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The Konnevesi symposium on *Clethrionomys* biology

Preface

Small rodents are extremely well suited for studies on general ecological principles. Small rodents have a world-wide distribution, they are — at least at times — often very abundant, and they are easy to catch and to handle. In themselves they are fascinating organisms, but their importance as pest species and disease vectors also necessitates these studies.

This special issue of Annales Zoologici Fennici has grown out of a workshop/symposium, held at Konnevesi Research Station (Finland) on February 6-11, 1984, on the population biology of the various *Clethrionomys* species. The meeting was organized as part of the activities of the NORDMUS-group, founded in 1972 on the initiative of the Nordic Council for Terrestrial Ecology (NCTE; presently Nordic Council for Ecology, NCE). This working group carries out research and organizes meetings on small mammals, particularly on rodents.

Just after the NORDMUS-group was founded, yearly meetings on different aspects of the ecology of small mammals were held. Two larger symposia have earlier been organized as part of the NORDMUS activities: the first on "Biocontrol of Rodents" resulting in a volume edited by Hansson and Nilsson (Ecological Bull., vol. 19, 1975); the second on "Population Dynamics of the Field Vole, *Microtus agrestis*" resulting in a volume edited by me (Oikos, vol. 29(3), 1977).

Why organize a meeting on *Clethrionomys* biology? First, but less important, we have not paid sufficient attention to this genus in the NORDMUS-group. Second, and more important, the various *Clethrionomys* species represent a fairly homogeneous group of organisms having several features distinctly different from, for example, the far more diverse group of *Microtus* species: *Clethrionomys* species eat predominantly seeds and berries — *Microtus* species eat predominantly green vegetation. Further, the social organization of *Clethrionomys* seems to be markedly different from that of most *Microtus* species. The two genera, are, however, similar in the sense that both contain species with populations exhibiting both pronounced multiannual density cycles and non-cyclic densities. A comparison of the biology of *Microtus* species with the biology of *Clethrionomys* species may, therefore, give some better insight into why some microtine populations exhibit pronounced multiannual density cycles. In this sense our symposium (and the present issue of Ann. Zool. Fennici) may be viewed as a counterpart to the Tvärminne meeting (and the special issue of Oikos, vol. 29(3)) except that this one is genus-specific whereas the earlier one was species-specific. Most of the topics discussed from a more general point of view in the present issue of Ann. Zool. Fennici are also discussed, with special reference to *Clethrionomys glareolus*, in the "Ecology of the bank voles" (edited by the late K. Petrusewics; Acta Theriol., vol. 29, Suppl. No. 1). We hope that the Acta Theriol.-issue and the present issue of Ann. Zool. Fennici will supplement each other. The present volume may, in certain respects, also be viewed as a counterpart to the New World *Microtus* volume produced by the American Society of Mammalogy (edited by R.H. Tamarin, 1985): "Biology of New World *Microtus*" (Special Publ. No. 8, Amer. Soc. Mammal.).

When inviting speakers to the Konnevesi-meeting we (Torgny Gustafsson, Jussi Viitala and I) aimed at covering most fields relevant for understanding the ecology of the various *Clethrionomys* species: partly we asked for general reviews of the rather extensive literature on various topics, and partly we asked for summary accounts of some of the more intensive studies on *Clethrionomys*. In all cases, speakers were asked to prepare talks which confronted ideas found in the *Clethrionomys* literature with pertaining data. For this purpose it was necessary to ask some authors to write joint papers. Some of these authors had never collaborated. It is a pleasure to see that these combined authorships were successful. In order to make this collection of papers as complete as possible, some papers — not presented at the meeting — have also been added.

As can be seen from Tables 1 and 2, studies *en large* on the listed genera (*Clethrionomys, Lemmus, Microtus, Apodemus, Peromyscus* and *Mus*) concentrate on *Microtus* (27.8%) and on *Mus* (26.8%); *Peromyscus* (17.7%) and *Clethrionomys* (13.3%) rank as the third and fourth most studied genera. *Microtus* has, as already mentioned, got its volume as has *Mus* (Berry, R.J. 1981: "Biology of the house mouse", Academic Press) and *Peromyscus* (King, J.A. 1968: "Biology of *Peromyscus* (Rodentia)", Special Publ. No. 2, Amer. Soc. Mammal.). *Clethrionomys* as a genus has so far not had its summary volume. Hence, we felt a need for such one: part of this need, we hope, is met by the present issue of Ann. Zool. Fennici.

