. G. Karling, biography

This third international symposium on the biology of the Turbellaria is held in honour of Professor Tor G. Karling. He is a very experienced person within the field, having now worked for half a century with morphological, taxonomical, systematic and other problems of the Turbellaria, and we are happy to find him here, taking part in the symposium.

Who is Tor Karling? When I was asked to give a biography of him at this symposium I felt honoured, but also hesitant. Is it possible in a short symposium paper to account for scientific results published under more than 80 titles? Even if I restrict myself to those dealing with turbellarians, there are still 66. And Karling is not only important as a scientist – it has been said that he is just as important as a man. As you can understand, it is not possible to give a full account of why this symposium is given in his honour, but, hopefully, this brief biography will give some explanation.

Karling was born in Hangö, Finland, in 1909. He retired from the chair of invertebrate zoology at the Swedish Museum of Natural History in 1975. Some of you may think that his rich scientific production is the result of a straight academic career – but this is not so. However, it began at a university, in Helsinki, where he was a student of Alex. Luther, who introduced him into the field of turbellarian morphology and systematics.

In 1929 Karling started his field studies of turbellarians at the Tvärminne Zoological Station, situated on the south coast of Finland, not far from Hangö. He took an interest in the small forms, about 1 mm long or somewhat more, many of them living in the interstices between the sand grains of

the sea bottom. His first scientific paper, a report on *Bresslauilla relictæ*, a dalyellioid turbellarian, was published in 1930.

A turbellarian group to which Karling has devoted much of his interest is the Kalyptorhynchia, a group characterized by having a proboscis for capturing prey, an organ in the anterior end of the animal, separate from the mouth which is ventral. In 1931 Karling published his first descriptions of turbellarian species new to science, three new kalyptorhynchids. Already in this early paper we find some of the skill in making the drawings which characterizes his publications. We also find that the descriptions are based on thorough morphological and anatomical studies which make them valuable not only as descriptions of species, but also as a basis for studying relationships of the Turbellaria as a whole and the evolution of the group.

In 1934 Karling was awarded a stipendium which enabled him to collect turbellarians at Herdla, on the west coast of Norway. In 1936 he worked for a period at the Swedish Museum of Natural History, in Stockholm. Here he met two other turbellarian scientists, Sixten Bock and Einar Westblad.

Karling wrote his thesis 'Zur Morphologie und Systematik der Alloecoela Cumulata und Rhabdocoela Lecithophora (Turbellaria)' before the war. It was printed in 1940, and he defended it during the so-called Moscow Peace in an icy cellar in Helsinki with Alex. Luther as the opponent. The dissertation is a very thorough morphological study of a number of species, and also a thorough study of the international literature with very precise references. New ideas of the evolution of organs were put forward, and based on this, a new turbellarian

system was erected. Just before this was published, similar ideas were put forward by Meixner, a scientist who had already been an inspiration to Karling earlier. In the new system suggested by Karling, the old groups Alloecoela and Rhabdo-coela were divided. The Macrostromida were no longer placed in the same group as many of the other former rhabdocoels, which were now called the Neorhabdocoela. Instead they were suggested to be a subgroup of a new order, the Archoophora, in which all the small turbellarians with the seemingly primitive type of eggs, the entolecithal eggs, were collected.

Karling spent some of the war years in uniform, and he was even wounded. For 28 years he was a teacher in different secondary schools, first in Finland where he was also a headmaster. After a five-year period at the Swedish Museum of Natural History in Stockholm 1951-1956 he returned to the teaching profession, now in Sweden, undertaking most of his turbellarian studies in his spare time. However, these studies were so successful that in 1967 he was appointed a professor in invertebrate zoology at the Swedish Museum of Natural History. He held this chair until his retirement in 1975.

One of the secrets behind Karling's successful studies is the very thorough approach he always adopts. This already starts in the field. When he collects material, he always makes very careful notes about the habitat and about the bottom material from which the turbellarians are later extracted. He is also interested in collecting devices. Among others, he constructed a special sand scraper for small animals (Karling 1937).

