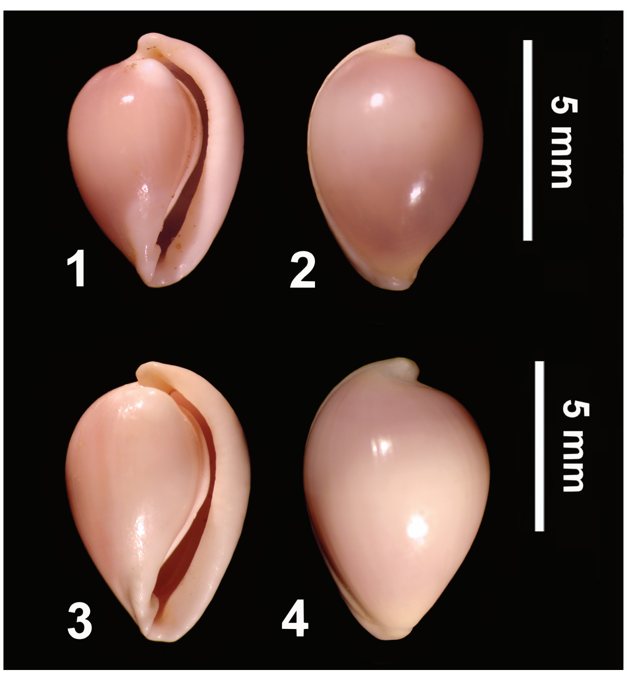
REPORT OF *GLOBOVULA TRIPOLIA* CATE, 1973 FROM WEST AFRICA: A GOOD SPECIES OR A SYNONYM OF *GLOBOVULA CAVANAGHI* (IREDALE, 1931)? (GASTROPODA, CAENOGASTROPODA, OVULIDAE)

The Ovulidae are a family of cypraeoidean caenogastropods associates with Anthozoan Cnidarians[1], given that most of the ovulid morphological features are related to their association with cnidarians. Six species (one Pediculariinae and five Ovulinae) are recognised with certainty as living in the Mediterranean sea. Two additional species are based on specimens of doubtful origin: *Prionovolva castanea* Cate, 1978 and *Globovula tripolia* Cate, 1973. The latter species was originally described on a single specimen, supposedly collected in the Gulf of Oran (north-west Algeria)[2] and was therefore included in the Mediterranean malacofauna[3]. Oliverio & Villa[4] reported two additional "Mediterranean" specimens (in the private collections of Mr Calò, Milan, Italy, and Mr Amati, Rome, Italy), but critically discussed the reliability of the collecting localities of these two shells and highlighted their similarity ("nearly identical") to the Australian *Globovula cavanaghi* (Iredale, 1931). Intriguingly, this species is restricted to the Australian coasts and there is no fossil record of members of this genus in Europe. Based on these considerations, Oliverio & Villa[4] suggested to reconsider the reliability of the type locality of *G. tripolia* too. We report herein a fourth record of a shell attributable to *G. tripolia*, with one specimen lacking soft parts (Fig. 1-2), dredged at a depth of 20-30 m offshore Dakar, Senegal (Atlantic Ocean). Also this shell strongly resembles the australian *G. cavanaghi* (Fig. 3-4), so we agree with Oliverio & Villa[4] that there are no diagnostic shell characters to separate these two species. It is worth mentioning that the similarity albeit "*only vaguely*" between the two taxa was indeed pointed out by Cate himself (1973, p. 22). Whether we are facing two sibling species or a single one (*G. cavanaghi*) with a very broad geographical distribution, due to its larval planktotrophic development[1], is still an open question. Anatomical and molecular studies could be very useful to solve this aspect. At the moment we conservatively kept the two species separate. With this record, the geographical distribution of the genus *Globovula* (whatever the species involved, *G. tripolia* or *G. cavanaghi*) is extended to the Atlantic Ocean, at the same time the Mediterranean records become more plausible.



Figs 1-2 *Globovula tripolia* Cate, 1973. 9.3 X 6.5 mm. Off Dakar, Senegal, 20-30 m depth. Collection F. Swinnen (Lommel, Belgium). **Figs 3-4** *Globovula cavanaghi* (Iredale, 1931). 12.5 X 8.3 mm; Port Hedland, western Australia, 5 m depth, dredged on coral. Collection Smriglio-Mariottini (Rome, Italy).

