

CHAPTER 2-2

PROTOZOA: CILIOPHORA AND HELIOZOA DIVERSITY

TABLE OF CONTENTS

Other Ciliophora Known from Bryophytes.....	2-2-2
Heliozoa	2-2-5
Summary	2-2-6
Acknowledgments.....	2-2-6
Literature Cited	2-2-6

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Other Ciliophora Known from Bryophytes



Figure 1. *Amphileptus pleurosigma*, a free-swimming, predatory ciliate. Photo by William Bourland, with permission.

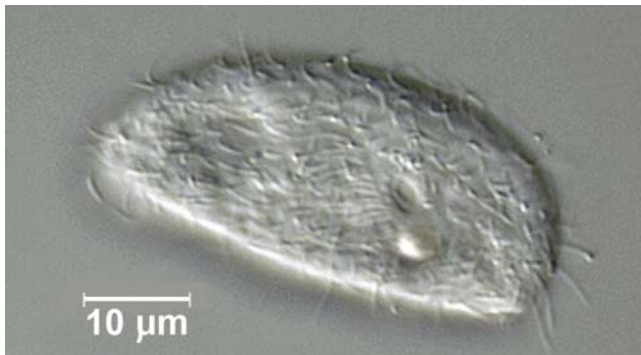


Figure 2. *Chilodontopsis depressa*, an algivorous ciliate (Risse-Buhl & Küsel 2008). Photo by William Bourland, with permission.

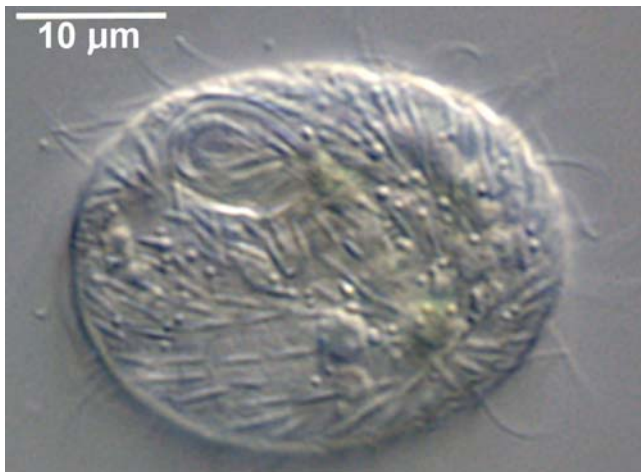


Figure 3. *Cinetochilum margaritaceum*, a bryophyte-inhabiting ciliate that Mieczan (2007) found in peatland ponds of Poland with pH of 5.0. Photo by William Bourland, with permission.

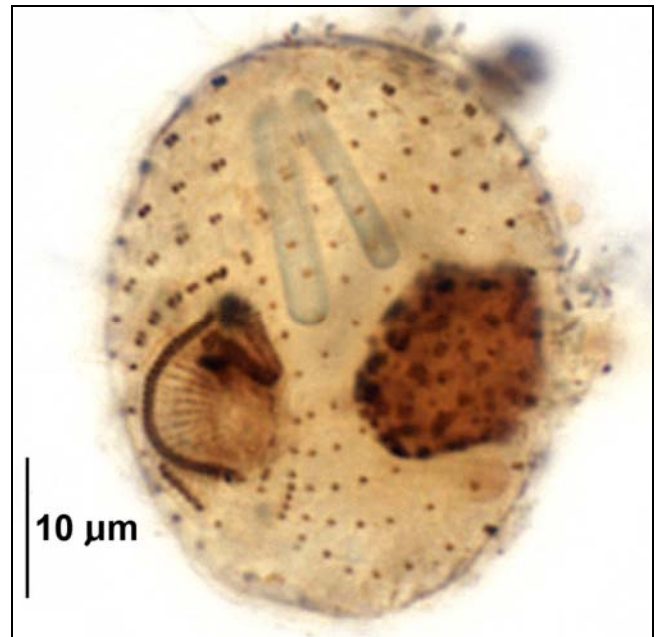


Figure 4. *Cinetochilum margaritaceum* stained to show organelles. Photos by William Bourland, with permission.



Figure 5. *Didinium nasutum*, a bryophyte-dwelling ciliate that feeds on *Paramecium*. This species is capable of encysting to avoid unfavorable conditions. Photo by William Bourland, with permission.