Karling collected much of his material in the Baltic Sea along its Finnish and Swedish coasts. In 1974 he published a very valuable synopsis of the turbellarian fauna of this brackish water sea. Based on this synopsis, I have compiled a diagram (Fig. 1) showing the number of turbellarians described during different decades. As can be seen most of them were described during the last five decades, and about a quarter of the total number of new descriptions were made by Karling.

In the synopsis published in 1974, there are keys to the identification of all the Baltic turbellarians known up to then, as well as figures showing the characteristic features of them all, for instance the hard structures of the genital organs which, when occurring, are species-specific. Besides a systematic

list, there is a general informative list of species, in alphabetical order, with references to the numbers in the systematic list. The idea of using alphabetic order for systematic material at first I found somewhat strange. However, I have since found it very useful. It has other advantages than just to put the first species Karling described, *Acrorhynchides robustus*, at the top of the list. The synopsis also provides much information about ecology and biogeography of the Baltic species, a result, among others, of the careful notes Karling made during the collection of material.

Karling's work was not limited to the Scandinavian countries. In 1960 he visited two marine stations on the Pacific coast of North America where he collected material. Apart from the polyclads studied by Hyman and others, only four free-

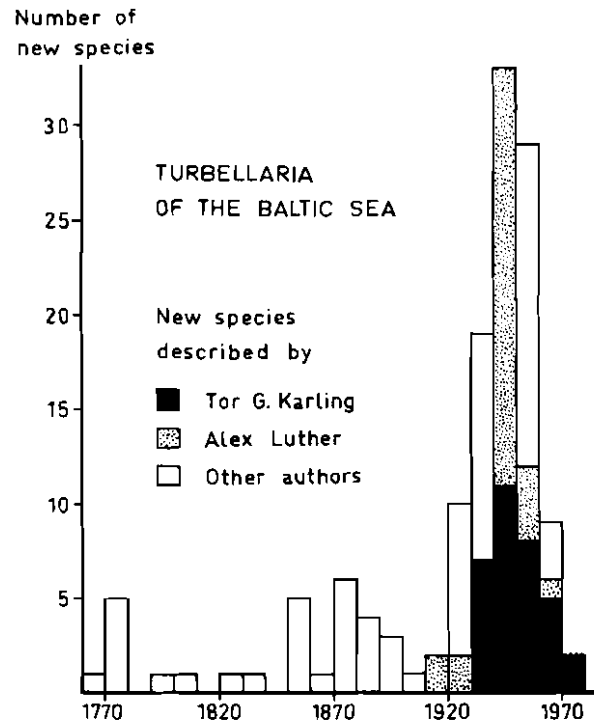


Fig. 1 Turbellaria of the Baltic: number of species described in different decades. As can be seen, most of the species were described in the last five decades (1921-1970) preceding Karling's (1974b) synopsis, from which the data were extracted. The majority of species were described by one or other of three authors: Tor G. Karling, Alex Luther and Peter Ax.

living  
from  
about  
started  
(1962  
many  
descri  
same  
tion o  
On  
collec  
Thus  
Anna  
the m  
spare  
who  
suppo  
An  
in To  
you e  
is his  
bifurc  
chia.  
pholo  
gives  
also d  
On  
think  
more  
in dif  
exam  
struct  
prob  
muscu  
Karlin  
starti  
more  
tions  
variab  
restric  
tissue  
In c  
system  
and N  
lecith  
paper  
Karlin  
born i  
had to  
Germ

living turbellarian species were known at that time from this coast. In a short period Karling collected about 80 species, most of them new to science, and started to describe them in a series of publications (1962a, b, 1964a, 1966c). Since then he has visited many other parts of the world, and found and described other new turbellarians, always with the same careful investigation and concise interpretation of structural details.

One of the new species, found in Bermuda, was called by Karling (1978) *Annalisella bermudensis*. Thus, the new genus was dedicated to his wife, Anna-Lisa, his support in life and not least during the many years in which he was using much of his spare time for studying the Turbellaria. Everyone who has met Anna-Lisa knows how much this support must have meant to Tor.

Among all the theoretical discussions and ideas in Tor Karling's papers I have chosen a few to give you examples of this side of his work. One example is his paper (Karling 1961a) dealing with the bifurcated proboscis found in many Kalyptorhynchia. Besides giving information about the morphology of this structure in different genera, Karling gives detailed information about its function and also discusses its evolution.