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Carlo Smriglio[1], Frank Swinnen[2], Paolo Mariottini[3]
[1] Via di Valle Aurelia 134, I 00167 Rome, Italy
csmriglio@tiscalinet.it
[2] Lutlommel 10, B 3920 Lommel, Belgium;
f.swinnen@skynet.be
[3] Dipartimento di Biologia, Università "Roma Tre", Viale Marconi 446, I 00146 Roma, Italy mariotpa@uniroma3.it

A FIRST RECORD OF *DEROCERAS AGRESTE* (L.) IN IRELAND

Wiktor[1] gives the range of *Deroceras agreste* (L.) as Palaearctic, extending from the British Isles across Eurasia to the Russian Far East including Sakhalin and the Kuril Islands. Though widespread in northern Britain it has never been recorded from Ireland[2, 3]. Absence from Ireland has always seemed unreasonable, since this is essentially a northern species, and the habitats occupied in Britain, former peatlands (Norfolk Broads), flushed montane grassland (Scotland & northern England), and marshy stream margins[3], are well represented there.

On 22 October 2005 six pale, unspotted *Deroceras* were collected in Buckroney dunes, near Mizen Head, Co. Wicklow (Irish grid T295797). These were found under wood debris on the banks of a marshy coastal stream which had been impounded by marine sand from an exposed beach. Dissection of the first specimen proved inconclusive as the reproductive organs were small so the remaining specimens were kept for a month before killing. When dissected the penis in these had a simple penial gland which was small and single coiled and lacked nodular outgrowths. This was inserted just above the penis base and the body of the penis was solid and not noticeably constricted (in dorsal view) in the middle. The point of insertion of the vas deferens could be seen from above without turning the body of the penis over. These are all aspects in which *D. agreste* differs from the much commoner *D. reticulatum* (Müller)[1]. In *Deroceras reticulatum* there is typically a deep lateral constriction in the penis and the penial gland is large, often with more than one branch, with most or all branches being nodular. Insertion of the vas deferens is also hidden and ventral in *D. reticulatum*, facing the viscera as Wiktor[1] puts it, rather than facing outwards and upwards and therefore being visible from above as in *D. agreste*.

Using its distribution in Britain as a guide[3] I have searched for *D. agreste* in montane wetlands in the northern half of Ireland on and off for about two decades, but without success. The sand dune environment and south-easterly location of Buckroney could scarcely be predicted from the British distribution and is most unexpected. More work is clearly needed to clarify the status of this species in Ireland and to determine whether it occurs more widely. In December 2005 the Buckroney site was re-visited and a further 4 specimens collected, this time in pony-grazed dune pasture near the stream. Two similar stream estuaries several hundred metres north and south of Buckroney were visited but only *Deroceras reticulatum* could be found, confirmng the peculiar isolation of the Buckroney colony.

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Roy Anderson
Dept. of Agricultural & Environmental Science
Queen's University
Newforge Lane
Belfast
BT9 5PX

ASHFORDIA GRANULATA (HYGROMIIDAE) LIVING IN NORTHERN FRANCE

Ashfordia granulata (Alder, 1830) is primarily known from Great-Britain[1], with a few records from Brittany[2], Cotentin[3] and also from N.W. Spain[4]. According to Kerney and Cameron[2], the distribution of this species is lusitanic.

In February 2004 a small, but stable, population of *Ashfordia granulata* was recorded from Fort-Mahon-Plage (Dept. Somme), 30 km West from Abbeville. All the specimens were observed in the leaf litter of the Common Reed (*Phragmites australis*), at the foot of a sea wall defence. All living specimens observed were juvenile snails and all the adults were dead shells. Amongst other common associates of *Ashfordia granulata* a stablepopulation of *Vertigo angustior* was noted at this new site. The habitat was similar to those ofpopulations found in eastern Great Britain. According to Kerney[1], the Silky snail is restricted in eastern Great Britain to marshy ground in river valleys and this recent find is located in the Bay of Authie River, a small coastal river.

This locality thus represents a considerable extension of the continental distribution of the species to the North and provides the most northern population in France to date.