As to studies of *Clethrionomys* and *Apodemus* combined there are as many studies on these two genera combined as there are on *Microtus* or *Mus* separately; the forthcoming *Clethrionomys/Apodemus* volume edited by Flowerdew, Gurnell & Gipps (Oxford Univ. Press) seems, therefore, highly justified. But, contrary to *Peromyscus* and *Apodemus, Clethrionomys* has a world-wide distribution (see maps, pp. 216-217), and is in this respect similar to *Microtus* (Corbet 1978; see p. 219). The scope of the papers included in this issue of Ann. Zool. Fennici and of those in the volume edited by Flowerdew et al. are therefore slightly different: the latter is more comparative than the former. Indeed, the two meetings — and the resulting publications — were planned in close cooperation so as to avoid too much overlap. We hope the two will supplement each other.

It is, further, of interest to note from Table 2 that the ranking of the total number of studies on these species also corresponds to the ranking of the species subdivided by various topics of study: for all species, studies on reproduction dominate whereas the social organization is the least studied topic. As can be seen, studies on social organization of *Clethrionomys* are virtually not represented, whereas population dynamics are fairly well studied. We hope that the present issue has succeeded in pointing out the most serious shortcomings; see the concluding section (pp. 393-395). In particular, we hope that if someone wants to start an ecologically oriented study on *Clethrionomys*, they will find several exciting problems to work on by reading the present issue of Ann. Zool. Fennici.

Table 1. Literature survey on studies on Population dynamics, Reproduction, Reproductive physiology, Sociobiology/Social biology/Social organization, and Space use/Dispersal/Spacing for six small rodent genera during the last 15 years (BIOSIS data-base). Number of publications using the entries in the table as key-words are listed for the three periods 1969-76, 1977-80, 1981-83; notice that the latter is shorter than the two previous periods. Numbers in parentheses after "population dynamics", etc., represent the total numbers — for any organism — with that entry in the data base; notice in particular that "population dynamics", "reproduction" and "reproductive physiology" cover both botanical and zoological studies. Similarly, numbers after the genera-names represent the total numbers with that entry in the data base. Due to time lags in updating the data base some references may also be missing for the latter time-interval.

	1969-76	1977-80	1981-83	1969-83
Population dynamics (4681)				
Clethrionomys (1333)	12	21	11	44
Lemmus (224)	0	2	2	4
Microtus (2781)	11	29	26	66
Apodemus (1210)	14	2	2	18
Peromyscus (1765)	9	13	8	30
Mus (2680)	9	9	6	24
Reproduction (19566)				
Clethrionomys	32	38	20	90
Lemmus	0	14	21	35
Microtus	36	81	55	172
Apodemus	15	18	10	43
Peromyscus	21	46	29	96
Mus	15	26	22	63
Reproductive physiology (1965)				
Clethrionomys	0	2	2	4
Lemmus	2	3	0	5
Microtus	1	10	7	18
Apodemus	0	0	0	0
Peromyscus	0	6	3	9
Mus	0	4	1	5
Sociobiology/Social biology/Social organization (772)				
Clethrionomys	0	1	0	1
Lemmus	0	0	0	0
Microtus	1	4	4	9
Apodemus	1	2	0	3
Peromyscus	0	2	0	2
Mus	2	1	2	5
Space use/Dispersal/Spacing (18539)				
Clethrionomys	5	10	11	26
Lemmus	0	0	1	1
Microtus	11	31	3	45
Apodemus	2	5	8	15
Peromyscus	6	25	11	42
Mus	2	11	11	24

Table 2. Selected information from Table 1 for the last 15 years (1969–83) presented as percentages: the left figures relative to all studies on the five topics for the particular genus, and the right figures relative to all studies on the listed genus for the particular topic.

Genus	All studies	Population dynamics	Reproduction	Reproductive physiology	Social organization	Space use	Total
Clethrionomys	13.3	26.7/23.7	54.5/18.0	2.4/9.8	0.6/5.0	15.8/17.0	100
Lemmus	2.3	8.9/2.2	77.8/7.0	11.1/12.2	0/0	2.2/0.7	100
Microtus	27.8	21.3/35.5	55.5/34.5	5.8/43.9	2.9/45.0	14.5/29.4	100
Apodemus	12.1	22.8/9.7	54.4/8.6	0/0	3.8/15.0	19.0/9.8	100
Peromyscus	17.7	16.8/16.1	54.6/19.3	3.4/22.0	1.1/10.0	23.5/27.5	100
Mus	26.8	19.8/12.8	52.1/12.6	4.1/12.1	4.1/25.0	19.8/15.7	100
Total	100	100	100	100	100	100	

Table 3. Geographic location of major ecological study sites frequently referred to in the papers on *Clethrionomys*-biology in this issue.

