

On a new species of *Agrodiaetus* (Lycaenidae) from Southern Italy*)

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Introduction

The taxonomy of the Lycaenid genus *Agrodiaetus* has been extensively studied by lepidopterists in the last 20 years from both the morphological (Forster, 1956, 1960, 1961) and the cytological point of view (de Lesse, 1957, 1959a, 1959b, 1959c, 1959d, 1959e, 1959f, 1960a, 1960b, 1960c, 1961a, 1961b, 1962a, 1962b, 1963a, 1963b, 1963c). In very recent times, however, further investigations have brought to evidence the existence of new taxa even among the well known south European fauna (Toso & Balletto, 1976; Brown, 1976a, 1976b, 1977).

At the present time five taxa are known to occur in Italy; three of these (*A. damon* (Denis & Schiffermüller), *A. damon* Hübner and *A. d. virgilius* (Oberthür have a dimorphic, upperside blue, male. The remaining two, *A. ripartii exuberans* Verity and *A. humadasae* Toso & Balletto, belong to the *ripartii* group of sibling-species (De Lesse, 1960c).

The discovery of a *ripartii*-like population of *Agrodiaetus* on mount Pollino (Lucania, Southern Italy) (Gallo & Della Bruna, 1974), later confirmed by other researchers (Parenzan, 1975; Gallo & Della Bruna, 1977) is therefore of great interest. Such population, in fact, is largely allopatric in respect to the nearest known population of *A. ripartii* (of the south western Alps); a detailed study of their morphology and cariology could therefore result interesting from both the evolutionary and the taxonomic point of view.

Characters selected

By the time being, a good deal of evidence has accumulated to demonstrate that no particular kind of character must be considered of fundamental theoretical importance in distinguishing species. With particular reference to the genus *Agrodiaetus* Hübner, the genitalic morphology is now known to be able to give, in some instances, good indications (Brown, 1976b, 1977), but is often of little help and unable to provide unequivocal information. Although the karyotypic analysis has been extensively used to separate species, it is not able, by itself, to establish in any case specific differences. The high chromosome number existing in many *Agrodiaetus* taxa and

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karyotypic polymorphism, provide in fact some margin of error to such studies. Genetical analysis, which is now quickly developing by means of electrophoretic techniques, should provide more reliable information, but it cannot be performed in the field or with field-preserved materials and needs detailed information for several related taxa of the gene-enzyme systems involved. On the other hand Mayr (1970) and Selander & Johnson (1973) have criticized the use of differentiating species on the basis of the number of protein differences between them, when this is not supported by other characters.

In such situation, who resolved to use all available morphological and cytological characters, also investigating on some less usual ones, as androconial scales (Beuret, 1957; Eliot, 1973; Kudrna, 1977), palpi (Eliot, 1973) and tegulae (Ehrllich, 1958). Some of these were previously used only at the family or subfamily level. An electrophoretic study is programmed for the future.

Agrodiaetus galloi **sp. nov.**

Agrodiaetus ripartii (Freyer), *sensu* Gallo & Della Bruna, 1974

Agrodiaetus ripartii exuberans Verity, *sensu* Parenzan, 1975

Agrodiaetus ripartii (Freyer), *sensu* Gallo & Della Bruna, 1977

Agrodiaetus sp., *sensu* Balletto *et al.*, 1978

Holotypus: a male specimen, collected in the massif of moudt Pollino, Lucania, southern Italy, loc. Piano di Ruggio, 1550 m, E. Balletto & G. Toso *leg.*, 21. vii. 1977. Forewing 16,3 mm, rather pointed.

Upperside colour olive chestnut-brown with darker upper nervular linings that are more distinct on the hind wings. Sex brand bilobate, extending to the whole proximal half of the forewing. Discoidal bars vestigial on both wings. Fringes brownish.