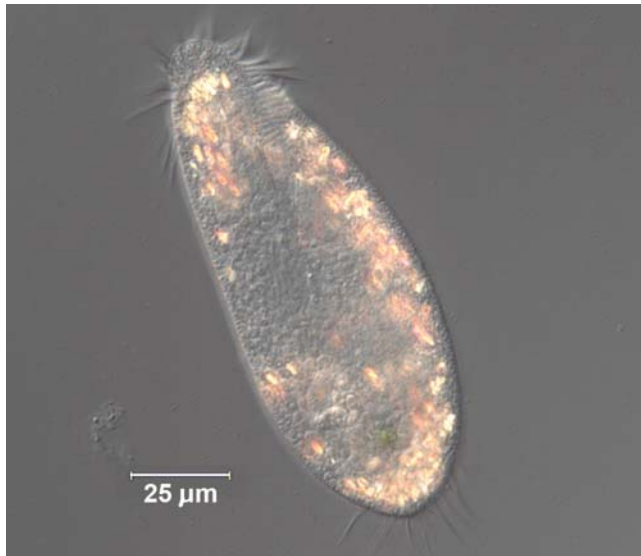


Figure 6. *Oxytricha fallax*, a ciliate, has a complex grouping of cilia that are used for sweeping food into the gullet. It lives among bryophytes, as well as other habitats. Lower organism has been stained. Photos by William Bourland, with permission.

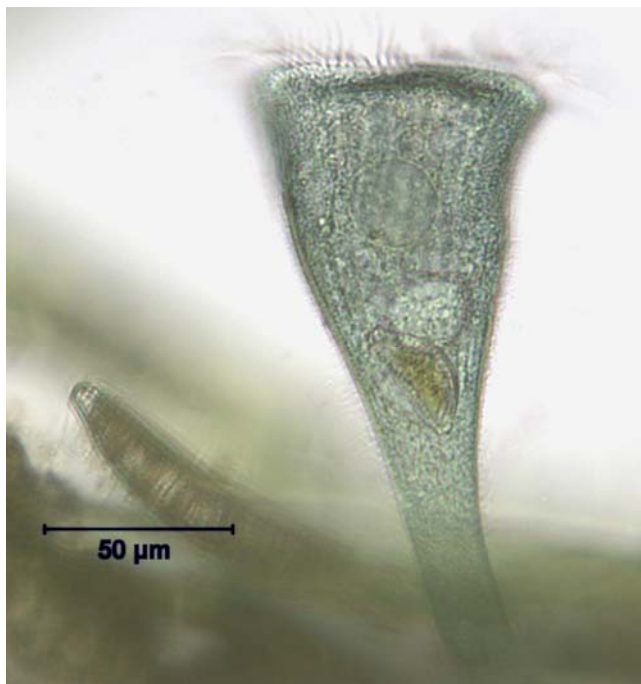


Figure 7. *Stentor multiformis*, a ciliate that occurs in peatlands (Mieczan 2006) and can attach to moss leaves. Photo by William Bourland, with permission.



Figure 8. *Stentor* showing green algal symbiont. Photo by Wim van Egmond, with permission.



Figure 9. *Colpoda steinii*, a constant member of *Sphagnum* communities in two Polish peatlands (Mieczan 2006). Photo by Yuuji Tsukii, with permission.

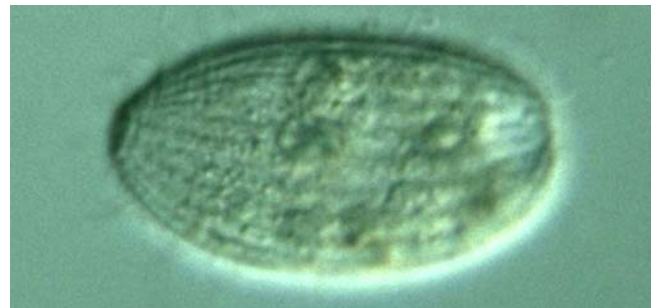


Figure 10. Two *Holophyra* species, ciliates that can inhabit *Sphagnum* in peatlands (Mieczan 2006). Photos by Yuuji Tsukii, with permission.



Figure 11. *Monodinium*, a ciliate that sometimes occurs on *Sphagnum* in peatlands (Mieczan 2006), showing ring of cilia. Photo by Yuuji Tsukii, with permission.