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Xavier Cucherat
GREET Ing
Route du Musée, Haringzelles
F-62179 Audinghen
E-mail: xavier.cucherat@wanadoo.fr
François Boca
Conservatoire des Sites Naturels de Picardie
1, place Ginkgo - village Oasis
F-80044 Amiens Cedex 1
E-mail: f.boca@conservatoirepicardie.org

SELF-FERTILISING OBSERVED IN THE INVASIVE IBERIAN SLUG *ARION LUSITANICUS*, MABILLE 1868

The Iberian slug *Arion lusitanicus* Mabille 1868, has over the last couple of decades spread across the European mainland and has become a major agricultural and horticultural pest. One of the reasons for its success is its capability to mass reproduce. One individual can lay up to 400 eggs during its lifetime, commonly one season[1].

To further add to the bad reputation of the slugs, it is common knowledge among gardeners that they can self-fertilise, ie a single slug introduced to a new habitat is enough to start a colony. The ability of the arionids to self-fertilise was observed in *Arion ater rufa* (probably what we today call *A rufus*) in laboratory conditions already in the 19th century[2]. Grimm[3], on the other hand, found no evidence for self-fertilisation in *A. lusitanicus* from Austria.

Our new observations prove however that also *A. lusitanicus* can self-fertilise. In our laboratory two individuals have laid egg clutches of 21 and 14 eggs, respectively, which have resulted in 20 hatched slugs. Some weeks past the egg-laying, the two adults were dissected and from internal morphology determined to be pure *A. lusitanicus*[4].

The parents were hatched in the laboratory from eggs collected in the Rya forest of Hisingen Island, Göteborg, Sweden. These specimens were separated from other individuals as juveniles, and have been reared in separate containers for approximately three months. During this period one of the slugs has once before laid an egg clutch, but with no hatching success.

The now observed hatching coincide with the reproduction pattern of *Arion lusitanicus* held in laboratory conditions some 13 years ago (von Proschwitz pers obs). In the summer of 1991 three individual *A. lusitanicus* were hatched from eggs and raised separately. They laid a total of 531 eggs of which 64 hatched. Two years later, one individual raised alone laid 127 eggs with hatching success in 21 cases.

We hereby conclude that the *Arion lusitanicus* has self-fertilising capability. How common it is, what triggers it and the genetic aspects, such as inbreeding depression, are some of many issues that needs further investigation. The fecundity to self fertilized eggs compared to cross fertilized, also needs further study.

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Jan Hagnell[1]
Ted von Proschwitz[1]
Christoffer Schander[2]
[1] Göteborg Natural History Museum, Box 7283SE-402 35 Göteborg, Sweden
[2] University of Bergen, Department of Biology
Postboks 7800, NO-5020 Bergen, Norway

TWO NOTES ON THE INVASIVE IBERIAN SLUG, *ARION LUSITANICUS* MABILLE, 1868

Invasive organisms may have a huge environmental impact in the area where they have been introduced. The recent introduction of the Iberian slug *Arion lusitanicus* (Mabille, 1868) to Northern Europe is one such example. The species has a high rate of reproduction and few known predators, Koslowski et al 1998[2], Keller *et al.* (1999[3]) makes this species a rapidly spreading agricultural pest (e.g. von Proschwitz *et al.* 1994[4], Proschwitz 1997[5]). The recent discovery that *A. lusitanicus* produces fertile hybrides with *Arion ater* (Linné, 1758) (Hagnell et al 2003[6]) allowing rapid accommodation to a temperate-boreal climate has increased the need for finding means to control the species, and several research projects with this aim have been launched. We here report two observations that relates to this goal.

The sticky mucus of *A. lusitanicus* constitutes a good defence against predators (pers obs). Hedgehogs and birds do feed on the domestic black forest slug (*Arion ater*) but not on *A. lusitanicus*. There are a few previously published observations on blackbird (*Turdus merula,* Linné, 1758) feeding on slugs (Falkner 1984[7], Pitchford 1969[8]). During two days in July 2003 one individual of *T. merula* was observed feeding on abundant *A. lusitanicus* outside the village of Fiskebäckskil in Southwest Sweden. The bird was observed collecting several slugs and bringing them from the place of capture to a gravel path. Here the bird held the slug in a firm grip whilst pecking a whole just posterior of the mantle. During the process, the bird repeatedly cleaned its beak on the surrounding gravel. Through the hole, the bird then devoured out the slug's internal organs. External parts were left uneaten.

