

The distribution of the species of the genus *Deroceras* RAFINESQUE, 1820 in Belgium (Gastropoda, Pulmonata, Agriolimacidae)



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ABSTRACT: Four species belonging to the genus *Deroceras* are known from Belgium: *D. reticulatum* /MÜLLER, 1774/, *D. laeve* /MÜLLER, 1774/, *D. caruanae* /POLLONERA, 1891/ and *D. agreste* /LINNAEUS, 1758/. The distribution of *D. reticulatum*, *D. laeve* and *D. caruanae* as known at the end of 1971 is compared with a map showing all records of landsnail species in Belgium till then. A similar comparison is given for the year 1982. From the period 1972-1982 year to year maps showing all records of each of these three *Deroceras* species are compared with a corresponding map compiling all landsnail records of the same year. At present *D. reticulatum*, *D. laeve* and *D. caruanae* are very widespread and common. *D. caruanae* was found for the first time in Belgium in 1968. As shown by means of a series of cumulative maps, *D. caruanae* became very rapidly widespread /1973 onwards/ presenting an explosive dispersal. Undoubtedly, man assisted in its introduction and dispersal. *D. agreste* seems to be very rare in Belgium with a limited number of local populations in the four southern provinces.

INTRODUCTION

The last survey of the Belgian non-marine molluscs was given by W. ADAM /1947; 1960/. As part of his contribution to the E.I.S., one of us /J. VAN GOETHEM/ assisted by members of the Recent Invertebrates Section of the K.B.I. N., started a new malacological survey in Belgium. From 1970 numerous explorations were made each year, according to a program for covering the whole Belgian territory within the next 10 or 15 years /e.g. figs 13,17,21,... give an idea of the sampled U.T.M. squares for the respective years/.

After some years we hit upon the idea to compile not only locality data but also to record information on collecting-sites and habitats. This would further our knowledge on the autecology of the species and their occurrence in time.

The object became now to study a changing fauna and to detect the dynamic processes involved as for instance introductions, decreasing populations, changes in densities, migrations, etc.

For this new, comprehensive project : "An extensive faunistic and ecological survey on landsnails in Belgium /1977-1982/", a grant was obtained from the Belgian Fund for Joint Basic Research. This survey was made by the "Laboratorium voor Algemene Dierkunde" of the "Rijksuniversitair Centrum Antwerpen", directed by Prof. Dr. W. N. VERHEYEN, and by the Recent Invertebrates Section of the "Koninklijk Belgisch Instituut voor Natuurwetenschappen", directed by Dr. J. VAN GOETHEM [see J. VAN GOETHEM /in press/, R. MARQUET /in press/].

The aim of this paper is to describe the occurrence and distribution of each species of *Deroceras* in Belgium and to investigate the dynamics of their distribution patterns.

MATERIAL AND METHODS

In total more than 12,000 specimens representing circa 2,600 lots of Deroceras species were identified and recorded on U.T.M. grid maps with 10 x 10 km squares. This material comprises all Deroceras specimens present in the collections of the Koninklijk Belgisch Instituut voor Natuurwetenschappen /K.B.I.N./.

The total number of 10 x 10 km U.T.M. squares in Belgium is 375. This number includes the trapezoidal partitions at 6° E, as well as the peripheral squares covering not only Belgian territory but also a part of a neighbouring country.

At the end of 1982, 94% of all U.T.M. squares in Belgium were sampled.

The percentages in the upper right corner of the distribution maps indicate the number of positive U.T.M. squares for the concerned species compared with the total number of sampled U.T.M. squares for the same year.

Legends

- ◆ : Pre 1950, collected alive or observed alive.
- : 1950 onwards, collected alive or observed alive.
- ◆ : Records concerning a single particular year as indicated.

RESULTS

All records of landsnails before 1972 /based on the collections of the K.B.I.N./ are indicated on fig. 1. About 50% of all U T M squares had been sampled at that time, most of the records covering the period from 1935 to 1950. Figs 2-3 present the known distribution patterns before 1972 of D. reticulatum and D. laeve, both species being widespread in Belgium, although D. laeve is less common than D. reticulatum.

D. caruanae was recorded for the first time in Belgium only in 1968: Brussels /Woluwe/, in garden, 1 juvenile 6 adult specimens, leg. J. VAN GOETHEM & A. LIEVROUW /see VAN GOETHEM, 1974/. In the next three years the species was, as far as we know, not found elsewhere in the country /fig. 4/.

