Abstract-Volume

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Morphology, phylogeny and ecology of ciliates (Protists, Ciliophora) from tank bromeliads [Talk]

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Bromeliads are rosette plants occurring mainly in Central and South America. They collect rainwater and particulate materials in tanks (cisterns) formed by the coalescing leaf axils. The tanks are inhabited by many ordinary and endemic organisms, ranging from small insect larvae to large crustaceans and amphibians. Protists, in contrast, have been poorly researched. Thus, it was easy to discover about 40 new ciliate species in the tanks, many representing new genera and families. Here, we report on two outstanding species: *Bromeliothrix metopoides* and *Glaucomides bromelicola*. The first is a small (~ 20–40 × 15–30 μm) colpodid ciliate that likely evolved from the very common soil ciliate *Paracolpoda steinii*. Basically, *B. metopoides* is a bacteria feeder but when their abundance decreases under a certain level, large (~ 55 × 30 μm) macrostome specimens develop, feeding specifically on a heterotrophic, 20–40 μm-sized flagellate of the genus Polytomella. When the environmental conditions become unfavourable, B. metopoides produces resting cysts. Experiments showed that *B. metopoides* needs an unusually high food threshold (> 1.4 mg C/L). Its maximum growth rates (6.8 doubling/d!) belong to the highest one recorded thus far for freshwater ciliates. Glaucomides bromelicola is about 60 × 40 μm in size and belongs to the order Tetrahymenida. Its life cycle is similar to that of B. metopoides but it cannot make resting cysts. *Glaucomides bromelicola* belongs to a group of species that evolved in bromeliad tanks. The ancestor is *Glaucoma scintillans*, a cosmopolite in running and stagnant freshwaters. (Supported by FWF project 20360-B17 and DFG grant STO 414/3-2.)

KEYNOTE LECTURE – 27.2.2013 – WORKSHOP

Protists as Indicators of Ecosystem Health: Quo Vadis?

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Bioindication is a valuable tool for estimating ecosystem health and stimulating students to become interested in applied environmental matters. A great variety of autotrophic and heterotrophic organisms has been used as indicators for, e.g., water and soil quality, the influence of toxic substances, and the effects of various fertilizers. Protists played a rather prominent role in this scenario between the years 1980 and 2000, for instance, in the "Saprobiensystem" for the assessment of water quality. Then, the number of papers decreased from year to year, and presently there are very few protistologists working in this field. There are three main reasons for this: (1) The advent of fast and cheap chemical and molecular methods generally decreased bioindication. (2) The number of well-trained taxonomists and identifiers decreased, and it is increasingly difficult to interest students for protists in general and as bioindicators in particular. This results from changed sociological paradigms, forcing youngsters to do "meaningful" science and to make much money as early and fast as possible. (3) The indolence of university and government biologists to identify bioindicators. Often, this is left for technicians. This not only takes jobs from academic biologists but also makes it difficult to build a strong lobby.

(Supported by the Austrian Science Fund, FWF project 22846-B17.)

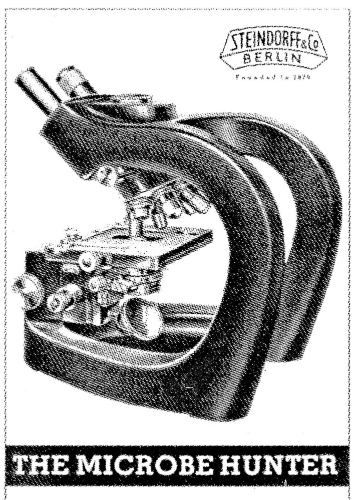

Abb. 1: *Mikrobenjäger-Reklameblatt für den US-amerikanischen Markt*

Talk

A Natural Monument for Ciliated Protozoa: The Ephemeral Krauthügel Pond in the Town of Salzburg

