

## A review of the genus *Arion* in Belgium (Mollusca, Pulmonata)

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### Abstract

The paper briefly reviews the present state of the systematic knowledge of the eight *Arion* species hitherto known to occur in Belgium.

**Key-words:** Mollusca; Pulmonata; *Arion*; systematics; Belgium.

### Résumé

Cet article donne un bref aperçu de l'état actuel de nos connaissances de la systématique des huit espèces du genre *Arion* appartenant à la faune belge.

**Mots-clefs:** Mollusca; Pulmonata; *Arion*; systématique; Belgique.

### Introduction

The genus *Arion* FÉRUSSAC, 1819 is a systematically confused group of terrestrial slugs, which are native in Europe. Currently, 25 to 30 species may be recognised and at least eight of these are known to occur in Belgium, viz. *Arion (Arion) ater* (LINNAEUS, 1758) s.l., *A. (Mesarion) subfuscus* (DRAPARNAUD, 1805) s.l., *A. (M.) lusitanicus* MABILLE, 1868, *A. (Kobeltia) hortensis* FÉRUSSAC, 1819 s.s., *A. (K.) distinctus* MABILLE, 1868, *A. (K.) intermedius* NORMAND, 1852, *A. (Carinarion) circumscriptus* JOHNSTON, 1828 and *A. (C.) silvaticus* LOHMANDER, 1937. The present paper aims to provide a brief account of these species.

### Supraspecific systematics

Until recently, most authors divided the genus *Arion* into five subgenera, viz. *Arion* FÉRUSSAC, 1819 s.s., *Mesarion* HESSE, 1926, *Kobeltia* SEIBERT, 1873, *Microarion* HESSE, 1926 and *Carinarion* HESSE, 1926. In fact this system is only a slightly modified version of the original proposals of COLLINGE (1897) and HESSE (1926). However, QUICK (1960), FORCART (1965), BOATO et al. (1983), GITTENBERGER et al. (1984) and VAN GOETHEM (1984, 1987) have doubts about this classification. WALDÉN (1976), for example, suggested to include *A. intermedius* in *Kobeltia*, so that *Microarion* would become a subjective junior synonym of *Kobeltia*. Later on, BEESON (1960), BURCH (1965), BACKELJAU (1985a) and BACKELJAU & DE WINTER

(1987) provided chromosomal and electrophoretic evidence in favour of this suggestion. In accordance with the latter authors I consider here only four subgenera. BACKELJAU & DE WINTER (1987), however, also observed that these four subgenera can be grouped two by two, viz. *Arion* s.s. and *Mesarion* at one hand, and *Kobeltia* and *Carinarion* on the other. Yet, no taxonomic status has been attached to these groupings. Moreover, VAN GOETHEM (1984, 1987) and BACKELJAU & DE WINTER (1987) even wondered whether the four "subgenera" should all have the same taxonomic rank. A more detailed, yet still preliminary, account of the infrageneric systematics of *Arion* is now in preparation.

#### *Arion (Arion) ater* s.l.

This complex consists of at least two nominal species, viz. *A. ater* s.s. and *A. rufus* (LINNAEUS, 1758), the systematics of which are still far from settled. So it is not excluded that some nomenclatural and taxonomic rearrangements will become necessary. Nevertheless, hitherto only the species commonly referred to as *A. rufus* was mentioned for Belgium (e.g. ADAM, 1960). Yet, MARQUET (1982) suggested that also *A. ater* s.s. might belong to our fauna. Recently, this assumption has been investigated by RISCH (1987), who concluded that the vast majority of Belgian *A. ater* s.l. specimens belong to *A. rufus*. Yet, in addition to the large number of *A. rufus*, RISCH (1987) also noted four doubtful specimens which perhaps could be assigned to *A. ater* s.s. Thus, the actual occurrence of the latter species in Belgium needs further confirmation. Finally, the most surprising result of RISCH (1987) and RISCH & BACKELJAU (1989) was the observation that in Belgium *A. ater* s.l. has been regularly confused with *A. lusitanicus*, a species which will be dealt with elsewhere in this paper.

