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A persisting population of an introduced slug, *Milax nigricans*, in Dunkirk, France

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Abstract: A population of *Milax nigricans* was found on February 19th 2011 outside a block of flats in Dunkirk, France. It was persisting 21 months later. This is the second finding in the department of Nord. We review earlier occurrences of the species outside its normal range in the Mediterranean and illustrate the most important identification characters.

Keywords: Milacidae, *Milax gagates*, identification, invasive species, alien

Zusammenfassung: Eine Population von *Milax nigricans* wurde am 19.2.2011 neben einem Wohnblock in Dünkirchen, Frankreich, gefunden und überlebte mindestens die folgenden 21 Monate. Dies ist der zweite Nachweis im französischen Department Nord. Wir geben einen Überblick über frühere Vorkommen der Art außerhalb ihres normalen Verbreitungsgebietes im Mittelmeer-Raum und illustrieren die wichtigsten Bestimmungsmerkmale.

Milax nigricans (PHILIPPI 1836) is a very common slug in some parts of the western Mediterranean, including often in synanthropic habitats (e. g. GIUSTI & al. 1995, ABBES & al. 2010). Its presence has been reliably confirmed in North Africa, Malta, Sicily, mainland Italy, Corsica, the Balearic Islands, northern and eastern mainland Spain, southern France, at one site in Croatia and from the Canary Islands (WIKTOR 1987, 1996, CASTILLEJO 1998, KAPPES & al. 2009); we can ourselves confirm its presence in Sardinia (Fig. 1). In addition, the species has occasionally been introduced further north in Europe. Specimens were collected near Bexhill on the south coast of England in about 1948, but never subsequently (ANDERSON 2005). In Munich a population was found near the Großmarkthalle on February 11th 1976 and again in 1978, thus implying survival over multiple winters (FALKNER 1990, M. FALKNER pers. comm.). However, a 1983 record from Waldbronn in Baden-Württemberg (SCHMID 1997) should be regarded as unconfirmed because identification was based only on external appearance. MIENIS (2007) found an outdoors population in Hoorn in the Netherlands in 1999, which still persisted in 2006, when he also discovered another population 20 km away. In northern France, *M. nigricans* was found in a garden in Hallennes-les-Haubourdin, near Lille, in 2003, the only locality in a thorough review of records from the departments of Nord and Pas-de-Calais (CUCHERAT & DEMUYNCK 2006). We here report a second locality for *M. nigricans* in the department of Nord.

On February 19th 2011 we collected several specimens of *M. nigricans* from a thriving population outside blocks of flats along the Rue de la Ferme, Dunkirk (51.0252° N / 002.3595° E). The species was abundant in bark mulch under exotic bushes planted in the forecourt of the flats; occasional pieces of rubbish provided additional shelters. We noted it at the same site again on November 22nd 2012. Specimens from the earlier date are deposited under collection number p17771 in the Senckenberg Museum of Natural History at Görlitz (SMNG). This sample includes both mature and juvenile specimens.

Species identification was based on genital anatomy (Figs. 2, 3; WIKTOR 1987). The best character to distinguish *M. nigricans* from the very similar *Milax gagates* (DRAPARNAUD 1801) is that *M. nigricans* has numerous big papillae on one side of its atrial stimulator (Fig. 2B); in *M. gagates* there are none, or only a few smaller papillae, and these only on the distal half (Fig. 3B, C, E). We have found other identification characters less reliable, including the shape of the stimulator, the position where the vas deference enters the epiphallus, the shape and size of the bursa copulatrix, and the body colour. The stimulator of *M. nigricans* is described as wider at the base than in *M. gagates*, whose stimulator