One of Karling's ideas, now generally accepted, I think, was that the evolution from a primitive to a more complex structure often follows the same way in different turbellarian organ systems. Thus, for example, the copulatory apparatus, the pharynx structure of the mouth, and the adhesive organs-proboscis, all characterized by functioning with muscular contraction and secretion, were found by Karling (1963b) to show similar trends of evolution, starting with a simple folding and continuing with more complicated alterations. From these observations Karling concluded that the spontaneous variability affording the basis of selection, is restricted by the structural properties of turbellarian tissues.

In one of his papers Karling (1967a) discussed the systematic values of the categories Archoophora and Neoophora, categories characterized by entolecithal and ectolecithal eggs, respectively. This paper was published in German, a language used by Karling in many of his earlier papers. Karling was born in a Swedish-speaking part of Finland, but he had to learn Finnish, too. He started to publish in German, but from 1961 and onwards most of his

papers are written in English. But now and then, especially when dealing with theoretical problems, he has returned to German.

A further development of the systematics of the Turbellaria was made by Karling in 1970 at the Hyman Memorial Symposium in Chicago. Adopting Hennig's ideas of analysis of relationships, based on the sister-group principle, Karling then discussed the affinities of the turbellarian subgroups. He also reconstructed a theoretical turbellarian archetype. His detailed discussion, published in the Hyman Memorial Volume (Karling 1974a), will be of great value for coming generations of turbellarian scientists.

Karling's collections of material from different geographical regions have made it possible for him to compare how structural details of closely related species have evolved in different parts of the world. An example of this is his study (Karling 1977a) of the genus *Austrorhynchus*, species of which were collected in the Mediterranean, the Antarctic regions, different parts of the Pacific, and the Indian Ocean. On the basis of the structural studies, the phylogeny and biogeography of the genus were discussed.

Science is international, and few persons have shown this better than Tor Karling. In his search for material he has worked in laboratories in different parts of the world. He has helped and encouraged many of us younger students from different countries. He has led international courses in the study of the Turbellaria. He has taken part in many symposia in Europe and America, and he has taken part in the organization of such symposia, such as the Symposium on Turbellaria held at Tvärminne, in 1977.

In Tvärminne this limerick was dedicated to Tor Karling by Pat Boaden:

*There once was a fellow called Tor  
Who said 'I won't write any more'  
But with exhortation  
From friends of each nation  
He wrote twice as much as before.*

I do not know if it is possible for Karling to write twice as much as before, but I know that most days he works for a number of hours in his emeritus room at the Swedish Museum of Natural History. And I really hope that he will spare some time for

publishing a check-list, or perhaps a full synopsis, of the Kalyptorhynchia of the world, that is, of the group he knows better than any other person. Anyway, what is sure is that he has made friends wherever he has been, and this, of course, is one of the reasons why we are happy to have him here with us to-day. We now thank him for what he has done and wish him many more prosperous years of turbellarian research.