Underside ground colour warm sandy-brown, more greyish along the anal margins of forewings. Dark points of the postdiscal series reduced in size, smallest on the hindwings, arranged to form a rather regular curve, with



Fig. 1 Holotypus (left) and Allotypus (right) of *Agrodiaetus galloi*.

medial concavity, on the anterior ones, five in number on the forewings, seven on the hind ones, each narrowly white-ringed. Hindwings with a shaded white stripe running from the wing base to its outer edge, through the cell and space 3. Discoidal bar of forewings angled in the middle, ringed white and thin; discoidal bar of hindwings vestigial, its white periphery remaining but very reduced. Praemarginal markings of both wings vestigial; green basal dusting virtually absent. Fringes cream-white.

Antennae narrowly white-ringed, clubs blackish-brown on the upperside, reddish underneath.

Palpi pointed, black scaled on the upperside, white beneath; second joint with longer white scales mixed to a few black bristles.

Eyes hairy.

Allotypus: a female specimen, data as for holotype; forewing less pointed, 16 mm long.

Upperside colour as in holotype, discoidal bars faint, but visible on the forewings, vestigial on the hind ones. Praemarginal markings of the hindwings inconspicuous, reduced to six shadowy maculae. Fringes cream-white on both sides of wings.

Underside ground colour similar to male, but more brown in tone, tinged red. Internervular postdiscal points almost black, larger and six in number on the forewings, seven on the hind ones. Discoidal bar of forewings lighter brown than postdiscal spots; no such markings on the hindwings. All spots of both wings ringed white.

Praemarginal markings vestigial on the forewings, faint, but visible, on the hind ones. Tornus of hindwings truncate.

Antennae, palpi and eyes as in holotype.

Paratype: 157 specimens (94♂♂, 63♀♀) as specified below:

- 2♂♂, M. Pollino, Vallone Malvento, E. Balletto & G. Toso leg., 21. vii. 77
1600 m,
6♂♂, 4♀♀, id, Piano di Ruggio, 1550
m, E. Gallo leg., 8. viii. 1969
1 ♂ : id, loc. Belvedere, 1600 m, E. Gallo leg., 14. viii. 1970
2♀♀: id., E. Gallo leg., 16. viii. 1970
14♂♂, 4♀♀: id., E. Gallo leg., 28. vii. 1975
5♂♂, 5♀♀: id., E. Gallo leg., 27. vii. 1977
36♂♂, 25♀♀: id., G. & C. Della Bruna leg., 26. vii. 1972
8♂♂, 1 ♀: id., L. Cassulo leg., 14. viii. 1970
12♂♂, 12♀♀: id., Timpone della Capanna, P. Parenzan leg., 1. viii. 1972
1♂, 2 ♀: M. Pollino, 2150 m, E. Balletto & G. Toso leg., 24. vii. 1977
1♂: Campo Tenese (Cosenza), 900 m, E. Balletto & G. Toso leg., 22. vii. 1977
1♂: massif of Orsomarso (Lucania), P. Campolungo, 1350 m, E. Gallo leg. 8.
viii. 1977

Discussion

Agrodiaetus galloi is easily distinguished from all other known species of the same genus, on both morphological and cytological grounds. The more closely related species could be *A. demavendi* Pfeiffer (n = 70), which occurs in Iran and northeastern Anatolia (De Lesse, 1960 c). They are, however, distinguishable from each other, by the presence, in the latter, of four (rather than two) pairs of larger chromosomes and by morphological features (see Part 2 in this same paper). Among all Italian species, *A. galloi* could be

mistaken only for *A. ripartii* (Freyer) (n = 90; de Lesse, 1960a, 1960c, 1961a). Good taxonomic characters are provided by the dimensions of the points of the postdiscal series on the underside of hindwings, by the warmer

