

## ***Calathus mollis erythroderus* Gemminger & Harold in Drenthe (Coleoptera, Carabidae)\***

by

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**ABSTRACT.** — *Calathus mollis erythroderus* Gemminger & Harold is caught in Drenthe in cultivated fields. Up till 1973 this subspecies was not mentioned from areas west of the Weser (Germany). Most individuals are macropterous (80-90%) here and are found in "abandoned" cultivated fields; it is not yet recorded from natural sites in Drenthe. *Calathus melanocephalus* Linnaeus and *C. m. erythroderus* reproduce during the same period of the year and in most places they are living in mixed populations. It is possible to cross-fertilize the species and there is evidence that this also occurs in the field. Possibly this subspecies has been extending in Drenthe during the last few years.

*Calathus mollis erythroderus* Gemminger & Harold is a subspecies of *C. mollis* (Marsham) and until very recently catches of this subspecies were only known from Central Europe (east of the Weser), Sweden and the north of Italy. From Western Europe, however (for instance: Norway, the Netherlands) only *C. m. mollis* was known (Lindroth, 1945, 1974, Freude et al, 1976).

Starting from 1972 and 1973, respectively, the agricultural use of several cultivated fields (pastures and arable land) in the province of Drenthe, the Netherlands, ceased and they were involved in our investigations on the population-ecology of carabid beetles. These fields, which are bordering a large heath-area — the Kraloër Heide — are destined to develop gradually into a heath, and are thus managed accordingly: the arable land is mowed each year (the hay is removed), and the pastures are grazed by sheep (without additional manuring). We intend to follow the changes in the carabid fauna, both qualitatively and quantitatively, that result from the demineralization process. In these fields mixed populations of *C. m. erythroderus* and *C. melanocephalus* are present (table 1a). In one experiment, in which many pitfalls are used, large numbers of *C. m. erythroderus* were collected (table 1b).

*C. m. mollis*, the subspecies only known from West Europe (Lindroth 1949), is absent from these fields and up till now was not caught in Drenthe, except a single migrant. In the Netherlands populations of *C. m. mollis* are living almost exclusively in the first rows of dunes bordering the North Sea. As far as known *C. m. erythroderus* is nowhere living sympatric with *C. m. mollis* (only in the island of Bornholm both subspecies are found, but probably not in the same sites, Lindroth 1949). As contrasted with *C. m. mollis* from the sea-dunes *C. m. erythroderus* has a more widened right paramere and an entirely rufous pronotum and therefore resembles *C. melanocephalus* (much more for the differences between both species, see below). *C. m. erythroderus* and *C. melanocephalus* appear to reproduce during the same period of the year (from August down to November) although *C. melanocephalus* somewhat earlier (August and September) than *C. m. erythroderus* (September and October). In the extensive heath-area bordering these fields (and also in other natural sites in Drenthe), we only met *C. melanocephalus*, and so it is concluded that *C. m. erythroderus* does not live in more or less natural sites.

Because of the greatly overlapping reproductive cycles of these closely related carabid beetles (only after a close examination there can be discriminated between them) we decided to compare the ecology of both species within these mixed populations (the results will be published elsewhere). At present we only record some striking points. Apart from many similarities (e.g. the colour of the pronotum) only a few differences between both species can be mentioned, viz.:

- a. The head of *C. m. erythroderus* is not quite as black as in *C. melanocephalus*, but dark brown and contrasts with the clear rufous pronotum as in *C. melanocephalus*; the elytra of this subspecies are generally brown to dark brown.

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Table 1. Number of brachypterous (brach.) and macropterous (macr.) individuals of *Calathus mollis erythroderus* and *Calathus melanocephalus*.

A) caught with a standard set* of pitfalls on an "abandoned" cultivated field						
year	<i>Calathus mollis erythroderus</i>			<i>Calathus melanocephalus</i>	% mollis	% melanoc.
	macr.	brach.	total	only brach.		
1972	0	0	0	25	0	100
1973	6	2	8	60	11.8	88.2
1974	2	1	3	47	6.0	94.0
1975	6	0	6	17	26.1	73.9
1976	21	5	26	18	59.1	40.9
1977	33	6	39	27	59.1	40.9

  

B) caught with 46 pitfalls (∅ 10 cm) at the circumference of a circular fence (∅ 30 meter)						
1975	590	76	666	346	65.8	34.2

\*A standard set of pitfalls is composed of two live-traps and one funneltrap (in the middle), each with an effective circumference of 100 cm and buried into the soil at mutual distances (in a straight line).

- b. Most specimens of *C. m. erythroderus* are full-winged (macropterous) (80-90%). A few individuals have been caught in window-traps, so we are sure that at least some of them are capable of flying. In Drenthe *melanocephalus* is nearly completely brachypterous (99.8%).
- c. The apex of the right paramere of *C. m. erythroderus* is unarmed or only with a very small hook, in contrast with the paramere of *C. melanocephalus*, which is more widened and sharply hooked.
- d. The episterna of the metathorax of *C. m. erythroderus* are longer than those of *C. melanocephalus*.

