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Cortical Pattern in Non-Dividers, Dividers, and Reorganizers of an Austrian Population of *Paraurostylia weissei* (Ciliophora, Hypotrichida): A Comparative Morphological and Biometrical Study, ERNA WIRNSBERGER, WILHELM FOISSNER, and HANS ADAM, Institut für Zoologie der Universität Salzburg, Akademiestraße 26, A-5020 Salzburg (Austria).

The morphology and the regulation of cortical pattern associated with the cell size, division, and reorganization of *Paraurostylia weissei* (Stein, 1859) were investigated. The ranges of variation of the Austrian, Polish and American strains were compared by biometrical analyses. The Austrian population shows peculiarities as follows: Most frequently it possesses 4 ventral rows, 8 transverse cirri, 4 frontal cirri in the anteriormost and 2 in the posterior row, and 7 dorsal kineties. Total isogametic conjugation was observed very infrequently. The oral primordium originates next to the postoral ventral row. The undulating membrane field and the 1st 3 frontal-ventral-transverse (FVT)-streaks for the opisthe develop as a result of the dispersion of the basal bodies of one or two cirri of the 1st ventral row. The farthest-right ventral row is of composite origin from 2 FVT-streaks. 3 short dorsal bristle rows originating beside the right marginal row are a constant feature. In reorganizers the oral primordium characteristically possesses a group of kinetosomes extending toward the anterior right, fusing with the undulating membrane field. The development of dorsal primordia always starts in the 3rd dorsal kinety. These results provide important criteria for future species discrimination, if the examination of nonmorphological characters provides evidence that *Paraurostylia weissei* is a complex of sibling species.

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Effects of Ammonium Sulphate ((NH₄)₂SO₄) on Soil Testacea, Ciliates, and Nematodes, HELMUT BERGER, WILHELM FOISSNER, and HANS ADAM, Institut für Zoologie der Universität Salzburg, Akademiestraße 26, A-5020 Salzburg (Austria).

High amounts of ammonium sulphate (AS) are used occasionally to stabilize the snow-cover of ski trails. Hence, we treated 3 sites of an alpine pasture with 100 (1), 400(2) and 1200(3) kg AS/ha on June 13, 1983. On July 5, Sep. 5, and Oct. 18, 1983 samples were taken. Testacea: There were no conspicuous differences in the species number. The abundances were always rather similar at the fertilized sites, but showed inverse dynamics to the control (c). Although all sites shared equal abundances on the average, the biomass was 60% higher in (3) than at the other sites, due to the higher dominance of *Centropyxis aerophila* var. *sphagnicola*, a larger species. Contrary, CHARDEZ et al. (Rev.Ecol.Biol.Sol, 1972,9,185-196) reported a 2/3 loss of testacean biomass three years after urea application. The average ratio of full:empty tests was 1:1 at (1), (2) and (c), whereas it

was 1:1,4 in (3). This suggests an increased turnover at this site. Ciliata (culture method!): Qualitative changes were inconspicuous and independent from the AS concentration. On Oct. 18, the abundances at the treated sites were 2-3 times higher than at the control plot. VISWANATH & PILLAI (J.Ind.Inst.Sci.,1977,59,113-120) found more ciliates in soils fertilized with super-phosphate too. Nematoda: On July 5, they showed a remarkable quantitative decrease, perhaps due to a toxic effect of the fertilizer, but on Oct. 18 three times higher values were obtained at the fertilized sites. This pilot study suggests that "normal" concentrations of AS do not effect the soil protozoa. Only high amounts of this fertilizer cause changes in the community structure of the micro-edaphon. (Supported by the "Forschungsinstitut Gastein-Tauern-region").

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Culture and Food Selection in the Autochthonous Soil Ciliate *Grossglockneria acuta* FOISSNER, 1980 (Ciliophora, Colpodida), WOLFGANG PETZ, WILHELM FOISSNER, and HANS ADAM, Institut für Zoologie der Universität Salzburg, Akademiestrasse 26, A-5020 Salzburg (Austria).