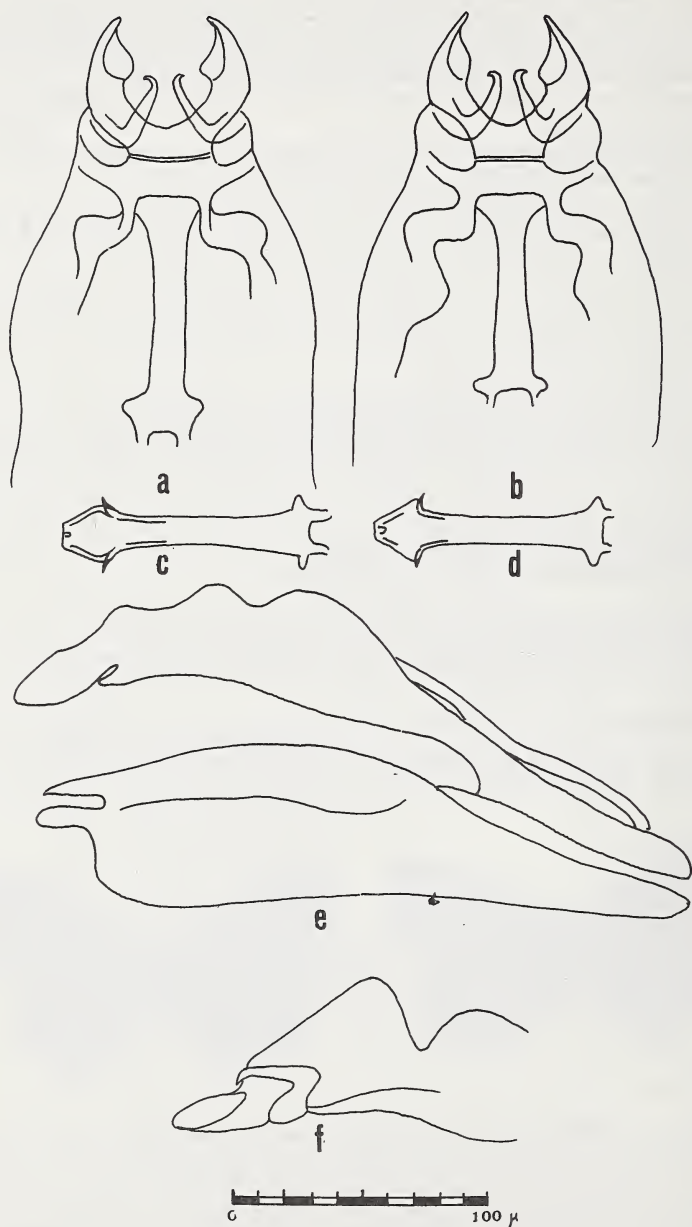


Fig. 2 Male genitalic structures of *A. galloi*. a, b = dorsal view; c, d = aedeagus; e = lateral view; f = medial view.

underside colour of *A. galloi* and by the stronger reduction that the latter generally shows in the green basal dusting of the four wings. Besides the obvious differences in the chromosome number, further taxonomic support is provided also by the shape of tegulae (figs. 3 and 4) and by the shape and size of androconial scales (fig. 6). Male genitalic structures are of little help to distinguish from each other the Italian monomorphic taxa belonging to the *ripartii* group of sibling species.