A. Study sites listed in the sequence of the papers in this issue (see list of contents for titles). Reviews contain data compiled from a variety of locations.

Henttonen et al. 221-227: Review.
Fuller 229-241, 243-245: Canada, Heart Lake 60°50'N 116°40'W.
Mihok et al. 257-271: Canada, Pinawa 50°11'N 96°01'W.
Gustafsson & Batzli 273-276: Sweden, Revinge 56°42'N 13°28'E, Ammarnäs 66°58'N 16°10'E.
Hansson & Henttonen 277-288: Review.
Stenseth & Gustafsson 289-301: Review.
Gustafsson 303-308: Review.
Ims 309-312: Norway, Finnmark 69°08'N 29°10'E.
Hansson 315-318: Review.
Hansson 319-328: Sweden, Revinge 55°42'N 13°28'E, Uppsala 59°50'N 17°45'E, Strömsund 64°10'N 15°30'E.
Bujalska 331-342: Poland, Crab Apple Island 54°40'N 21°35'E.
Gipps 343-351: Review.
Ylönen & Viitala 353-358: Finland, Konnevesi 62°15'N 26°26'E.
Viitala & Hoffmeyer 359-371: Review.
Bondrup-Nielsen 373-383: Review.
Bondrup-Nielsen & Karlsson 385-392: Review.

B. Study sites frequently referred to in the papers in this issue. The names of researchers refer to authors in this issue who have worked in these areas and/or to other people whose data are frequently referred to.

Ammarnäs, Sweden 66°58'N 16°10'E, L. Hansson, T. Gustafsson.
Karelia, USSR 62°–62°30'N 33°E, E. V. Ivanter.
Kilpisjärvi, Finland 69°03'N 20°49'E, O. Kalela, J. Tast, J. Viitala, H. Henttonen.
Kirkenes, Norway 69°45'N 30°01'E, L. Hansson.
Lednice, Czechoslovakia 48°48'N 16°48'E, J. Zejda.
Kola Peninsula, USSR 67°30'N 33°E, T. V. Koshkina, O. Semenov-Tjan-Shanskij.
Konnevesi, Finland 62°15'N 26°26'E, J. Viitala, H. Ylönen.
Pallasjärvi (Muonio), Finland 68°03'N 24°09'E, H. Henttonen.
Revinge, Sweden 56°42'N 13°28'E, L. Hansson, T. Gustafsson, I. Hoffmeyer.
Sodankylä, Finland 67°20'N 26°35'E, L. Hansson.
Sotkamo, Finland 63°54'N 28°26'E, H. Henttonen, A. Kaikusalo.
Strömsund, Sweden 64°10'N 15°30'E, L. Hansson.
Uppsala, Sweden 59°50'N 17°45'E, L. Hansson.
Vesterålen, Norway 68°30'N 15°37'E, L. Hansson.
Vittangi, Sweden 67°40'N 21°38'E, L. Hansson.
Wytham Woods, England 51°46'N 01°16'W, H. N. Southern, J. H. W. Gipps.

Table 3 is provided in order to facilitate the reading and improve the understanding of the various papers included in this special issue. Here locations of study sites discussed or frequently referred to are listed with geographical coordinates.

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The success of the Konnevesi meeting was made possible by the skills of many people. First of all, Torgny O. Gustafsson and Jussi Viitala helped greatly in planning and organizing the symposium. Jussi Viitala, with the able help of the staff at Konnevesi Research Station, handled the many executive problems of the meeting with great care and success.

The meeting and the volume would, however, have been impossible without grants from the Nordic Council for Ecology (NKE), Nordic Research Grants (NOS), Natural Science Research Council of Sweden (NFR), the Academy of Finland, the Ministry of Education in Finland, the Boreal Institute for Northern Studies of the University of Alberta, the Royal Holloway College (London University) and the Departments of Biology in Jyväskylä and Oslo.

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Nils Chr. Stenseth
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