This tactic is most likely a novel invention by a single individual. Earlier observations suggest that this strategy can be learned by other individuals (Falkner 1984[7], Pitchford 1969[8]). *Arion lusitanicus* is a newcomer to Sweden, and is now extremely abundant, partly due to lack of predators. If the behaviour could spread within the blackbird population, in a way similar to the behaviour of gulls that have learned forage on earth worms in newly plowed fields (Tomlin et al 1988[9]) it would be highly advantageous since it would not share this source of food with any other predators. It would also be a welcome aid to both professional and amateur crop cultivators.

Other birds can be less successful in their

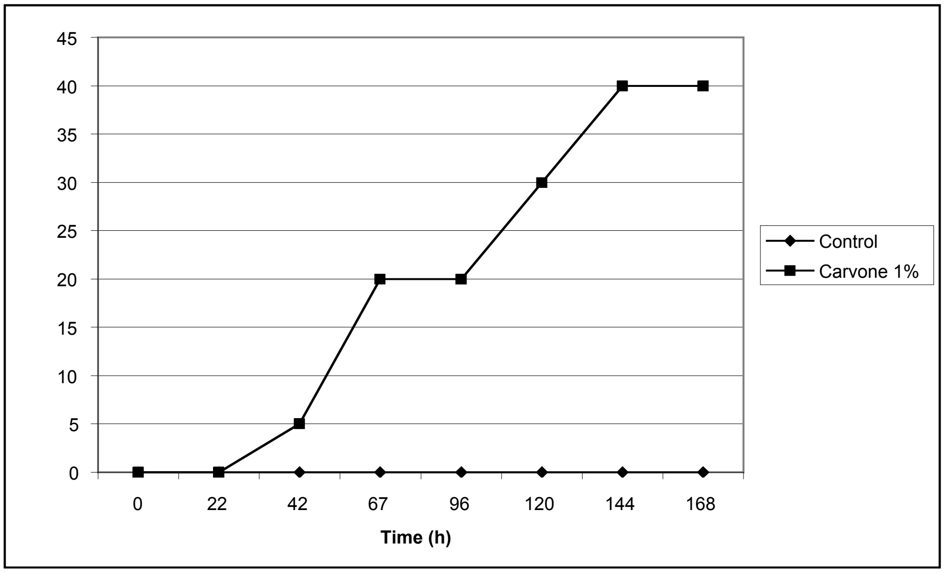

Figure 1 The effect of Carvone. 20 slugs in a sealed container were fed with special food treated with carvone. 25 slugs in an other container were used as control and fed only with the special food. The former slugs were noted to move as far away as possible from the contaminated food.

Table 1 Recipe for slug food, approx 0,5l:

60g	cat or kitten dry food pellets
13g	casein
1g	sorbic acid
0,5g	methylparaben
7,5g	agar
400ml	water

Crush the cat food (preferably in a kitchen blender) and add all ingredients except agar and water. Heat the water to boiling temperature and add agar while whipping thoroughly. Leave to cool only just until the mix starts to coagulate. Pour it into the dry mix and mix everything thoroughly. Pour into one or several containers of suitable size. Close with lid and place in refrigerator.

attempt to make the slugs part of their diet. A jay, *Garrulus glandarius* (Linné, 1758) was observed through binoculars in August 1997 sitting on a spruce branch in Fengersfors (province of Dalsland, W. Sweden). The bird held an almost adult *A. ater* in its beak, making several unsuccessful attempts to open the slug with the beak by pressing it to the branch. It also tried to swallow the prey whole. After trying for several minutes, the jay let go of the slug, which fell to the ground. The bird then, for more than five minutes, in different ways forcefully tried to clean its beak from the slug slime. The sides of the beak were pressed against the stem, rubbing both sideways and back and forth. The jay also shook its head intensively opening and closing its beak alternatively with the rubbing movements. Also swallowing movements were observed, most likely in attempt to get rid of slime in the mouth.

Another mean of protecting crops is by using chemical or physical barriers, as well as poison (eg. Speiser *et al.* 2002[10], Schüder *et al.* 2003[11]). The ketone Carvone (5-isopropenyl-2-methylcyclohex-2-en-1-one; ISO 1750) is a highly volatile substance in caraway seeds (*Carum carvi* Linné, 1753) with a smell often associated with bread in which the seeds often are an ingredient. Carvone is classified as a fungicide and as a plant growth regulator. Frank et al. (2002[12]) showed that carvone has feeding deterrent properties on the Nettled Slug, *Deroceras reticulatum* (O. F. Müller, 1774), we therefore conducted two small scale experiments to see if this apllied also to *A. lusitanicus*.