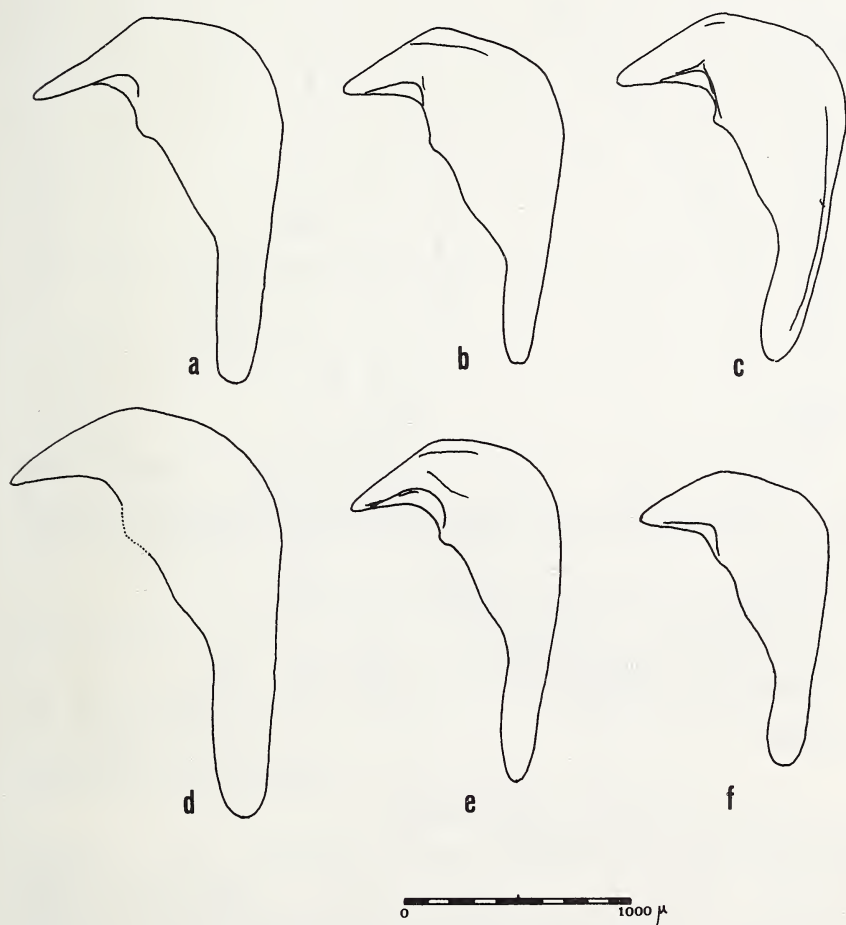


Fig. 3 Shape of tegulae in some monomorphic species of *Agrodiaetus*. a = *A. humedasae* (Pondel, Cogne, Aosta Valley, N. Italy, 29. VII. 1976, Balletto & Toso leg.), b = *A. fabressei agenjoi* (Taradell, Cataluna, Spain, 21. VII. 1965, Villarubia leg.), c = *A. galloi* (Piano di Ruggio, M. Pollino, Lucania, S. Italy, 21. VII. 1977, Balletto & Toso leg.), d = *A. admetus* (Budapest), e = *A. ripartii exuberans* (Gouta, Imperia, N.W. Italy, 13. VIII. 1974, Balletto & Toso leg.), f = *A. ripartii ripartii* (Jaca, Sierra de la Pena, Huesca, Spain, 3—5. VIII. 1974, Gallo leg.)