is usually thin and gradually narrowing towards the end (WIKTOR 1987). But the mature specimen of *M. gagates* in Fig. 3E has a rather short stimulator with a wide base. In both species the vas deferens connects to the tip of the epiphallus, but, whereas in *M. nigricans* the point of contact is typically near the axis of the epiphallus (Figs. 2A, C), in *M. gagates* it is typically to one side (WIKTOR 1987; Fig. 3A). However, Fig. 2D shows a specimen of *M. nigricans* with an asymmetric arrangement as in *M. gagates*; conversely Fig. 3D shows a specimen of *M. gagates* with a symmetric arrangement. The bursa copulatrix is described as oval and large in *M. nigricans* and as elongate and narrowing at the end in *M. gagates* (see WIKTOR 1987), but at least in *M. nigricans* its size can vary considerably (Fig. 2). The large bursa of the *M. nigricans* in Fig. 2D is considerably longer than penis and epiphallus together and slightly pointed at the end; it contains a spermatophore (probably responsible for the pointed end) and other material. The bursae of the *M. nigricans* illustrated in Figs. 2A and 2C are considerably smaller, and, in proportion to the penis and epiphallus, overlap in size those of *M. gagates*. Perhaps a more promising character is the bursa trunk, which is longer in the *M. gagates* that we have examined, even though it is often more distinct in *M. nigricans* because of the more swollen bursa. Other characters that might prove useful are the thickness of the oviduct where it is joined by the bursa trunk (bulkier in *M. nigricans*) and the ducts connecting the atrial accessory glands to the atrium (longer in *M. nigricans*).



Fig. 1: A sample of *Milax nigricans* from Cala di Luna, Sardinia (40.2243° N / 009.6226° E; under stones on short turf in river valley; coll. Oct. 17th 2009, photographed Nov. 6th 2009, collection number p17842, SMNG). A demonstrates the variation in coloration; some of these individuals appear in more detail in B-D. Identification was based on internal anatomy. (Photographs: J. M. C. HUTCHINSON)

The Dunkirk locality is only 3 km from the coast, so the maritime influence on the local climate may have helped this Mediterranean species to persist through winter. Over the 10 years preceding our second finding, the coldest recorded by a weather station at Koksijde, 21 km away and a similar distance from the coast, was -10° C (<http://www.wunderground.com>). This occurred between our two visits, so the population survived this bout of cold weather.

The nearest previously published occurrence, in Hallennes-les-Haubourdin (CUCHERAT & DEMUYNCK 2006), lies 62 km inland from the Dunkirk site. The nearest Dutch locality (MIENIS 2007) is 241 km northeast along the North-Sea coast. It seems probable that there are further occurrences in the intervening areas, including in Belgium.

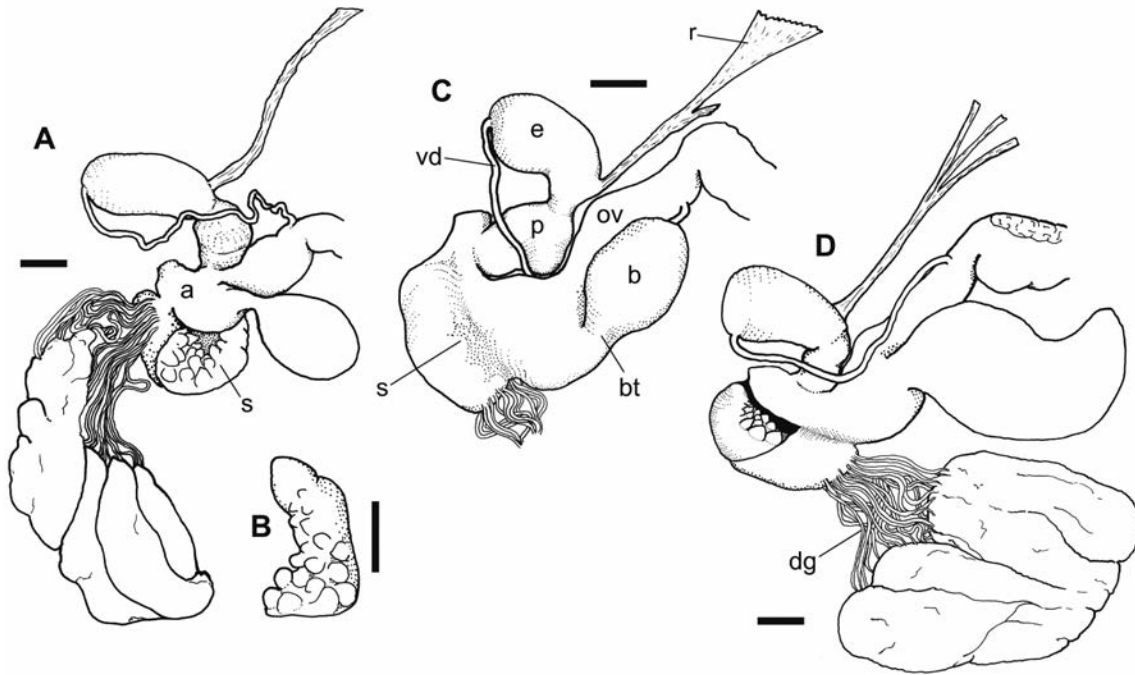


Fig. 2: Distal genitalia of *Milax nigricans*.