Figure 12. *Monodinium* dividing. Photo by Yuuji Tsukii.

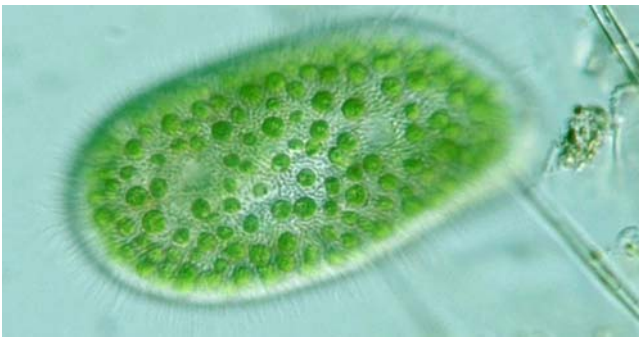


Figure 13. *Paramecium bursaria*, a common species that can occur on *Sphagnum* in peatlands in Poland (Mieczan 2006). This one has algal symbionts. Photo by Yuuji Tsukii, with permission.



Figure 14. *Spathidium muscicola*, a ciliate that can live among mosses. Photo by Yuuji Tsukii, with permission.



Figure 15. *Steinia sphagnicola*. Normal cell. Photo by Yuuji Tsukii, with permission.



Figure 16. *Steinia sphagnicola* cell dividing. Photo by Yuuji Tsukii, with permission.



Figure 17. **Upper:** *Urotricha farcta*. **Lower:** *Urotricha platystoma*. This genus occurs on mosses in Polish peatlands (Mieczan 2006). Photo by Yuuji Tsukii, with permission.



Figure 18. *Strombidium viride*, a ciliate that occurs occasionally on mosses in peatlands in Poland (Mieczan 2006). Photo by Yuuji Tsukii, with permission.

Michael Lüth kindly sent me the names of several **Ciliophora** that commonly occur on bryophytes. These include *Phacodinium metchnikoffi* (Figure 19-Figure 20), *Bryophyllum tegularum* and *B. loxophylliforme* (Figure 21).



Figure 19. *Phacodinium metchnikoffi*, a common species on wet moss. Photo by Michael Plewka <www.plingfactory.de>, with permission.



Figure 20. *Phacodinium metchnikoffi* showing ribs. Photo by Michael Plewka <www.plingfactory.de>, with permission.



Figure 21. *Bryophyllum loxophylliforme*, a common species on wet moss. *Bryophyllum tegularum* likewise is common there. Photo by Michael Plewka <www.plingfactory.de>, with permission.

Heliozoa

The heliozoans look like a sunburst with their sticky, wirelike pseudopods. About 20 species live among *Sphagnum* in pools with pH ranging 5-5.6 (Hingley 1993). The sticky pseudopods, known as **axopods**, are used to ensnare food such as algae and smaller protozoa, and to protect the organisms. They also facilitate a slow movement, since these organisms lack cilia or flagella. The beautiful and delicate moss dwellers include *Actinophrys sol* (Figure 23) and *Actinosphaerium eichhorni* (Figure 24-Figure 25).

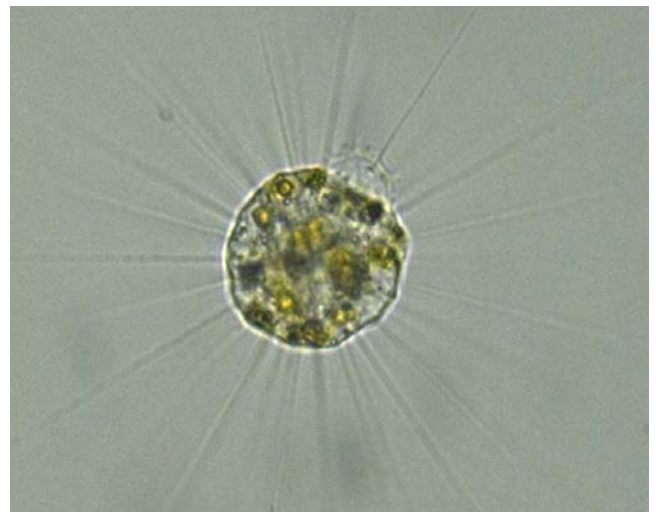


Figure 22. *Actinophrys sol*, a moss dweller, showing radiating pseudopodia. Photo by Yuuji Tsukii., with permission