After some experience other small differences can be found in the shape of the pronotum, the colour of the sternites and the curvature of the elytra.

The presence in the same season and in mixed populations raised the question whether *C. m. erythroderus* could be crossed with *C. melanocephalus*. Both from hybridization experiments and from field data it became evident that the two species can be cross-fertilized and that this also occurs in the field. In the laboratory it was possible to cross unfertilized females of *C. m. erythroderus* with males of *C. melanocephalus*, resulting in a progeny composed of specimens of *C. melanocephalus* (brachypterous) and of *C. m. erythroderus* (brachypterous and macropterous) and of specimens with characters of both species. The same results were obtained from eggs of females of *C. m. erythroderus* sampled from the field in the middle of the reproduction period and consequently we were sure that they were fertilized in the field either by males of *C. m. erythroderus* or by males of *C. melanocephalus*. These females were kept without males in the laboratory to deposit their eggs that were subsequently bred.

The case of ♂ *C. m. erythroderus* × ♀ *C. melanocephalus* results in a progeny only consisting of *melanocephalus*-like individuals (all brachypterous).

Finally we have indications that from 1972 onwards *C. m. erythroderus* has been extending in Drenthe, for, especially in 1976 and 1977, this species was found in several new sites (also aban-



doned cultivated fields). The last 10 years in Drenthe more and more arable land is withdrawn from the agricultural destination. After several years these "abandoned" fields become apparently suitable for *C. m. erythroderus*. Therefore we expect that an increase of "abandoned" agricultural fields will result in an increase of the number of settlements of *C. m. erythroderus* in Drenthe. We wonder whether in the future this carabid beetle will succeed in settling in more natural sites too.

## REFERENCES

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HOLLOWAY, J. D., 1977, THE LEPIDOPTERA OF NORFOLK ISLAND THEIR BIOGEOGRAPHY AND ECOLOGY . - *Series entomologica* vol. 13: VI + 291 pp., 140 afb., literatuurlijst ca. 230 titels, onderwerpenregister 5 kolommen, taxonomisch register 12 kolommen. Dr. W. Junk B.V., the Hague. ISBN 90-6193-124 X. Prijs (gebonden): f 85,-.

Norfolk Island is een klein zeer geïsoleerd eiland (oppervlakte: 34 km<sup>2</sup>) in de Pacifische Oceaan, gelegen tussen Nieuw Zeeland en Nieuw Caledonië. In 1971 bracht de auteur een bezoek van drie weken aan dit eiland. In deze periode verzamelde hij vlinders met behulp van UV lichtvallen. Na zijn vertrek werd dit werk voortgezet door het echtpaar Jowett, waardoor een totaal van bijna 100.000 exemplaren van meer dan 120 vindplaatsen werd bijeengebracht. In dit boek worden alleen de Rhopalocera (12 soorten) en de „macroheterocera" (86 soorten) behandeld; van de 87 Pyralidae en de microlepidoptera wordt alleen een voorlopige naamlijst gegeven.

De eerste hoofdstukken over het klimaat, de geologie, en de geschiedenis van het eiland met betrekking tot de flora en fauna sinds de ontdekking door James Cook in 1774, zijn informatief en boeiend.

In het taxonomische gedeelte worden verreweg de meeste „macroheterocera" beschreven en afgebeeld door foto's, terwijl voor vele soorten tekeningen van de mannelijke genitaliën, en voor enkele van de vrouwelijke genitaliën, gegeven worden. Dat hier tevens enige nieuwe taxa beschreven worden, die niet op Norfolk Island maar op andere Pacifische eilanden voorkomen (bijv. acht soorten van het genus *Schrankia*) wekt wel enige bevreemding; deze beschrijvingen horen eigenlijk in het boek niet thuis.

Na het taxonomische gedeelte worden analyses gegeven van de lokale en wijdere verspreiding en van de diversiteit van de „macroheterocera" van Norfolk Island. In het hoofdstuk over de biogeografie worden de geografische elementen van de vlinderfauna van het eiland onderscheiden door middel van singlelinkage cluster analysis. Op grond van een analyse van de verspreidingspatronen op Norfolk Island zelf worden naast de migranten twee categorieën, nl. van wijd verspreide soorten en van bossoorten, onderscheiden. Een van de meest interessante hoofdstukken van het boek is dat over de ecologische diversiteit, waarin een bediscussie van de recente literatuur voorafgaat aan een analyse en discussie over de diversiteit van de vlinderfauna van Norfolk Island, die m.i. van belang is voor de studie van diversiteit in het algemeen.

In een appendix van 16 pagina's wordt een overzicht gegeven van hetgeen bekend is over de andere groepen van insecten die op het eiland voorkomen.

Voor taxonomen die werken aan de vlinderfauna van het Pacifische gebied is dit een onmisbaar boek, maar ook voor biogeografen die in eilandfauna's geïnteresseerd zijn wordt het van harte aanbevolen. — J. P. Duffels.