## References

- Tor G. Karling's papers on Turbellaria and other aquatic worms are listed in this reference list.
- Karling, T. G., 1930. *Bresslauilla relicta* Reisinger (Turbellaria, Rhabdocoela) zum ersten Male in Finnland angetroffen. Mem. Soc. Fauna Flora fenn. 6: 128-130.
- Karling, T. G., 1931. Untersuchungen über Kalyptorhynchia (Turbellaria Rhabdocoela) aus dem Brackwasser des Finnischen Meerbusens. Acta zool. fenn. 11: 1-67.
- Karling, T. G., 1934a. Ein Beitrag zur Kenntnis der Nemertinen des Finnischen Meerbusens. Mem. Soc. Fauna Flora fenn. 10: 76-90.
- Karling, T. G., 1934b. *Haplobranchus balticus* n.sp. Eine neue sedentäre Polychäte aus dem Finnischen Meerbusen. Mem. Soc. Fauna Flora fenn. 10: 242-244.
- Karling, T. G., 1935. Mitteilungen über Turbellarien aus dem Finnischen Meerbusen: 1. *Dalyellia nigrifrons* n.sp. 2. *Promesostoma cochlearis* n.sp. Mem. Soc. Fauna Flora fenn. 10: 388-395.
- Karling, T. G., 1937. Ein Apparat zum Auffangen von Kleintieren des Meeressandes. Acta Soc. Fauna Flora fenn. 60: 387-391.
- Karling, T. G., 1940. Zur Morphologie und Systematik der Allocoela Cumulata und Rhabdocoela Lecithophora (Turbellaria). Acta zool. fenn. 26: 1-260.
- Karling, T. G., 1943. Studien an *Halammovortex nigrifrons* (Karling) (Turbellaria Neorhabdocoela). Acta zool. fenn. 37: 1-23.
- Karling, T. G., 1947. Studien über Kalyptorhynchien (Turbellaria). I. Die Familien Placorhynchidae und Gnathorhynchidae. Acta zool. fenn. 50: 1-64.
- Karling, T. G., 1949. Studien über Kalyptorhynchien (Turbellaria). II. Die Familien Karkinhynchidae und Diascorhynchidae. Acta zool. fenn. 58: 1-42.
- Karling, T. G., 1950. Studien über Kalyptorhynchien (Turbellaria). III. Die Familie Schizorhynchidae. Acta zool. fenn. 59: 1-33.
- Karling, T. G., 1952a. Kalyptorhynchia (Turbellaria). Further zool. Results Swed. Antarct. Exped. 1901-03 4, 9: 1-50.
- Karling, T. G., 1952b. Studien über Kalyptorhynchien (Turbellaria). IV. Einige Eukalyptorhynchia. Acta zool. fenn. 69: 1-49.
- Karling, T. G., 1953a. *Cytocystis clitellatus* n.gen., n.sp., ein neuer Eukalyptorhynchien-Typus (Turbellaria). Ark. Zool. (2) 4: 493-504.
- Karling, T. G., 1953b. Zur Kenntnis der Gattung *Rogneda* Ulianin (Turbellaria, Kalyptorhynchia). Ark. Zool. (2) 5: 349-368.
- Karling, T. G., 1954a. Einige marine Vertreter der Kalyptorhynchien-Familie Koinocystididae. Ark. Zool. (2) 7: 165-183.
- Karling, T. G., 1954b. *Echinoderes levanderi* n.sp. (Kinorhyncha) aus der Ostsee. Ark. Zool. (2) 7: 189-192.
