Data on three Baltic species of Corynosoma Lühe, 1905 (Acanthocephala: Polymorphidae) from Baltic grey (Halichoerus grypus) and ringed seals (Pusa hispida)

Leidenberger, Sonja, University of Skövde, https://orcid.org/0000-0002-3985-8405

Boström, Sven, Swedish Museum of Natural History

Wayland, Matthew T., University of Cambridge, https://orcid.org/0000-0002-8095-858X

Sonja.Leidenberger@his.se, Sven.Bostrom@nrm.se, mw283@cam.ac.uk

Publication date: April 15, 2020

Publisher: Dryad

https://doi.org/10.5061/dryad.np5hqbzq1

Citation

Leidenberger, Sonja; Boström, Sven; Wayland, Matthew T. (2020), Data on three Baltic species of Corynosoma Lühe, 1905 (Acanthocephala: Polymorphidae) from Baltic grey (Halichoerus grypus) and ringed seals (Pusa hispida), v3, Dataset, https://doi.org/10.5061/dryad.np5hqbzq1

Abstract

We analyzed Baltic *Corynosoma* material (*C. magdaleni* Montreuil, 1958, *C. semerme* (Forssell, 1904) Lühe, 1911 and *C. strumosum* (Rudolphi, 1802) Lühe, 1904) from grey (*Halichoerus grypus*) and ringed seals (*Pusa hispida*) for the variation of hook morphology and for finding possible morphotypes, by using the proboscis profiler (Wayland 2010) and Meristogram (Wayland 2016).

Methods

Methods:

All data analysis was performed using the R language and environment (R Core Team 2019). For species names we followed the nomenclature given by the Catalogue of Life (2019 Annual Checklist: Roskov et al. 2019) and WoRMS (WoRMS Editorial Board 2020).

The studied seals were collected during Swedish grey and ringed seal hunting in 2007-2008 in different parts of the Baltic Sea (Table 1). The thorny-headed worms were collected during the autopsy at the Swedish Museum of Natural History (for more details see Leidenberger et al. 2019). The worms have been preserved in 70% alcohol. Voucher material is deposited in the invertebrate collection of the Department of Zoology, Swedish Museum of Natural History (SMNH), Stockholm, Sweden (# SMNH-162973-162978, SMNH-172304-172310).

Additionally, specimens of *C. magdaleni* collected by Nickol et al. (2002) from the Finish Baltic Sea, were borrowed from the University of Nebraska State Museum, Manter Laboratory of Parasitology (# HWML 39480). Here, we tested the material mentioned in Table 1 for intra-taxon and inter-taxon variation in hook morphology by using the Proboscis profiler (Wayland 2010).

We measured the length and base measurements of each hook in at least one longitudinal row of hooks per specimen (for more information see Wayland 2010). In total, 11 specimens (3 females and 8 males) of *C. semerme* were in a suitable condition for measuring hook morphometrics. Dorsal hook rows were measured in two female specimens (the ventral hooks were obscured by debris or damaged). In each of the male specimens only one single row was visible in profile; six of these rows were dorsal, one lateral and the other ventral. Additionally, hook morphometrics, for both a dorsal and a ventral longitudinal row of hooks, were recorded from a single male specimen of *C. magdaleni* (HWML 39480-1041-3).

The proboscis profiler and meristogram analyse serial variation in hook morphology along longitudinal rows of hooks. An acanthocephalan specimen can only be analysed using these methods if it has at least one longitudinal row of hooks visible in profile. The R package FactoMineR (Lê et al. 2008) was used to conduct principal component analysis (PCA).

The proboscis profiles of *C. semerme* did not show any evidence of sexual dimorphism (Figs 1, 2). Males of *C. semerme* and *C. magdaleni* appear to display similar patterns of serial variation in hook length and base dimensions (Fig. 1). A principal component analysis of male proboscis profiles demonstrated more variation within *C. semerme*, than between this taxon and *C. magdaleni* (Fig. 2).

The meristogram (Huffman and Bullock 1975, Wayland 2016) was used to produce a graphical summary of serial variation in hook morphometrics. A meristogram (Huffman and Bullock 1975, Wayland 2016) was generated to provide a graphical summary of serial variation in hook morphology in *C. semerme* (Fig. 3); insufficient data was available for the other two taxa. Maximum values of all four hook morphometrics (length, base, ratio and area) were found approximately half way along the proboscis.

Comparison of the number of longitudinal rows and number of hooks in each row is known to vary in *Corynosoma* species depending on the region and host. Cryptic speciation is known as one reason for morphological variability in Acanthocephalans observed within and between geographical locations (e.g. Waindok et al. 2018, Steinauer et al. 2007, Väinölä et al. 1994, Popov and Fortunato 1987). For example Popov and Fortunato (1987) could, on the bases of only the number of longitudinal rows and number of hooks in each row, separate two clear populations of *C. strumosum* in ringed seals, namely the western-arctic (Barents and East Siberian Sea) and western-pacific one (Bering and Okhotsk Sea). Our analyzed material consisted of too few individuals to find any morphotypes, but by comparing the literature there are numerous variations in hook arrangement described. Plastic morphometric characters are also known between different host species. Hernández-Orts et al. (2017) observed for *C. hannae* Zdzitowiecki, 1984 intraspecific morphological and biometrical variability depending on the host. A study by Skorobrechova and Nikishin (2014) showed that also the structure of the capsule of *C. strumosum* was regarded as a morphological expression of the degree of balance of the host-parasite system and was determined by the adaptation to the given paratenic host.