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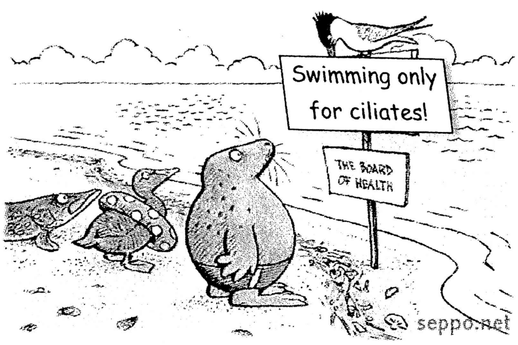
On 19.01.2012, the mayor of the town of Salzburg declared the "Ephemeral Pond on the Krauthügel" as a natural monument for ciliates. The pond is on the foot of the castle of Hohensalzburg, i.e., near the city centre, in a natural depression. When filled, the pond is claviform with a size of about 30 × 15 m and a depth of about 30 cm. The pond has water for some days or weeks only after heavy rains or after longer periods of rain. The pond area was used for several hundred years as a field for root and leafy vegetables (e.g. cabbage). In the sixties of the past century, the field turned to grassland fertilized organically. Up to the eighties, the area was used as grassland and as autumn pasture. This turned the pond to a paradise for ciliates because the water became highly eutrophic by the excrements of the cows. We investigated the ciliates of the Krauthügel pond during the past 40 years, recognizing about 150 species of which 10 were undescribed, i.e., new to science. This was a main argument for our effort to conserve this pond. Further, we used ciliates from this pond as neotypes for another 10 species. Types and neotypes cause that the locality becomes the "type locality". The type locality is a very important site because the type or neotype population is a measure for all future identifications, especially when not all characteristics can be seen in prepared specimens, as it is usual in protists. As far as we know, this is the first official conservation of a certain site for ciliates. (Supported by the FWF, Project number P22846-B17.)



Talk

Contrasting life strategies of two common ciliates from tank bromeliads

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This study investigates the ecology and life strategy of two recently described ciliate species from tank bromeliads. We conducted laboratory experiments to assess the response of the ciliates to food, pH, and competition. *Glaucomides bromelicola* (family Bromeliophryidae) is the most common ciliate in the reservoirs (tanks) of bromeliads. In contrast to the coexisting species *Bromeliothrix metopoides* and many other colpodean ciliates, *G. bromelicola* does not form resting cysts, which jeopardizes this ciliate when its small aquatic habitats dry out. Both ciliates form bactivorous microstomes and flagellate feeding macrostomes. However, only *G. bromelicola* has a low feeding threshold and is able to adapt to different protist food. The higher affinity to the local bacterial and flagellate food renders it the superior competitor relative to *B. metopoides*. Continuous encystment and excystment of the latter enable stable coexistence of both species in their natural habitat. Both species are tolerant to a wide range of pH (4-9). These ciliates appear to be limited to tank bromeliads because they either lack resting cysts (*G. bromelicola*) or have highly specific food requirements (*B. metopoides*).

Poster P13

Morphology and morphogenesis of a *Psilotricha*-like ciliate from Hawaii

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The genus *Psilotricha* was described by Stein in 1859. Since then, there was some confusion about the species and its systematic position because the original description lacks information on the dorsal infraciliature and the ontogenesis. The present study describes a new *Psilotricha*–like species from Hawaii, using live observation, protargol impregnation and, for the first time, scanning electron microscopy of morphostatic and dividing specimens. The Hawaiian species has a size of about 65 × 45 µm in vivo and is broadly obovate. The most characteristic feature is an about 30 µm long left marginal cirrus on the acute posterior body end. The nuclear apparatus is composed of two macronuclear nodules and one micronucleus in between. The cortex is very rigid, as, for example, in *Euplotes*. There is an average of 23 cirri in four ventral rows, one postoral row, and one left and one right marginal row; frontal, buccal, and transverse cirri are absent. The adoral zone occupies about 43 % of body length and is on average composed of 21 ordinary, wide-spaced membranelles. The dorsal infraciliature is composed of about 33 bristles in three kineties; caudal cirri are absent. The ontogenesis is hypoapokinetal, i. e., starts with the *de novo* formation of the oral primordium on the cell surface followed by an invagination into a subcortical pouch close to the buccal vertex. The proter undulating membranes reorganise but do not produce cirri. The postoral row is formed by terminal segregation of the second right ventral row as in *Psilotricha succisa* (Foissner 1983), indicating a close relationship. In spite of several attempts, the systematic position of the Psilotrichidae remains unknown. The rigid cortex and the hypoapokinetal stomatogenesis suggest some relationship with euplotids. Molecular data are needed!