#### *Arion (Mesarion) subfuscus* s.l.

Some authors have suggested that *A. subfuscus* in fact refers to a complex of cryptic species, while others have

tried to divide the species into several forms. No one so far, however, has been able to separate and define these species or forms conveniently. Yet, recent electrophoretic analyses have provided evidence, which enabled McCracken & Selander (1980) to split North-American *A. subfuscus* s.l. into two distinct genetic types. One of these is highly polymorphic and seems to reproduce by allogamy. The other one consists of at least three monomorphic genetic strains, which are assumed to reproduce uniparentally. Similarly, Foltz et al. (1982) reported two genetic types in British *A. subfuscus* s.l. One of these appeared to be identical to the outcrossing American form. The other one, however, was different from any of the American types. An electrophoretic survey of *A. subfuscus* s.l. in continental Europe indicates that in Belgium and the Netherlands this species also consists of at least two distinct electrophoretic forms (Backeljaeu & De Winter, in prep.). For the time being they are labelled as the S- and F-type, according to the relative mobilities of their phosphoglucosyltransferase electromorphs (S=slow and F=fast) as revealed by polyacrylamide gel electrophoresis (Backeljaeu & De Winter, 1987: fig. 4). However, the taxonomic status of these genetic types, as well as their relationships with the forms demonstrated in Great Britain and North America, require further research.

#### *Arion (Mesarion) lusitanicus* s.l.

This is another complex which, at least in Britain, consists of two distinct species, viz. *A. lusitanicus* s.s. and *A. flagellus* Collinge, 1893 (see Davies, 1987; Risch & Backeljaeu, 1989). Consequently, a review of *A. lusitanicus* s.l. in continental Europe is badly needed, especially since it may be expected that in southern Europe several other species may belong to this group (Backeljaeu, 1989; Risch & Backeljaeu, 1989). This situation is further complicated by the fact that *A. lusitanicus* is also commonly confused with *A. ater* s.l., even though the anatomical differences between both complexes are quite obvious (Risch & Backeljaeu, 1989). Finally, the subgeneric allocation of *A. lusitanicus* is also still debated. Traditionally, the species has been assigned to *Arion* s.s. Recently Davies (1987) confirmed this, but stated simultaneously that the very similar *A. flagellus*, on the contrary, would be a *Mesarion*. For the time being, however, I'm not inclined to follow this opinion and I prefer to assign both *A. lusitanicus* and *A. flagellus* to *Mesarion*. This thesis seems to be supported by the structure of the oviduct and ligula in these species. A chromosomal analysis could be decisive here, since arionid chromosome numbers may be correlated with the "subgenera" (Backeljaeu & De Winter, 1987; Risch & Backeljaeu, 1989).

The occurrence of *A. lusitanicus* in Belgium was

recently investigated by Risch & Backeljaeu (1989) who found that previous Belgian authors referred the species to as *A. rufus*. Hitherto *A. lusitanicus* is known from 21 Belgian 10 x 10 km U.T.M. squares. Since the oldest sample dates from 1973, it seems as if the species is a relatively recent immigrant.

#### *Arion (Kobeltia) hortensis* s.l.

This is undoubtedly the best studied arionid species complex in Europe, even though much work still needs to be done with respect to the situation in southern Europe. Yet, in northwestern Europe, the complex consists of at least three distinct species, viz. *A. hortensis* s.s., *A. distinctus* and *A. owenii* Davies, 1979 (see Davies, 1977, 1979; Backeljaeu, 1981, 1985a, b, 1987a; De Wilde, 1983, 1986; De Winter, 1984; Backeljaeu & Marquet, 1985; Backeljaeu & Van Beeck, 1986).

*A. hortensis* s.s. and *A. distinctus* have also been demonstrated in Belgium (Backeljaeu, 1981; De Wilde 1983; Backeljaeu & Marquet, 1985). Yet, even though hitherto more than 2500 Belgian specimens of *A. distinctus* have been checked anatomically, the genital dimorphism of this species, as originally reported by Davies (1977, 1979), has not been observed in Belgium. Thus for the time being only *A. distinctus* with a bipartite oviduct has been positively identified in our country. *A. distinctus* with a tripartite oviduct, on the contrary, has been recorded in the Netherlands, West Germany, France and the British Isles, where it lives sympatrically with the bipartite type (Davies, 1977; De Winter, 1984). Finally, despite intensive faunistic research in northwestern Europe, no one so far has been able to demonstrate the existence of *A. owenii* in continental Europe. The record of *A. owenii* from northwestern Germany by Zeissler (1981) should indeed be considered erroneous (Backeljaeu et al., 1988). Hence *A. owenii* appears to be endemic in the British Isles (see also Backeljaeu, 1988; Backeljaeu et al., 1988) and is thus hitherto not known from Belgium.

