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## ***Carabus* of Subgenus *Cathoplius* C.G. Thomson, 1875, with description of their life-way, life-cycle and pre-imaginal morphology (Coleoptera: Carabidae)**

ENRICO BUSATO<sup>1</sup>, CLAUDIO GHITTINO<sup>2</sup> & ACHILLE CASALE<sup>3</sup>

<sup>1</sup>Dipartimento di Scienze Agrarie, Forestali e Alimentari (DISAFA), Università di Torino, Largo Braccini 2, 10095 Grugliasco (TO), Italy. E-mail: [enrico.busato@unito.it](mailto:enrico.busato@unito.it)

<sup>2</sup>State Veterinary Institute for Umbria and the Marches (IZSUM), Via C. A. Dalla Chiesa 78, 05100 Terni, Italy. E-mail: [c.ghittino@izsum.it](mailto:c.ghittino@izsum.it)

<sup>3</sup>Dipartimento di Scienze della Natura e del Territorio (DIPNET), sezione Zoologia, Università di Sassari, Via Muroni 25, 07100 Sassari, Italy. E-mail: [a\\_casale@libero.it](mailto:a_casale@libero.it)

### **Abstract**

According to current taxonomy, Subgenus *Cathoplius* C.G. Thomson, 1875, within the Genus *Carabus* Linnaeus, 1758 (in the broad sense), includes two species: *C. (Cathoplius) asperatus* (Dejean, 1826), monotypic with a northern distribution, and the southern polytypic substitutive species *C. (Cathoplius) stenocephalus* Lucas, 1866. The authors describe the life-way, life-cycle and pre-imaginal characters of the taxa currently ascribed to Subgenus *Cathoplius*, with details never provided before. *Cathoplius* are ground beetles adapted to live in arid environments and extreme habitats such as sub-desert areas. All of them are strictly helicophagous, both during the pre-imaginal stages and as adults, and are localized in a narrow fringe along the Atlantic coast of northwestern Africa. Several data and observations on the ecology of the different taxa, obtained both in field and in laboratory, are reported. The life-cycle of *Cathoplius* belongs to the winter breeding type, with an extremely high fecundity rate concentrated in a very short period of time, that has no similarity to any other *Carabus* species. Eggs, larvae and pupae of the different species and subspecies of *Cathoplius* are described and illustrated. Larval characters clearly place Subgenus *Cathoplius* into the lineage of Neocarabi, confirming it as a monophyletic and homogeneous assemblage. Hybridization trials between some taxa led to a reduced survival rate of the progeny, thus confirming their specific or subspecific differentiation as proposed by classical taxonomy. Furthermore, hybridization results suggest that *C. (Cathoplius) stenocephalus aliai* could be considered as a distinct species. Notes about the origin, biogeography and phylogeny of *Cathoplius* are also provided.

**Key words:** Ground beetles, Morocco, biological notes, larvae, pupae, hybrids, helicophagy, *Theba* snails

### **Introduction**

Representatives of the Subgenus *Cathoplius* C.G. Thomson, 1875, within the Genus *Carabus* Linnaeus, 1758, form a very homogenous monophyletic group, which includes ground beetles characterized by strongly sclerified integument, black in color, brachypterous, with elytra that are joined along the suture, an achetous, ellipsoidal, silphoid or cychrized pronotum, and a narrow and very elongate head. These features are typical of strictly helicophagous species adapted to arid habitats. All of them are localized along the Moroccan Atlantic coast (Fig. 115) and colonize open habitats, such as coastal dunes, stony steppes, sandy zones or sub-desert areas with scarce xerophilous vegetation (Figs. 113–114), composed mainly by broom shrubs (in northern Morocco), argan trees (in central Morocco) or *Launaea arborescens*, *Lycium intricatum* and arboreal spurge shrubs (in southern Morocco), where snails they prey upon are abundant. Secondly, they can colonize land modified by man, such as arable fields. Moreover, some populations are known to be present in inland areas (e.g. in Skhour des Rehamna, between Settat and Marrakech, J. Kaláb legit). In southern Morocco, the southernmost taxon [*C. (Cathoplius) stenocephalus aliai* Escalera, 1944] lives also in localized desert zones far from the Atlantic coast.

According to current taxonomy (Breuning 1932–1937; Antoine 1955; Kocher 1963; Deuve 1991; 1994; 2004; 2012), Subgenus *Cathoplius* includes two species: *C. (Cathoplius) asperatus* (Dejean, 1826), monotypic, with a

*meurguesianus* was then able to survive at high altitude on the High Atlas chain. Later, Pleistocene climatic changes, with alternate extensions of savanna, steppe and desert biomes, could explain the differentiation and isolation of the subspecies of *C. stenocephalus*, and the localization of *C. stenocephalus aliai* in the Saharan area of southwestern Morocco.

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