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Poster P20

Updating the Microthoracids (Ciliophora, Microthoracida): Five new *Drepanomonas* taxa from soil

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Using standard methods, we describe five new *Drepanomonas* taxa. *Drepanomonas hymenofera* (Horváth, 1956) Omar and Foissner, 2012, which is composed of two subspecies, was discovered in Venezuela and Iceland, respectively. Both are comparatively large (~50 × 20 µm and ~40 × 18 µm), differing in the cortex pattern and the structure of kineties 3 and 4. *Drepanomonas vasta* Foissner and Omar, 2012, which was discovered in the mud of a tree hole in Austria, is thick and middle-sized (~35 × 18 µm). It swims continuously and appears slightly helical at low magnification due to two ridges right of the distinctly converging kineties 2 and 3 and the cuneate transverse shape. Species 3 and 4, both discovered in Venezuela and Germany, respectively, are spiny and large (~45 × 25 µm and ~50 × 25 µm). They have a crescentic body with an obfalcate cortical plate on the right side and differ mainly in the number of ventro-lateral spines (three vs. two) and the left side cortical pattern. Species 5, which was discovered in Australia, is rather large (~45 × 20 µm) and has an ellipsoidal body slightly tapered anteriorly and rounded posteriorly, resembling *D. obtusa* Penard, 1922. It has an obfalcate plate on the right body side and two ridges along kineties 5 and 6. Ontogenesis shows that the ciliary pattern of *Drepanomonas* is homologous to that of *Leptopharynx*, specifically, the structure and origin of the so-called postoral complex. The main features for distinguishing *Drepanomonas* species are: detailed morphometrics; body size and shape; cortex pattern (ridges, furrows, and spines); arrangement and total number of basal bodies; position of oral apparatus; and movement.

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Poster P27

Morphological and Molecular Description of a New Species in the Extraordinary Genus *Schmidingerothrix* (Ciliophora, Hypotricha)

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In 2012, Foissner described a very curious, new hypotrichous ciliate genus and species (Europ. J. Protistol. 48:237–251): *Schmidingerothrix extraordinaria*. This hypotrich, which was discovered in hypersaline soils (~ 100 ‰) from Namibia and Egypt, has an outstanding organization: it possesses a frayed buccal lip, three-rowed adoral membranelles, only one frontal cirrus, a distinct gap between frontal and ventral adoral membranelles, and a miniaturized first frontal membranelle, while a paroral membrane, dorsal bristle rows, and buccal, transverse, and caudal cirri are absent. Thus, Foissner put the new genus into a new family: the Schmidingerotrichidae. When Foissner's study became available, we discovered a very similar species in a marine saline in Portugal, differing from *S. extraordinaria* mainly by the number of frontal cirri (3 vs. 1), adoral membranelles (24 vs. 19), and ventral cirral rows (2 vs. 1). Foissner, not having the advantage of a molecular sequence, interpreted the specialities as a reduction caused by the extreme habitat. Thus, we were greatly surprised when the small subunit (SSU) rDNA placed *Schmidingerothrix*, with a bootstrap support of > 90%, at the base of all stichotrichine sequences, from, e.g., *Oxytricha*, *Stylonychia*, *Paraurostyla*, *Bistichella* and so on. Accordingly, *Schmidingerothrix* could be a living fossil, showing us how the stichotrichine hypotrichs evolved. This is corroborated by morphological investigations (Foissner, unpubl.) on *Cladotricha* spp. They have, like *Schmidingerothrix*, a frayed buccal lip but possess also dorsal bristle rows and caudal cirri both absent from *Schmidingerothrix*.

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CONSERVATION OF PROTISTS: THE IMPORTANCE OF TYPE LOCALITY

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Protists are frequently ignored in biodiversity and conservation issues due to their supposed cosmopolitan distribution. However, this is outdated: very likely a third of protists have restricted distribution. We studied for 30 years the ciliates of a small, ephemeral pond in Salzburg City, Austria. Of 121 species identified, at least 10 were new to science and for 10 other species, which were neotypified, it is now type locality. Using biodiversity and type locality as arguments, the government protected this pond as a "Natural Monument". The type locality is much more important in protists than in large multicellulars because the ancient protist descriptions are often very incomplete, frequently needing reinvestigation of material from the type locality. (Supported by the FWF, Projects P20360–B17.) Page 301 - 302.

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