For the period 1972-1982, series of maps /figs 5-48/ are given showing year by year all records of landsnails /sampled U T M -squares/ gathered by the Recent Invertebrates Section /K.B.I.N./ and by the "Laboratorium voor Algemene Dierkunde /R.U.C.A./". Comparison of the corresponding maps compiling all the records for a given species, confirms the widespread occurrence of D. reticulatum and D. laeve in Belgium. The percentages of the positive U T M -squares for both species vary slightly. These variations can be explained by the fact that year after year not always the same degree of diversity in biotopes could be taken into account by sampling landsnails. On the other hand, very dry weather conditions during certain years might be responsible for low percentages of D. laeve /e.g. figs 19,23; 1976 = exceptionnally dry summer/.

After its first discovery in Belgium, D. caruanae was recorded again in 1972 in 6 different U.T.M. squares /fig. 8/. From then, the number of records increases rapidly each year. With a few exceptions /1978, 1980/ this species was found every year even more frequently than D. laeve.

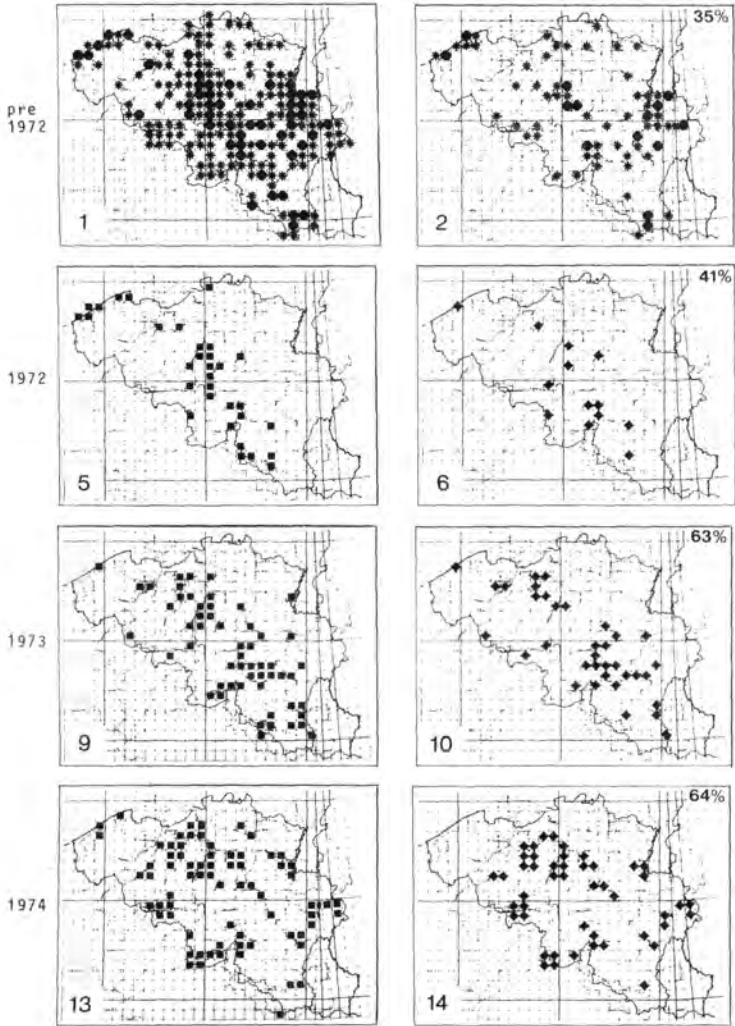
Although in 1978 the survey was almost exclusively concentrated in the four northern provinces, a percentage of 28% /fig. 32/ seems lower than could be expected. However, the scarcity of D. caruanae at that time in West Flanders and in Limburg could explain this low number.

The low percentage for 1980 /20%, fig. 40/ clearly demonstrates its low frequency in the southern part of Belgium. See dispersal of. D. caruanae.

The situation at the end of December 1982 is given by figs 49-52. They are directly comparable with figs 1-4.

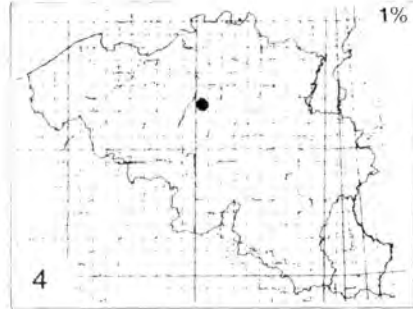
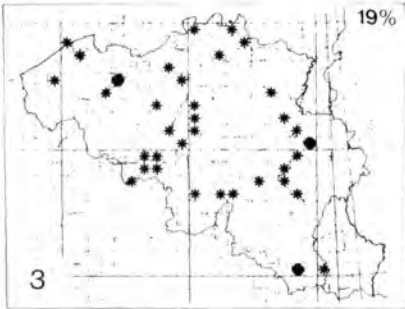
All records of landsnails