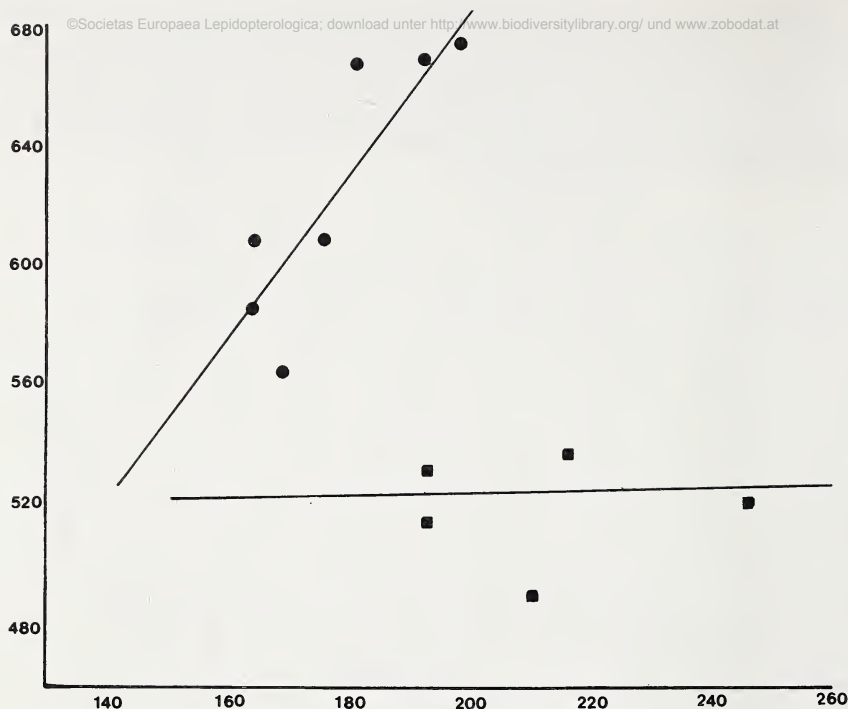


Fig. 4 Length (ordinates) and width (abscissae) of the posterior process of tegulae in *A. ripartii exuberans* Verity (solid circles) and *A. galloi* sp. nov. (squares).

The equations of regression lines are respectively:

$$y = 137.9545509 + 2.734148823 x, \text{ for } A. \textit{ripartii exuberans} \text{ and}$$

$$y = 519.1612148 + 0.035801886 x, \text{ for } A. \textit{galloi}$$

The covariance analysis has given $F = 11.747^{**}$ ($P = 0.01$)

Diagnosis

A. galloi: a medium-little sized species of *Agrodiaetus* (fw. 13.5–17.5 mm), with evident sex brand on male forewings.

Upperside brown in both sexes.

Forewing length 15.0 — 17.5 mm in males, 13.5 — 16.3 in females. Individual variation feeble; postdiscal series of dark points on the underside of forewings usually lacking, in males, the point of space 1b (70 % of specimens), for showing it in a reduced form. The point of space 6 is absent in 70 % of male hindwings.

A single male specimen of the paratypic series (M. Pollino, Belvedere di Piano di Ruggio, 1600 m, 14. viii. 1970, L. Cassulo leg. and Coll.), shows a paler, bluish-brown area on the discal region of the upperside of forewings, due to the presence of several depigmented sacs.

Sexual dimorphism feeble: females lack the sex brand of forewings and show darker underside ground colour, blackish and larger forewing postdiscal points and discoidal bars, faint, but visible praemarginal