- Karling, T. G., 1954c. Über einige Kleintiere des Meeressandes des Nordsee-Ostsee-Gebietes. Ark. Zool. (2) 7: 241-249.
- Karling, T. G., 1955. Studien über Kalyptorhynchien (Turbellaria). V. Der Verwandtschaftskreis von *Gyratrix* Ehrenberg. Acta Zool. fenn. 88: 1-39.
- Karling, T. G., 1956a. Morphologisch-histologische Untersuchungen an den männlichen Atrialorganen der Kalyptorhynchia (Turbellaria). Ark. Zool. (2) 9: 187-279.
- Karling, T. G., 1956b. Zur Kenntnis einiger Gnathorhynchiden nebst Beschreibung einer neuen Gattung. Ark. Zool. (2) 9: 343-353.
- Karling, T. G., 1956c. *Alexlutheria acrosiphoniae* n.gen., n.sp., ein bemerkenswerter mariner Vertreter der Familie Dalyellidae (Turbellaria). Ark. Zool. (2) 10: 331-345.
- Karling, T. G., 1957. Drei neue Turbellaria Neorhabdocoela aus dem Grundwasser der schwedischen Ostseeküste. K. Fysiogr. Sällsk. Lund Förh. 27: 25-33.
- Karling, T. G., 1958a. Zur Kenntnis von *Stygocapitella subterranea* Knöllner und *Paregodrilus heideri* Reisinger (Annelida). Ark. Zool. (2) 11: 307-342.
- Karling, T. G., 1958b. Zur Kenntnis der Gattung *Coelogyndra* Steinböck (Turbellaria Proseriata). Ark. Zool. (2) 11: 559-568.
- Karling, T. G., 1961a. Zur Morphologie, Entstehungsweise und Funktion des Spaltrüssels der Turbellaria Schizorhynchia. Ark. Zool. (2) 13: 253-286.
- Karling, T. G., 1961b. On a species of the genus *Multipeniata* Nasonov (Turbellaria) from Burma. Ark. Zool. (2) 15: 105-111.
- Karling, T. G., 1962a. Marine Turbellaria from the Pacific Coast of North America. I. Plagiostomidae. Ark. Zool. (2) 15: 113-141.
- Karling, T. G., 1962b. Marine Turbellaria from the Pacific Coast of North America. II. Pseudostomidae and Cylindrostomidae. Ark. Zool. (2) 15: 181-209.
- Karling, T. G., 1962c. *Gnathostomula paradoxa* Ax, 1956 (Gnathostomulida) from the vicinity of Bergen, Norway. Sarsia 7: 23-24.
- Karling, T. G., 1963a. *Ulianinia mollissima* Levinsen, 1879, re-discovered (Turbellaria Prolecephora). Vidensk. Medd. dansk naturh. Foren. 125: 496-508.
- Karling, T. G., 1963b. Some evolutionary trends in turbellarian morphology. In: Ed. Dougherty, E. C. The Lower Metazoa, Univ. Calif. Press. Berkeley and Los Angeles, pp. 225-233.
- Karling, T. G., 1963c. Die Turbellarien Ostfennoskandiens. V. Neorhabdocoela 3. Kalyptorhynchia. Fauna fenn. 17: 1-59.
- Karling, T. G., 1964. Ueber einige neue und ungenügend bekannte Turbellaria Eukalyptorhynchia. Zool. Anz. 172: 159-183.
- Karling, T. G., 1965a. Marine Turbellaria from the Pacific Coast of North America. III. Otoplanidae. Ark. Zool. (2) 16: 527-541.