A, C: typical individuals, from Dunkirk (collection details in text). **B:** stimulator from same individual as **A**.

D: individual from Sicily (37.0106° N / 015.0050° E, coll. Nov. 12th 2010, collection number p16832, SMNG), untypical in the shape of its bursa copulatrix and in the position of the vas deferens entering the epiphallus. The atrial gland has been swung to the left in **A** and is omitted in **B**. In **A** and **D** the atrium is opened to show the stimulator; in **C** the stimulator with papillae is indistinctly visible through the atrium wall. a = atrium, b = bursa copulatrix, bt = bursa trunk, dg = ducts of atrial accessory glands, e = epiphallus, ov = free oviduct, p = penis, r = retractor muscle, s = stimulator, vd = vas deferens. Scale bar = 1 mm.

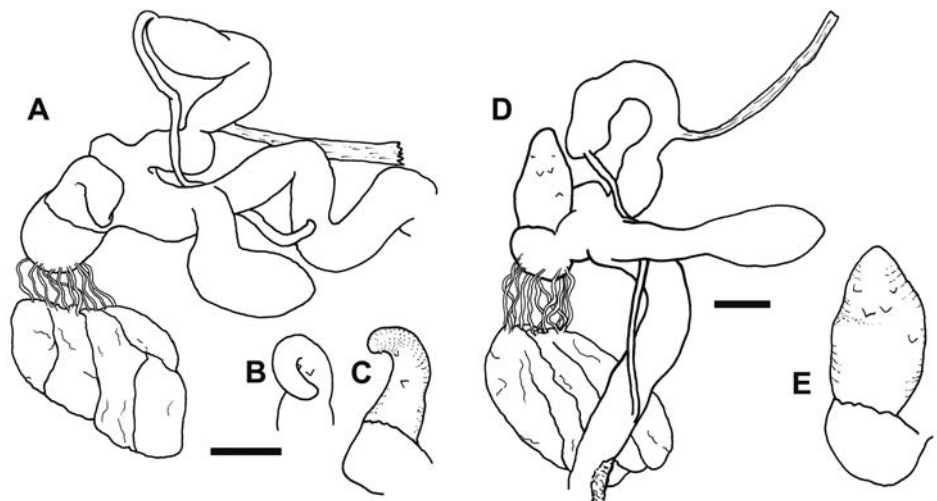


Fig. 3: Distal genitalia of *Milax gagates*.

A: typical individual, from Vila Baleira, Porto Santo, Madeira (coll. Mar. 21st 1994, killed Apr. 26th 1994, collection number p2125, SMNG), with stimulator (**B, C**), partially uncoiled in **C**. **D:** individual from Ostend, Belgium (51.224° N / 002.927° E, coll. Apr. 29th 2013, killed Jul. 2nd 2013, collection number p17744, SMNG) with an untypical position of the vas deferens entering the epiphallus and a stimulator (**E**) with an untypically wide base. In **A** and **D** the atrium is opened to show the stimulator. Scale bar = 1 mm.

Given the abundance of this species in the Mediterranean, and its close coexistence with man, it is not surprising that it occasionally reaches Northwest Europe. An observation from Austria of this slug on imported lettuce plants (REISCHÜTZ 1980) suggests one mode of introduction. However, despite the evidence of repeated introductions, so far *Milax nigricans* appears never to have “taken off” north of

the Alps in the way that some other slugs such as *Deroceras invadens* REISE & al. 2011 and *Boettgerilla pallens* SIMROTH 1912 have spread pervasively during the twentieth century (DE WILDE & al. 1986, REISE & al. 2000). In regions elsewhere in the world with warmer climates more like that of its Mediterranean home, *M. nigricans* is known to have established itself only in the Canaries. However, quite possibly some introductions have been misidentified as *Milax gagates*, which does now have a worldwide distribution (WIKTOR 1987).

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