Specimens of *A. lusitanicus* were placed in closed but ventilated containers and fed with a special food-mixture based on cat-food pellets (Table 1). In some containers 1% Carvone were added to the food. The slugs reacted rapidly by

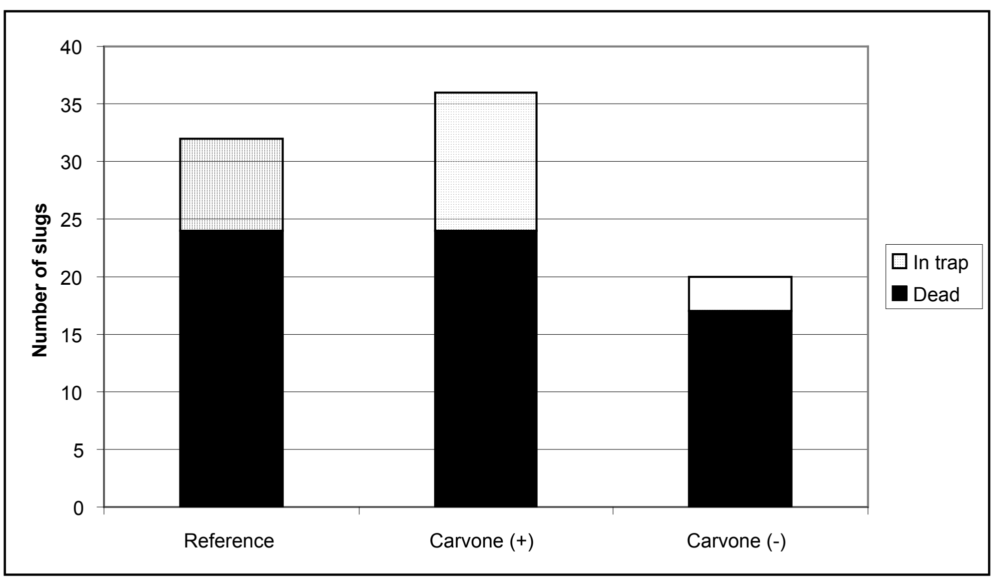

Figure 2 Effect of Carvone in field traps. The Slug Traps™ were placed on three different locations in the garden and moved between the these locations to avoid interference from local population variations. The carvone was applied to Oasis™ which was jinxed in the opening of two of the traps. The "in trap"-groups represent the slugs attracted to the traps' bait but hadn't crawled down into and drowned in the beer in the bottom of the traps.

withdrawing from the carvone baited food, as far as possible. The mortality rate in the containers with carvone baited was also significantly higher (t=0) than in the controls (Figure 1). Frank et al. (2002[12]) showed that slugs can die after having crawled over mulch containing Carvone. Our test makes it seem likely that the vapour itself is enough to harm the slugs. It is therefore not necessary for the slugs to eat or even to be in direct physical contact with the Cavone in order to cause increased mortality.

The high volatility of carvone seams to be a disadvantage when applied as a barrier in the field. In field-test, 3 traps (Slug-Trap™, Bröderna Nelson, Sweden) were set up according to the manufacturers instructions. Small pieces of Oasis™ (Smithers-Oasis, Denmark) (a porous material used for planting flowers) were treated with the + and – carvone isomeres and placed in the opening of two traps respectively. The third trap was used as control. Pieces of Oasis™ treated with a repellant has previously been shown to be effective against the common deer *Capreolus capreolus* (Linné, 1758) (http://www.nrm.se/jourhavande_biolog/). The positions of the traps were changed daily so that different local population concentrations of slugs wouldn't affect the test. The test was run for 12 consecutive days. As shown (Figure 2), + Carvone seems to have no deterring effect on the slugs. The - Carvone seems to have better effect but we could not find any statistically significant difference between the traps treated with carvone and the control.

We conclude that Carvone has high potential as slug pesticide but the forms for its distribution must be investigated further.

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Jan Hagnell[1]
Ted von Proschwitz[1]
Christoffer Schander[2]
[1] Göteborg Natural History Museum, Box 7283SE-402 35 Göteborg, Sweden
[2] University of Bergen, Department of Biology Postboks 7800, NO-5020 Bergen, Norway