- Karling, T. G., 1965b. *Haplopharynx rostratus* Meixner (Turbellaria) mit den Nemertinen verglichen. *Z. Zool. Syst. Evolut.-Forsch.* 3: 1-18.
- Karling, T. G., 1966a. On nematocysts and similar structures in turbellarians. *Acta zool. fenn.* 116: 1-28.
- Karling, T. G., 1966b. *Rhodope veranyi* (Gastropoda, Euthyneura) von der norwegischen Küste. *Sarsia* 24: 33-35.
- Karling, T. G., 1966c. Marine Turbellaria from the Pacific Coast of North America. IV. Coelogynoporidae and Monocelididae. *Ark. Zool.* (2) 18: 493-528.
- Karling, T. G., 1966d. On the defecation apparatus in the genus *Archimonocelis* (Turbellaria, Monocelididae). *Sarsia* 24: 37-44.
- Karling, T. G., 1967a. Zur Frage von dem systematischen Wert der Kategorien Archoophora und Neophora (Turbellaria). *Commentat. biol.* 30: 1-11.
- Karling, T. G., 1967b. On the genus *Promesostoma* (Turbellaria), with descriptions of four new species from Scandinavia and California. *Sarsia* 29: 257-268.
- Karling, T. G., 1968. On the genus *Gnosonesima* Reisinger (Turbellaria). *Sarsia* 33: 81-108.
- Karling, T. G., 1969. Ein überzähliger Genitalapparat bei einem rhabdocoelen Turbellar. *Z. Morph. Tiere* 65: 202-208.
- Karling, T. G., 1970a. On *Pterastericola fedotovi* (Turbellaria), commensal in sea stars. *Z. Morph. Tiere* 67: 29-39.
- Karling, T. G., 1970b. Kinorhyncha. In: Ed. Gray, P., *The Encyclopedia of the Biological Sciences*. New York: Reinhold Co, pp. 470-471.
- Karling, T. G., 1970c. *Bothriomolus balticus* Meixner 1938 (Turbellaria) in dem schwedischen Binnensee Vättern. *Zool. Anz.* 184: 120-121.
- Karling, T. G., 1970d. Aspects on the anatomy and affinities of the turbellarian groups. *Am. Zool.* 10: 525.
- Karling, T. G., 1973a. Anatomy and taxonomy of a new otoplanid (Turbellaria, Proseriata) from South Georgia. *Mikrofauna Meeresboden* 16: 361-369.
- Karling, T. G., 1973b. Ist *Hypoblepharina* Böhmig (Turbellaria) eine kommensalistische Gattung? Mit Beschreibung einer neuen Art aus der Amphipode *Cheirimedon femoratus*. *Z. Morph. Tiere* 75: 51-58.
- Karling, T. G., 1974a. On the anatomy and affinities of the turbellarian orders. In: Eds. Riser, N. W. & Morse, M. P. *Biology of the Turbellaria*. New York: McGraw-Hill, pp. 1-16.
- Karling, T. G., 1974b. Turbellarian fauna of the Baltic proper. Identification, ecology and biogeography. *Fauna fenn.* 27: 1-101.
- Karling, T. G., 1977a. Taxonomy, phylogeny and biogeography of the genus *Austrorhynchus* Karling (Turbellaria, Polycystididae). In: Ed. Sterrer, W. & Ax, P., *The meiofauna species in time and space. Mikrofauna Meeresboden* 61, pp. 153-165.
- Karling, T. G., 1977b. On Alex Luther's contribution to our knowledge of the Turbellaria. In: Eds. Karling, T. G. & Meinander, M., *The Alex Luther Centennial Symposium on Turbellaria*. *Acta zool. fenn.* 154, pp. 4-9.
- Karling, T. G., 1978. Anatomy and systematics of marine Turbellaria from Bermuda. *Zool. Scripta* 7: 225-248.
- Karling, T. G., 1980. Revision of *Koinocystididae* (Turbellaria). *Zool. Scripta* 9: 241-269.
- Karling, T. G. & Kinnander, H., 1953. Några virvelmaskar från Östersjön. *Svensk faun. Revy* 3: 73-79.
- Karling, T. G., Mack-Fira, V. & Dörjes, J., 1972. First report on marine microturbellaria from Hawaii. *Zool. Scripta* 1: 251-269.
- Karling, T. G. & Mack-Fira, V., 1973. Zur Morphologie und Systematik der Gattung *Paramesostoma* Attems (Turbellaria Typhloplanoida). *Sarsia* 52: 155-170.
- Karling, T. G. & Meinander, M. (eds.), 1977. *The Alex Luther Centennial Symposium on Turbellaria. Proceedings of a symposium at Tvärminne Zoological Station, Finland, 1977*. *Acta zool. fenn.* 154.
- Karling, T. G. & Nilsson, A.-M., 1974. Further studies on the genus *Hypoblepharina* Böhmig (Turbellaria, Dalyellioida) with description of *H. serrifera* sp.n. *Zool. Scripta* 3: 59-63.
- Karling, T. G. & Schockaert, E. R., 1977. Anatomy and systematics of some Polycystididae (Turbellaria, Kalyptorhynchia) from the Pacific and S. Atlantic. *Zool. Scripta* 6: 5-19.
- Bashiruddin, M. & Karling, T. G., 1970. A new ectocommensal turbellarian (fam. Pterastericolidae) from the sea star *Astropecten irregularis*. *Z. Morph. Tiere* 67: 16-28.
- Dörjes, J. & Karling, T. G., 1975. Species of *Turbellaria Acoela* in the Swedish Museum of Natural History, with remarks on their anatomy, taxonomy and distribution. *Zool. Scripta* 4: 175-189.
- Holmquist, C. & Karling, T. G., 1972. Two new species of interstitial marine triclads from the North American Pacific coast, with comments on evolutionary trends and systematics in *Tricladida* (Turbellaria). *Zool. Scripta* 1: 175-184.
- Schockaert, E. & Karling, T. G., 1970. Three new anatomically remarkable Turbellaria *Eukalyptorhynchia* from the North American Pacific coast. *Ark. Zool.* (2) 23: 237-253.
- Schockaert, E. R. & Karling, T. G., 1975. Anatomy and taxonomy of some species of Polycystididae (Turbellaria, Kalyptorhynchia) from N. Atlantic and Mediterranean coastal areas. *Zool. Scripta* 4: 133-143.