All records of *D. reticulatum*

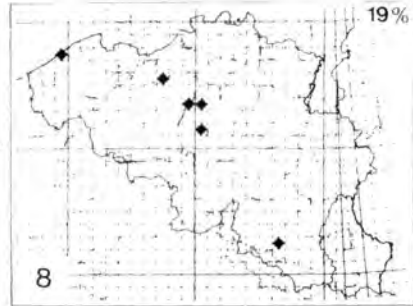
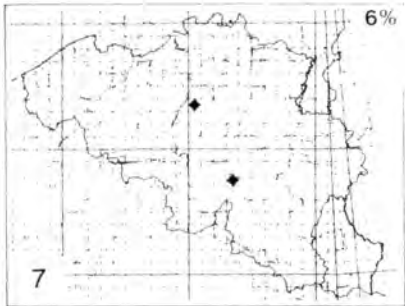


All records of *D. laevis*

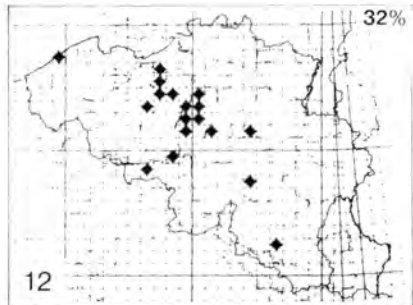
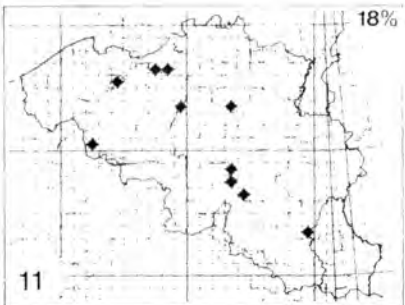
All records of *D. curvatae*



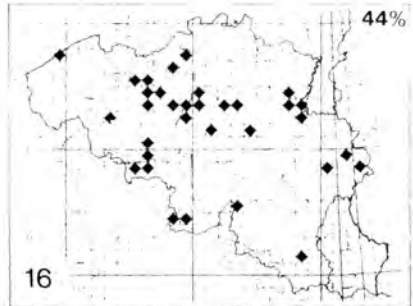
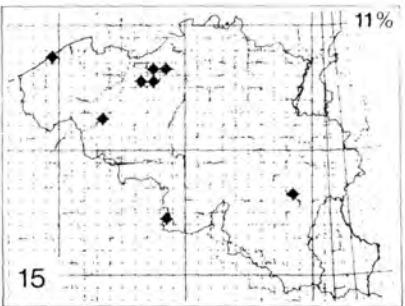
pre
1972



