

manipulating a single core sample with an internal area of 36 cm². The species richness observed in the manipulated core represents almost 5% of all described ciliate species, and all species recorded in Airthrey Loch were also found in Esthwaite Water, which is separated by a distance of 300 km. As far as we are aware, all these species, and all those retrieved in the manipulated core, had previously been described from elsewhere in the world — supporting the widely held view that most ciliate species are indeed cosmopolitan.

Similar studies may soon be made of species richness in natural communities of bacteria and other microorganisms, and we may find that the vast number of organisms involved is indeed represented by a relatively modest global richness of species. For the moment, we await a satisfactory solution to the rather difficult question of just what is a bacterial species.

Bland J. Finlay

Genoveva F. Esteban

*Institute of Freshwater Ecology,
Windermere Laboratory,
Ambleside LA22 0LP, UK*

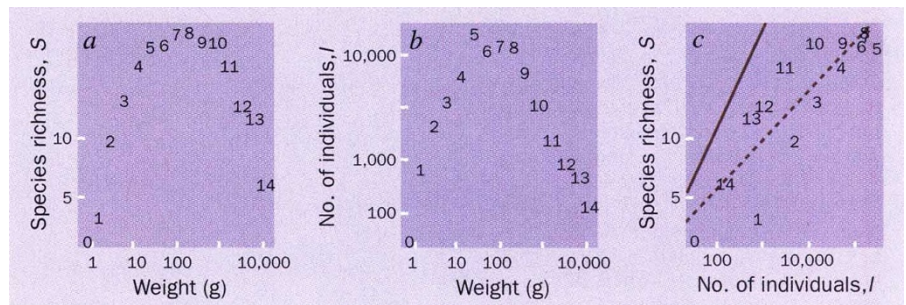
Tom Fenchel

*Marine Biological Laboratory,
University of Copenhagen,
Strandpromenaden 5,
DK-3000 Helsingør, Denmark*

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SIR — Siemann *et al.*¹ showed that, for 1,167 species of grassland insects, a characteristic peak in species richness (*S*) and number of individuals (*I*) occurs at intermediate body size, when species are classified into log₂ size-class intervals. The location of the peaks for *S* and *I* are approximately the same, both for the dataset as a whole, and for a given taxonomic order. Siemann *et al.* also observed a simple relationship between *S* and *I* within size classes ($S = 1.05I^{0.51}$ for the entire fauna). These observations raise the question, among others, of whether the same relationships hold for other groups². We have performed a comparable analysis for demersal fish using trawl survey data from the North Sea³. We also find that peaks in *S* and *I* are coincident (*a*, *b* in the figure), and observe a power-law relation similar to that found by Siemann *et al.* for the Orthoptera ($S = 1.72I^{0.25}$ compared with $S = 1.14I^{0.26}$; *c* in the figure).

Siemann *et al.* concluded that size-biased sampling is unlikely because decreases in species richness and abundance occur in all orders, even though peak body sizes differ by up to 100-fold.



a, Relation between *S* and body weight for individuals classified per log₂ weight class. *b*, Relation between *I* and body weight for individuals classified in log₂ weight classes. *c*, Relation (*S*) and (*I*) in log₂ weight classes. Dashed line, regression fit ($S = 1.72I^{0.25}$, $r^2 = 0.85$, $n = 16$, $P < 0.001$); solid line, overall fit obtained by Siemann *et al.* ($S = 1.05I^{0.51}$). (In all plots, numbers (*n*) identify individuals falling in the weight range $2^n - 2^{n-1}$ g). Data from 312 1-h trawl hauls (24 hauls per year from 1980 to 1993).

They also showed that estimates of asymptotic S_{max} (ref. 4) for within-size class rarefaction curves are close to those actually observed. We could not perform the first of these analyses because there were only 66 species of fish, so orders contain insufficient species and do not differ sufficiently in their body-size distribution. However, analyses of rarefaction curves suggest it is unlikely that we missed many smaller-bodied species.

As Siemann *et al.* note, a unimodal relation between *S* and body size is well known. What is new is that *I* should show a peak at the same location as *S* — a result common to both our analyses. This coincidence could, however, be a sampling artefact owing to the downward bias in estimates of *I* for smaller-bodied animals, resulting from mesh selectivity or differences in catchability with body size. For trawling, the mesh size we used was 30 mm when stretched open (a situation that is rarely the case when fishing), and the decline from the peak in fish abundance occurs at a body length of 70–100 mm. Mesh selectivity may, perhaps, be less likely for insect sweep-netting than fish trawling, but the possibility that individuals of small insect species are less easily dislodged from plants, or that small fish have better refuges from trawling, cannot be entirely discounted. Despite these misgivings, the patterns appear to be very similar for two widely differing taxonomic groups. Thus further efforts to determine the generality of the patterns and to seek explanations for them seem worthwhile.

There is one important difference in the way the two data sets have been treated. Siemann *et al.* assigned each individual of a given species to the body-size category of the oldest life stage, whereas we used the actual body sizes for all individuals. We used the latter approach because many younger individuals will not survive to the oldest life stage. Our data treatment does, nevertheless, present something of a paradox because, although large individuals have to be small at some stage, we do not find all species represented in

the smaller size classes. Part of the explanation for this phenomenon probably lies in the fact that many demersal fish species settle to the sea bed from a pelagic juvenile phase which would not be sampled by a demersal trawl. Because many of the species for which this occurred are relatively rare, however, it may also be that juveniles of these species occur elsewhere and only larger adults range into our sampling area.

Stephen J. Hall*

Simon P. Greenstreet

*SOAEFD Marine Laboratory,
PO Box 101,
Victoria Rd,
Aberdeen AB9 8DB, UK*

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*Present address: School of Biological Sciences, Flinders University of South Australia, GPO Box 2001 Adelaide, SA 5001 Australia. e-mail: stephen.hall@flinders.edu.au

Iron stimulation of Antarctic bacteria

SIR — Recent investigations of the ocean's iron cycle have focused primarily on the response of phytoplankton to iron enrichment¹. Bacteria, however, are important in the trophodynamics and elemental cycles of marine ecosystems^{2,3}. With the exception of phototrophic prokaryotes^{4,5}, the response of bacteria to iron enrichment has largely been ignored. Here we report the results of an iron-enrichment experiment suggesting that the growth of heterotrophic bacteria in Antarctic waters is stimulated by low-concentration additions of iron.

By virtue of their abundance (10^7 to 10^9 cells per litre), high surface-to-volume ratios⁵, and ability to produce Fe-chelating siderophores⁶, heterotrophic bacteria can successfully compete with phytoplankton for available Fe. Iron stimulation of heterotrophic bacteria can lead to