FOISSNER and DIDIER (Protistologica, 1983, 19, 103-109) showed that *Pseudoplatyophrya nana* feeds perhaps exclusively on yeast cells. For that reason the related species, *Grossglockneria acuta*, was tested for its food requirements using bacteria, fungi, yeast, flagellates, and the ciliate *Colpoda aspera*. Except yeast and *C. aspera* they were isolated from the same soil as was *G. acuta*. Testing of the fungi needs a special method: They were grown on agar slant in glass petri dishes (10 cm Ø). Only 1/3-1/4 of the petri dish may be occupied by the nutrient agar. During its solidification some hyphae are inoculated from a pure culture. After sufficient development of the fungus a few individuals of *G. acuta* suspended in 12-15 ml Knop's solution are added. It is crucial that many hyphae are immersed into the medium but enough remain out to keep the fungus alive. 11 species of fungi were tested as food organisms in 5-10 parallel experiments. Only 3 species (*Mucor muccedo*, *Mucoraceae*, and *Aspergillus* sp.) provided reproduction of *G. acuta*. It is possible for the ciliate to feed exclusively either on the contents of hyphae or on that of spores. No growth was observed with bacteria, flagellates, yeast, *C. aspera*, and the fungi *Penicillium* spp., *Verticillium* sp., *Botrytis* sp., *Sclerotium* sp., *Gymnoascaceae*, and *Aspergillaceae*. The highly specialized food requirements suggest that the *Grossglockneridae* are autochthonous soil ciliates. This is emphasized by their special oral equipment with a tentacle-like structure which is used in breaking up and sucking out the fungi. In addition, during the investigation of some hundred stagnate and running waters we could never find any species of this family. Contrary, they are abundant in many soils from different regions of the world: Austria, Germany, Poland, and Nepal (FOISSNER, unpublished).

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r- and K-Strategies in Soil Ciliates of Different Affinity to their Habitat: A Field and Experimental Approach, GABRIELE LÜFTENEGGER, WOLFGANG PETZ, WILHELM FOISSNER, and HANS ADAM, Institut für Zoologie der Universität Salzburg, Akademiestraße 26, A-5020 Salzburg (Austria)

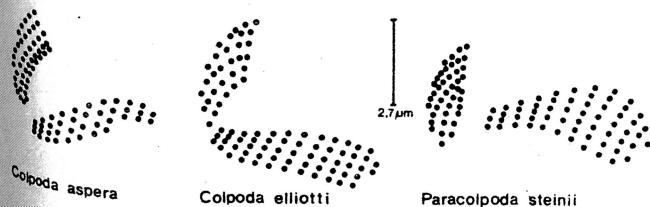
Nothing is known about r- and K-selection in soil ciliates. Thus, we compared 3 species with different affinity to the soil and of different systematic categories with regard to their population growth and tolerance to vari-

ous temperatures (5,10,21,30°C): Blepharisma undulans (accessoric in soil; Polyhymenophora), Colpoda aspera (very widespread in soil; Colpodea), and Grossglockneria acuta (autochthonous soil species; Colpodea). To complete these results, we performed field investigations and calculated the C/P-quotient (i.e. the ratio of colpodean and polyhymenophoran species) at different sites and climates. These studies took place at 5 plots (A-E) in the Tullnerfeld, Austria, with A-C being xerothermic sites (average soil moisture 22%, av. summer temperature 16,5°C, sea level about 180m) and D,E being lowland sites (av. soil moisture 40%, av. summer temp. 16,5°C, SL 180m). Two other plots (F,G) were in the Austrian Alps (av. soil moisture 45%, av. summer temp. 4,5°C, SL about 2000m). Concerning these climatic factors, A-E are "well-balanced or predictable" and F,G comparable "extreme or unpredictable". Similarly, A-C are more "extreme" than D,E because they dry up aperiodically. The growth curves show that C.aspera and G.acuta can develop great individual densities in a much wider temperature range than B.undulans, but the latter remains longer at the equilibrium point than C.aspera and G.acuta. These 2 species show a sudden increase in individual numbers followed by a sharp breakdown to extinction. This is because their reproductive strategy (4 individuals emerge from one cyst!) is more efficient than that of B.undulans. Thus, C.aspera and G.acuta are more r-selected than B.undulans. The field investigations confirm the experimental results. The Colpodea show a relative dominance at A-C (C/P=1:1,08) and F,G (C/P=1:0,2), whereas more Polyhymenophorans occur at D,E (C/P=1:1,5).