In the majority of acanthocephalans, the proboscis is the primary organ of attachment to the intestinal wall of the definitive host and therefore adaptive radiation is expressed in divergence of proboscis morphology, including hook patterns. However, in *Corynosoma* both the trunk and proboscis anchor the acanthocephalan to the wall of the intestine (Aznar et al. 1999). We might speculate that adaptation to different regions of the digestive tract might be accompanied by changes in trunk shape and spination. Spine coverage may be linked to trunk shape (Hernández-Orts et al. 2012), but further analyses are needed here.

This meristogram, as well as the row data (available as Suppl. material 1-2) may serve as a useful reference for comparison with further *Corynosoma* specimens and/or other *Corynosoma* species in the future. We see great challenges in the access to good and sufficient material for further analysis, while our study of the hooks might contribute and motivate to further investigations on this interesting parasite group. Leidenberger et al. (2020) presented an extensive literature summary on host records and geographical

distribution of the three Baltic *Corynosoma* species, which can be used as guide for further sampling efforts.

Usage Notes

Table 1

Material studied with the Proboscis Profiler (M= male).

Figure 1

Proboscis profiles of male *Corynosoma magdaleni* and *C. semerme*. **a**. Length. **b.** Base. Proboscis profiles generated using a moving average interval of 20%. Profile labels are comprised of three parts: species, surface of proboscis (dorsal, lateral or ventral) and a numerical identifier for the acanthocephalan specimen. N.B. profiles for *C. magdaleni* (dorsal and ventral) are from a single specimen.

Figure 2

Result of the principal component analysis of the proboscis profiles of male *Corynosoma magdaleni* and *C. semerme*.

Figure 3

Meristogram for *Corynosoma semerme*. Graph shows serial variation in four hook morphometrics: L: length; B: base width; A: area; R: ratio. Meristogram generated with a moving average interval of 20%, using data from two females and eight males.

Supplementary Material 1

Row data of the measurements of the Baltic *Corynosoma semerme* Proboscis Profiler.

Supplementary Material 2

Row data of the measurements of the Baltic *Corynosoma magdaleni* Proboscis Profiler.

Notation used for the accession number in both supplementary materials:

species (s for *semerme*, m for *magdaleni*) - sex - surface of proboscis (d=dorsal, v=ventral, l=lateral) - host (g=grey, r=ringed) - specimen number

For example, s-m-d-g-1 denotes a dorsal row of hooks from a male specimen of *Corynosoma semerme* which was collected from a grey seal and given the ID "1"

References

Aznar FJ, Bush AO, Fernández M, Raga JA (1999) Constructional morphology and mode of attachment of the trunk of *Corynosoma cetaceum* (Acanthocephala: Polymorphidae). Journal of Morphology 241: 237-249. https://doi.org/https://doi.org/10.1002/(SICI)1097-4687(199909)241:33.0.CO;2-A

Hernández-Orts JS, Timi JT, Raga JA, García-Varela M, Crespo EA, Aznar FJ (2012) Patterns of trunk spine growth in two congeneric species of Acanthocephalan: investment in attachment may differ between sexes and species. Parasitology 139: 945-955. https://doi.org/https://doi.org/ 10.1017/S0031182012000078

Hernández-Orts JS, Smales LR, Pinacho-Pinacho CD, García-Varela M, Presswell B (2017) Novel morphological and molecular data for *Corynosoma hannae* Zdzitowiecki. New Zealand. Parasitology International 66: 905-916.

https://doi.org/https://doi.org/10.1016/j.parint.2016.10.007

Huffman D, Bullock W (1975) Meristograms: Graphical analysis of serial variation of proboscis hooks of *Echinorhynchus* (Acanthocephala). Systematic Zoology 24: 333-345.

https://doi.org/https://doi.org/10.1093/sysbio/24.3.333

Lê S, Josse J, Husson F (2008) FactoMineR: an R Package for Multivariate Analysis. Journal of Statistical Software 25: 1-18. https://doi.org/https://doi.org/10.18637/jss.v025.i01

Leidenberger S, Boström S, Wayland M (2019) Morphological observations on three Baltic species of *Corynosoma* Lühe, 1905 (Acanthocephala, Polymorphidae). European Journal of Taxonomy 514 https://doi.org/10.5852/ejt.2019.514

Leidenberger S, Boström S, Wayland M (2020) Host records and geographical distribution of Corynsoma magdaleni, C. semerme and C. strumosum (Acanthocephala: Polymorphidae). Biodiversity Data Journal 8:e50500 https://doi.org/10.3879/BDJ.8.e50500

Nickol B, Helle E, Valtonen ET (2002) *Corynosoma magdaleni* in Gray Seals from the Gulf of Bothnia, with emended descriptions of *Corynosoma strumosum* and *Corynosoma magdaleni*. Journal of Parasitology 88 (6): 1222-1229. https://doi.org/10.2307/3285497

Popov VN, Fortunato ME (1987) Geographic variation of *Corynosoma strumosum* (Acanthocephala, Polymorphidae) – a parasite of marine mammals. Zoologicheskii Zhurnal 66: 12-18. [In Russian].