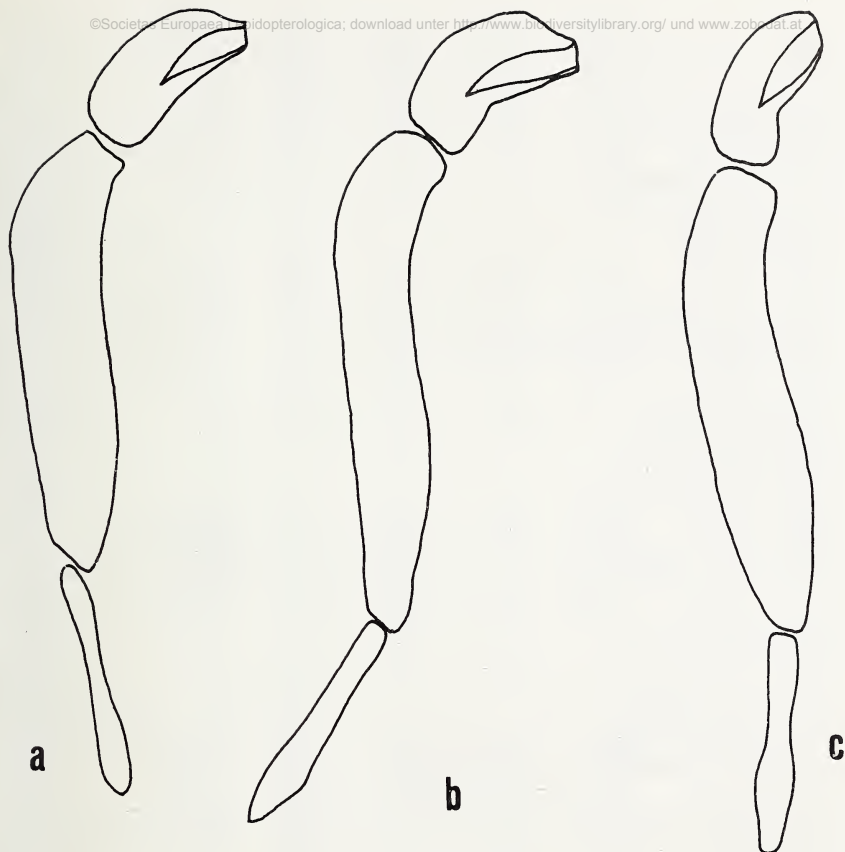


Fig. 5 Shape of *palpi* in the Italian monomorphic species of *Agrodiaetus*.
a = *A. humedasaе* Toso & Balletto, b = *A. ripartii exuberans* Verity,
c = *A. galloi* sp. nov.
(Scale as in figs. 2 and 3)

markings on the hindwings, truncate or feebly concave tornus and clearer wing fringes.

Genitalia as in fig. 2.

Tegulae as in fig. 3; posterior process short and broad.

Palpi as in fig. 5; second joint long and slender.

Androconia battledore shaped, lanceolate, generally 50 x 17 u (fig. 6).

Underside warm sandy-brown, darker and more reddish in females; hindwings with a well defined white stripe diagonally placed from the wing base to its outer edge. Dark points of the postdiscal series smallest on the hindwings; green basal dusting reduced to vestigial Androconial scales battledore shaped, lanceolate, small (50 x 17 u); tegulae with a short and rather stout posterior process.

	1	2	3	4
<i>Agrodiaetus galloi</i>	6.3	0.8	0.4	2.0
<i>Hesperia comma</i>	0.1	0.4	—	—
<i>Ochlodes venatus</i>	—	—	—	1.5
<i>Pyrgus alveus</i>	0.1	—	0.6	—
<i>Iphiclides podalirius</i>	—	—	—	0.5
<i>Pieris brassicae</i>	0.5	—	—	—
<i>Artogeia rapae</i>	0.3	—	0.2	1.0
<i>Colias crocea</i>	0.2	—	—	0.5
<i>Colias australis</i>	0.6	0.4	0.4	1.0
<i>Heodes virgaureae</i>	—	2.0	1.0	4.0
<i>Palaeochrysophanus hippothoe</i>	—	—	1.0	—
<i>Aricia agestis</i>	—	—	0.2	—
<i>Lysandra dorylas</i>	1.5	0.8	1.6	—
<i>Lysandra coridon</i>	5.1	0.8	—	2.0
<i>Polyommatus icarus</i>	—	—	—	1.5
<i>Meleageria daphnis</i>	—	—	0.2	—
<i>Nymphalis polychloros</i>	—	—	—	0.5
<i>Aglais urticae</i>	—	0.4	0.8	—
<i>Mesoacidalia aglaja</i>	—	3.2	1.0	2.5
<i>Fabriciana niobe</i>	—	4.0	1.0	15.5
<i>Issoria lathonia</i>	—	—	—	0.5
<i>Pandoriana pandora</i>	—	—	—	0.5
<i>Argynnis paphia</i>	—	—	—	1.0
<i>Melanargia galathea</i>	—	—	—	2.5
<i>Melanargia russiae</i>	3.8	1.2	0.4	1.0
<i>Hipparchia hermione</i>	0.9	1.6	0.6	2.5
<i>Hipparchia semele</i>	0.6	—	—	2.5
<i>Satyrus ferula</i>	9.9	—	—	4.0
<i>Erebia cassioides</i>	3.7	18.0	5.0	4.0
<i>Erebia gorge</i>	—	—	1.0	—
<i>Hyponephele lycaon</i>	1.2	—	—	1.0
<i>Coenonympha dorus</i>	—	0.4	—	—

Tab. 1 — Caenological data obtained for *Rhopalocera* in four areas of the massif of Mt. Pollino. 1 = Serra del Prete (*Sesleria* — *Xerobromeion apenninum*), 2 = Mt. Pollino, 2000 m (same phytosociological unit), 3 = Mt. Pollino, 2200 m (summital screes), 4 = Vallone di Malvento (beech-wood clearings). Data in number of specimens/hectar.