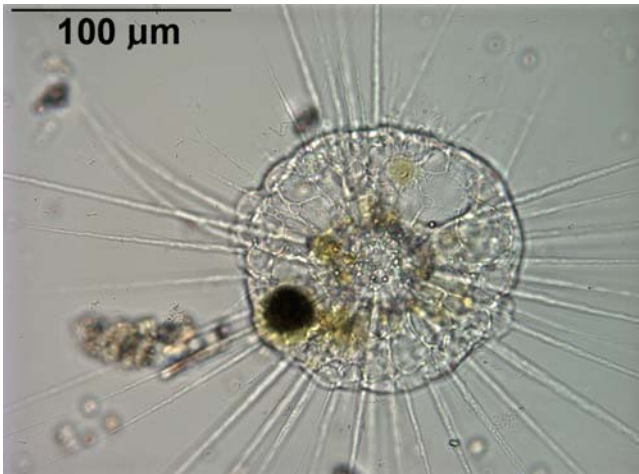


Figure 23. *Actinophrys sol* showing radiating pseudopodia. Photo by William Bourland, with permission.

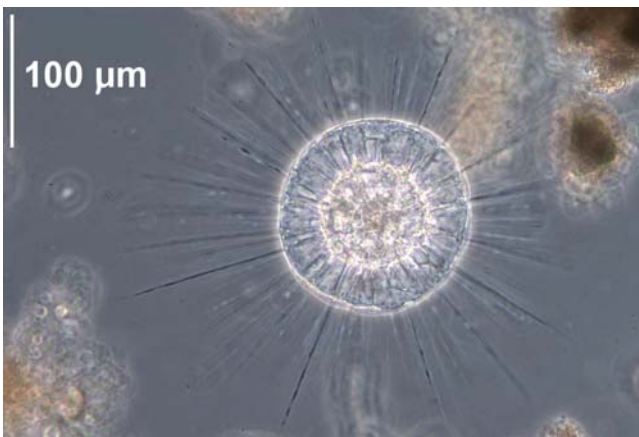


Figure 24. *Actinosphaerium eichhorni*. Photo by William Bourland, with permission.



Figure 25. *Actinosphaerium eichhorni*. Photo by William Bourland, with permission.

Summary

Although they are more difficult to detect, the **Ciliophora** are quite common among bryophytes. They are best detected by culturing, and then the many species seen in this chapter become active. **Heliozoa** are not common among bryophytes, and only the few species shown here are familiar ones in a bryophyte habitat.

Acknowledgments

This chapter would not have existed without my new, but never seen, friends, William Bourland and Yuuji Tsukii. William Bourland provided me with a set of his pictures of bryophyte inhabitants. Yuuji Tsukii gave me unlimited permission to use his many, many images on the Protist Information Server website. Michael Lüth reported his observations on Protozoa on bryophytes.

Literature Cited

- Hingley, M. 1993. Microscopic Life in *Sphagnum*. Illustrated by Hayward, P. and Herrett, D. Naturalists' Handbook 20. [i-iv]. Richmond Publishing Co. Ltd., Slough, England, 64 pp. 58 fig. 8 pl. (unpaginated).
- Mieczan T. 2006. Species diversity of protozoa (Rhizopoda, Ciliata) on mosses of *Sphagnum* genus in restoration areas of the Poleski National Park. Acta Agrophys. 7: 453-459.
- Mieczan, T. 2007. Planktonic ciliates in peat ponds of different acidity (E Poland). Electronic Journal of Polish Agricultural Universities (EJPAU) 10 #20 accessed online at <<http://www.ejpau.media.pl/volume10/issue4/art-20.html>>.
- Risse-Buhl, U. and Küsel, K. 2008. Colonization dynamics of biofilm-associated ciliate morphotypes at different flow velocities. Eur. J. Protistol. Accessed 12 January 2009 at <http://www.sciencedirect.com/science?_ob=ArticleURL&_udi=B7GW3-4TWSWJK-2&_user=10&_rdoc=1&_fmt=&_orig=search&_sort=d&view=c&_acct=C000050221&_version=1&_urlVersion=0&_usolid=10&md5=72e1521f8b2c0570cf1ccbe243e4b04b>.