R Core Team (2019) R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL: http://www.R-project.org/

Roskov Y, DeWalt RE, Ower G, Orrell T, Nicolson D, Bailly N, Kirk PM, Bourgoin T, Decock W, Nieukerken Ev, Zarucchi J, Penev L (2019) Species 2000 & ITIS Catalogue of Life, 2019 Annual

Checklist. Species 2000: Naturalis, Leiden, the Netherlands. ISSN 2405-884X. Catalogue of Life. Release date: 2019-1-01.

URL: www.catalogueoflife.org/annualchecklist/2019

Skorobrechova EM, Nikishin VP (2014) Dependence of the structure of the capsule surrounding the acanthocephalan *Corynosoma strumosum* on the species of its natural paratenic host. Biology Bulletin 41 (4): 333-348. https://doi.org/10.1134/s1062359013050166

Steinauer ML, Nickol BB, Ortí G (2007) Cryptic speciation and patterns of phenotypic variation of a highly variable acanthocephalan parasite. Molecular Ecology 16: 4097-4109. https://doi.org/https://doi.org/10.1111/j.1365-294X.2007.03462.x

Väinölä R, Valtonen ET, Gibson DI (1994) Molecular systematics in the acanthocephalan genus *Echinorhynchus* (*sensu lato*) in northern Europe. Parasitology 108: 105-114. https://doi.org/https://doi.org/10.1017/S0031182000078574

Waindok P, Lehnert K, Siebert U, Pawliczka I, Strube C (2018) Prevalence and molecular characterisation of Acanthocephala in pinnipedia of the North and Baltic Seas. International Journal for Parasitology: Parasites and Wildlife 7 (1): 34-43. https://doi.org/10.1016/j.ijppaw.2018.01.002

Wayland MT (2010) Proboscis profiler: a tool for detecting acanthocephalan morphotypes. Systematic Parasitology 76: 159-167. https://doi.org/https://doi.org/10.1007/s11230-010-9245-z

Wayland MT (2016) The Meristogram: a neglected tool for acanthocephalan systematics. Biodiversity Data Journal 4 (7606).

https://doi.org/https://doi.org/10.3897/BDJ.4.e7606

WoRMS Editorial Board (2020) World Register of Marine Species. http://www.marinespecies.org. Accessed on: 2020-03-18.

Funding

Swedish Taxonomy Initiative, Award: DHA 2017.4.3-16

Riksmusei Vänner, Award: Stipendium 2017

References

This dataset cites https://doi.org/10.1002/(SICI)1097-4687(199909)241:3<227::AID-JMOR5>3.0.CO;2-G

This dataset cites https://doi.org/ 10.1017/S0031182012000078

This dataset cites https://doi.org/10.1016/j.parint.2016.10.007

This dataset cites https://doi.org/10.1093/sysbio/24.3.333

This dataset cites https://doi.org/10.18637/jss.v025.i01

This dataset cites https://doi.org/10.5852/ejt.2019.514

This dataset cites https://doi.org/10.2307/3285497

This dataset cites https://waves-vagues.dfo-mpo.gc.ca/Library/147268.pdf

This dataset cites http://www.R-project.org/

This dataset cites https://doi.org/10.5852/ejt.2019.514

This dataset cites https://doi.org/10.3897/BDJ.8.e50500

This dataset cites hdl:www.catalogueoflife.org/annualchecklist/2019

This dataset cites https://doi.org/10.1134/s1062359013050166

This dataset cites https://doi.org/10.1111/j.1365-294X.2007.03462.x

This dataset cites https://doi.org/10.1017/S0031182000078574

This dataset cites https://doi.org/10.1016/j.ijppaw.2018.01.002

This dataset cites https://doi.org/10.1007/s11230-010-9245-z

This dataset cites https://doi.org/10.3897/BDJ.4.e7606

This dataset cites http://www.marinespecies.org

This dataset is supplement to https://doi.org/10.3897/BDJ.8.e50500

This dataset is supplement to https://doi.org/10.5852/ejt.2019.514

Keywords

Acanthocephala, Baltic Sea, Corynosoma, Meristogram, proboscis profiler, Seals

Files

6 files for this dataset

Figure1a_b_ProboscisProfile.jpg	613.77 kB	image/jpeg
Figure2_PCA_Corynosoma.jpg	140.95 kB	image/jpeg
Figure3_Meristogr...osomaSemerme.jpg	364.83 kB	image/jpeg
Suppl_Material1_C...soma_semerme.csv	3.76 kB	text/csv
Suppl_Material2_C...ma_magdaleni.csv	421 B	text/csv
Table1_Corynosoma_Material.doc	37.38 kB	application/msword

License