Depository of types

Holotypus and Allotypus: Museo Civico di Storia Naturale Giacomo Doria, Via Brigata Liguria 9, Genova, Italy. Paratypes: Colls. E. Balletto, G. Toso, E. Gallo, C. Della Bruna, P. Parenzan and I. Cassulo

Derivatio nominis

We take pleasure in dedicating this new species to its first discoverer, our friend Enrico Gallo, who most willingly made available his collection for this research. He also collected much of the type material.

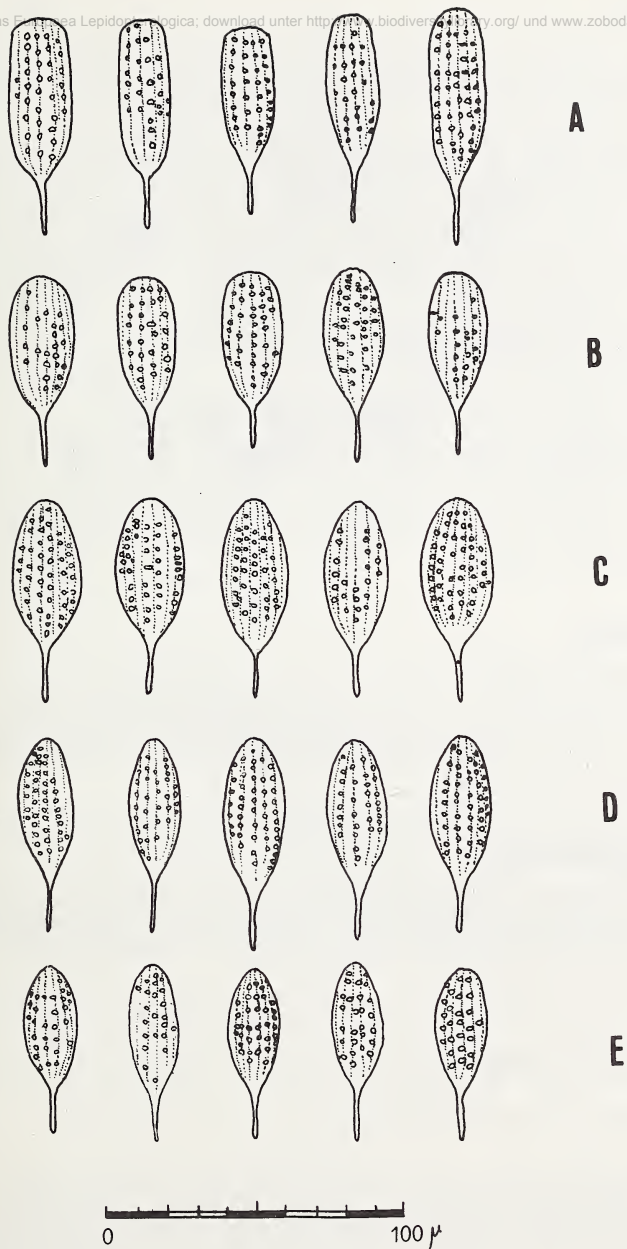


Fig. 6 Androconial battledore scales in some monomorphic species of *Agrodiaetus* (predominant shapes outlined).

a = *A. fabressei agenjoi*, b = *A. admetus*, c = *A. humedasae*, d = *A. ripartii exuberans*, e = *A. galloi* (data as in fig. 3)

The ecology of *A. galloi* was investigated in the field on four different localities of the massif of Mt. Pollino: Vallone di Malvento (1600 m), Serra del Prete (1750-1800 m), Mt. Pollino (2000 and 2200 m).