#### *Arion (Kobeltia) intermedius*

Backeljaeu (1986) clearly demonstrated that Normand (1852) described this species as an *Arion* and not as a *Limax* as has often been stated by other authors. Until recently *A. intermedius* was considered to be the least problematic species in the genus. Yet, the electrophoretic analysis of McCracken & Selander (1980) and the parallel investigations on *Carinarion* spp. by Backeljaeu et al. (1987), suggest that *A. intermedius* should perhaps be considered as an agamospecies complex. Indeed, although the species is polymorphic at several enzyme loci, it does not show any trace of heterozygosity. This may indicate that *A. intermedius* reproduces uniparentally, something which is further

supported by the fact that its spermatophore is unknown, that its copulation has never been observed and that individuals reared in isolation still produce a viable offspring (CHICHESTER & GETZ, 1973). Evidently, a polymorphic, but uniparental species will inevitably produce a series of monomorphic genetic strains. BACKELJAU et al. (1987) discuss the systematic consequences of the existence of such genetic strains in more detail. In any case, even though the electrophoretic survey of European *A. intermedius* is still in its initial phase, I already recorded three genetic strains of this species in Belgium (BACKELJAU, unpubl. data). Yet, several more of such strains may be expected since *A. intermedius* is the most common and widespread arionid in Belgium (MARQUET, 1982).

#### *Arion (Carinarion) fasciatus* s.l.

I use here the name *A. fasciatus* s.l. to denote a species complex coinciding with the subgenus *Carinarion*. It includes *A. fasciatus* (NILSSON, 1823) s.s., *A. circumscriptus* and *A. silvaticus*.

Generally, *A. fasciatus* s.l. has been reckoned amongst the most enigmatic arionids in Europe. Indeed, the three involved species are morphologically and anatomically highly similar and the lack of clear cut characters distinguishing them, has made it necessary to search for additional criteria. Therefore, CHICHESTER (1967) and BACKELJAU et al. (1987) performed electrophoretic analyses of albumen gland proteins of *Carinarion* spp. and defined in this way species specific profiles. Yet, even though these data support the specific rank of the three forms, parallel electrophoretic analyses of enzymes in American populations showed that the species actually consist of single genetic strains (McCRACKEN & SELANDER, 1980; SELANDER & OCHMAN, 1983). This indicates that *Carinarion* spp. have an uniparental breeding system. In that case, however, the biological species concept may be no longer applicable. Therefore, BACKELJAU (1987b) and BACKELJAU et al. (1987) suggested to treat *A. fasciatus* s.l. as an agamospecies complex, even though these authors also

assumed that *Carinarion* spp. may have a mixed breeding system, in which, however, uniparental reproduction would dominate. Yet, the problem is more complicated, since recently I found that in continental Europe, each of the three species contains not one, but several genetic strains (BACKELJAU & VAN ROMPAEY, 1988), of which at least 14 occur in Belgium (two strains of *A. circumscriptus* and 12 strains of *A. silvaticus*; *A. fasciatus* s.s. has hitherto not been recorded in Belgium). Obviously, these results may have far reaching systematic and ecogenetic consequences, which will be discussed in detail in a forthcoming paper.

#### Conclusive remarks

The most recent informations on the distribution of *Arion* spp. in Belgium have been provided by DE WILDE et al. (1986) and RISCH & BACKELJAU (1989). Yet, the present account demonstrates that these data are still far from complete. In fact, only the distributions of *A. hortensis* s.s. and *A. distinctus* are fairly well-known, whereas for all other species the distributional data need to be revised with respect to possible subdivisions into cryptic species and/or genetic strains. Obviously, the same applies to the ecological data. Finally, it should be pointed out that the variety of breeding systems apparently prevalent in *Arion*, provides a most interesting opportunity to investigate some tentative evolutionary and ecogenetic hypotheses such as for example the controversy about sympatric speciation and the evolutionary power of uniparental breeding systems.

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