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The Shape of the Left Polykinetid: A New Character for the Discrimination of Colpoda aspera, C. ellioti, and Paracolpoda steinii, WILHELM FOISSNER, Institut für Zoologie der Universität Salzburg, Akademiestraße 26, A-5020 Salzburg (Austria).

Several morphological and morphometrical characters have been suggested to discriminate C. aspera, C. ellioti, and P. steinii (see W. FOISSNER and G. SCHUBERT 1983: Acta Protozool. 22, 127-138). However, most of them are difficult to gather. This is perhaps the reason why these species which are obviously widespread in different edaphic habitats have been rarely separated by soil ecologists, and even by ciliate taxonomists. A re-investigation of two populations of each species by conventional light microscopical technics and the silver carbonate method of FERNANDEZ-GALIANO showed that they can be easily separated by the shape of their left polykinetid. It is notched in C. aspera, slightly trapezoid in C. ellioti, and spoon-like in P. steinii. There is no significant difference (t-test: $P > 0,05$, $n = 20$) in the number of kinetids in the kinetid: C. aspera: $\bar{x} = 10,8$ (10-12), C. ellioti: $\bar{x} = 11,2$ (10-13), P. steinii: $\bar{x} = 10,9$ (10-12). Similarly, no pronounced differences can be found in the shape and size of the right polykinetid. (Supported by the "Fonds zur Förderung der wissenschaftlichen Forschung").



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The Fine Structure of Spiromonas sp., an Ectoparasitic Flagellate on the Ciliate Colpoda, WILHELM FOISSNER and ILSE FOISSNER, Institut für Zoologie der Universität Salzburg, Akademiestraße 26 and Institut für Botanik der Universität Salzburg, Lasserstraße 39, A-5020 Salzburg (Austria).

A flagellate which ectoparasitized ciliates of the genus Colpoda occurred in a soil sample. Heavily infected hosts show a strongly vacuolized cytoplasm and die. As far as we know, this is the first reliable record of an ectoparasitic flagellate on ciliates. Its fine structure and mode of life show that it is related to the genus Spiromonas. Spiromonas sp. has 2 flagella, the left one emerges from a periflagellar canal. The pellicle consists of 3 unit membranes and is perforated by many micropores. There are subpellicular microtubules and a net-like fibro-granular layer on the surface of the pellicle. The anterior region contains many micronemes. The host-parasite connection is mediated by a complex "apical apparatus" that consists of an ring of 4-5 microtubules, a polar ring-like structure, and a unit membrane that separates the host from the parasite. The separating membrane is made of the inner electron dense layers of the cell membrane of the ciliate and the flagellate respectively. We suppose, that nutritive substances must pass through this membrane because Spiromonas lacks a true cytostome and feeding is a long lasting procedure. Lytic enzymes released from the micronemes could be of importance during this process. The cristae mitochondriales are tubular. Neither extrusomes nor a contractile vacuole were found. All these peculiarities suggest a close affinity of this Spiromonas to the Sporozoa. But if we consider the flagellated trophic stage, it is more likely that the Spiromonadidae are nearer to the Zooflagellates than to the Sporozoa.

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Dynamics of the cytoskeleton in the reticulopodial network (RNP) of Allogromia laticollaris, RAINER GOLZ, MANFRED HAUSER, Department of Cell Morphology, Ruhr-Universität, 4630 Bochum, P.B. 10 21 48, FRG

Within the RPN of A. laticollaris, an incessant saltatory and bidirectional streaming of cytoplasmic particles occurs. EM-Studies on cryosubstituted and tannic acid fixed RPN's document the occurrence of two structurally different mt-classes. The mt-bundles are interconnected by regular arrays of cross bridges and by 3-5 nm filaments (mf) running parallel to the mts. With monoclonal actin antibodies we obtained a fluorescence pattern, which corresponds with the mf-distribution observed in the EM. Helical structures (hes), sometimes in a bulky paracrystalline array are continuous with mt-bundles, suggesting a close relationship. The interchangeability of hes and mts is clearly demonstrable. It seems likely that the hes represent an intermediate assembly form of tubulin. The high sensitivity of the RPN for Ca^{2+} ions makes it to a favourable object for studying Ca^{2+} -regulation of the cytoskeleton. IIF with anti calmodulin reveals the existence of vesicle-bound calmodulin (cal) within the filopodia. At the tip of outgrowing filopodia the cal-fluorescence marks the course of mt-