The vegetational cover of the studied areas is represented, in two instances (Serra del Prete, Mt. Pollino 2000 m) by the phytosociological sub-alliance *Seslerio-Xerobromeion apenninum* Bruno, 1968; *A. galloi* was found, however, also in neighbouring formations, as some beech-wood clearings (Vallone del Malvento) at the upper limits of forested areas and in the summital screes of the northern slopes of Mt. Pollino (2200 m). This new species was always found more abundant at altitudes between 1750 and 1900 m, on sunny, semiarid, south exposed slopes; in such situations it may represent a co-dominant entity (Serra del Prete). Male specimens were often observed to rest on flowers of *Echinops ritro* L., *Lavandula angustifolia* Miller, *Sedum* sp.; females seemed to prefer the dead stems of graminaceous plants, as *Sesleria apennina* Ujhelyi or *Asteraceae*. The same conditions were observed also at Piano di Ruggio (1550 m); at the lowest altitudes (1100-1600m) *A. galloi* may fly together with *A. dolus virgilius* (Oberthür) and enters down into the horizon of oak trees (Campo Tenese, 1100 m). Some coenological data are reported in tab. 1 (see also Balletto *et al.*, 1978).

Distribution

Agrodiaetus galloi is so far known only from the massif of Mt. Pollino and from the Orsomarso Mts. (Piano di Campolungo, 1350 m); we think however that it could be discovered also in other, more southern regions of the Calabrian Apennines.

Acknowledgments

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Karyotypic analysis

G. TROIANO & M. A. GIRIBALDI

Preparations were made from 20 abdomens of male specimens fixed in the field in 3:1 absolute alcohol and glacial acetic acid. This material was then transferred in 70 % alcohol after about 12 hours and stored at 0° C. The abdomens were dissected in this same preserving liquid; testes were drawn and placed in a 1:1 glacial acetic acid and lactic acid solution. After about 10 minutes the softened material was transferred in a drop of 1 % acetic-carmin and squashed between slide and coverslip. In all specimens examined the content of testes consisted mainly of mature spermatozoa. Only a few spermatocysts contained dividing nuclei relative to the primary

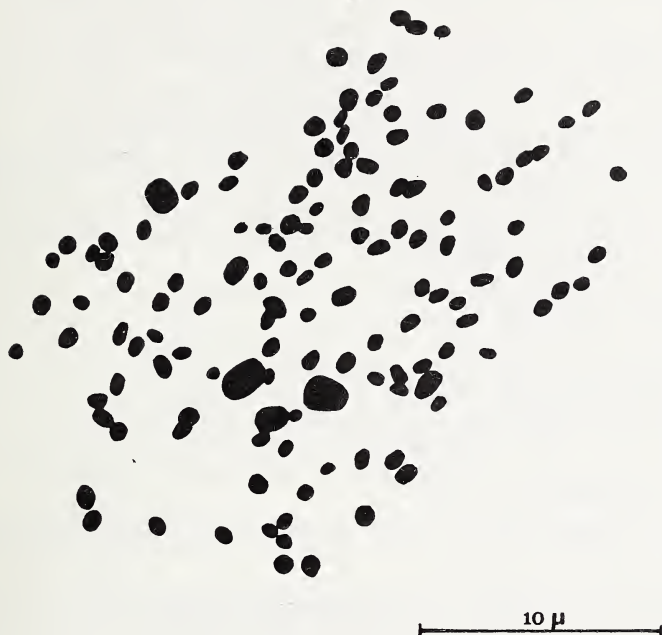


Fig. 7 Early anaphase I of *Agrodiaetus galloi* ($2n = 132$).

or secondary meiotic division. Most of the spermatogenesis is therefore very likely to occur already in larval or pupal instars, as it seems to happen also in other species of the genus *Agrodiaetus* (Brown, 1976b). Chromosome analysis was rather difficult either out of the high number of chromosomes or insufficient spreading of the material. Only in a few (about 10) plates it was possible to observe the chromosomes distinctly enough to allow computation.

All analyzed plates were early anaphases I or meta-anaphases I; they show most of the bivalents already separated and the incipient formation of the spindle. All the chromosomes are dot-shaped and rather similar in size, with the exception of two pairs of large chromatine bodies. The aploid chromosome number was determined about 66 (fig. 7).

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