1972



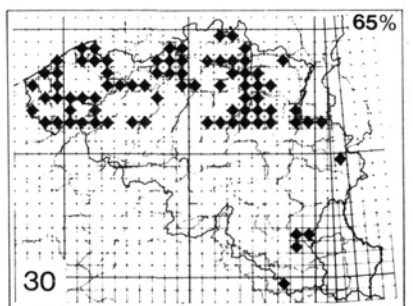
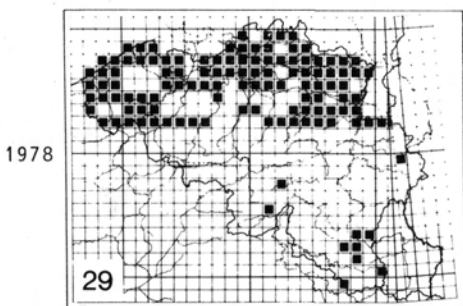
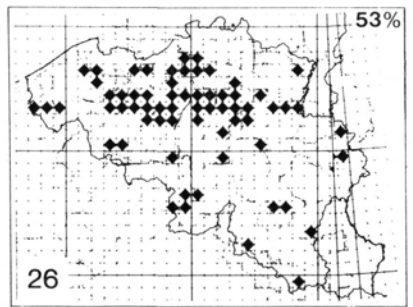
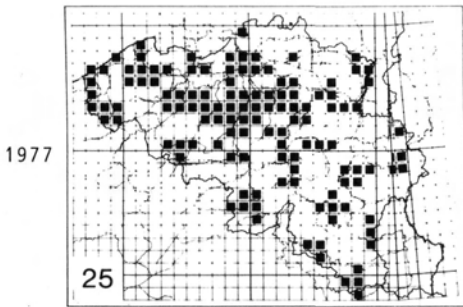
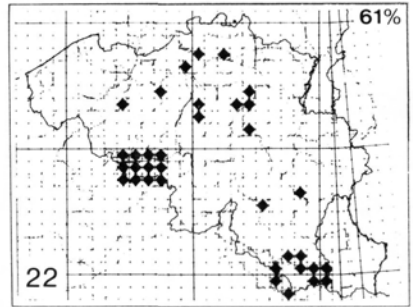
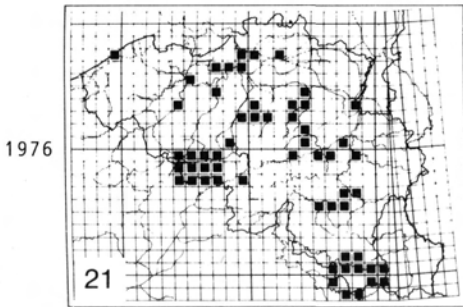
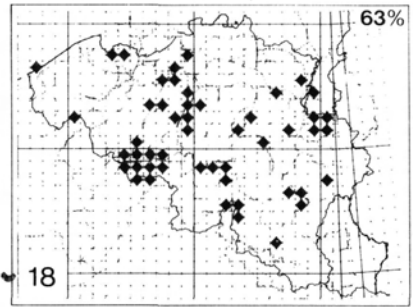
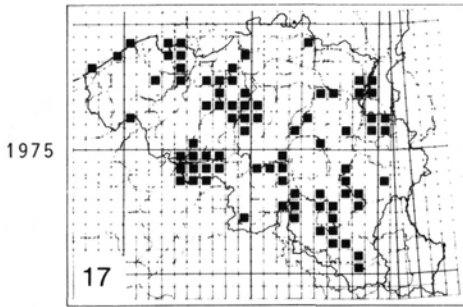
1973



1974

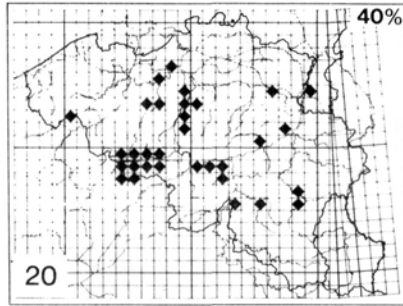
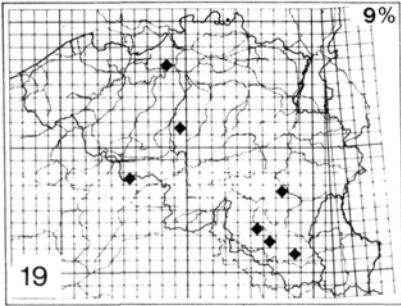
All records of landsnails

All records of *D. reticulatum*

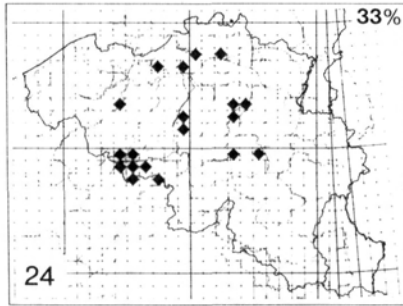
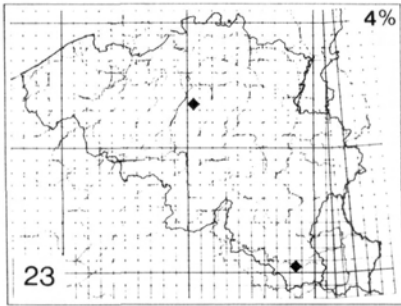


All records of *D. laeve*

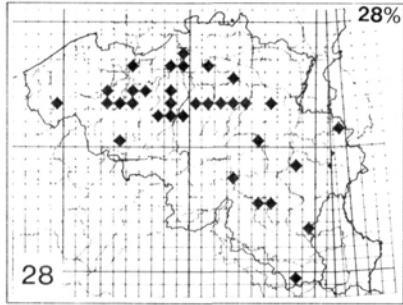
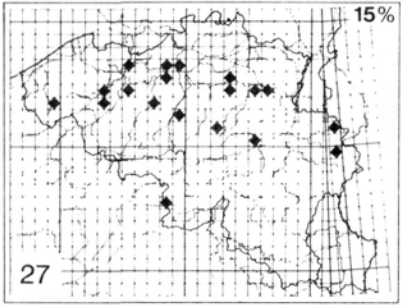
All records of *D. caruanae*



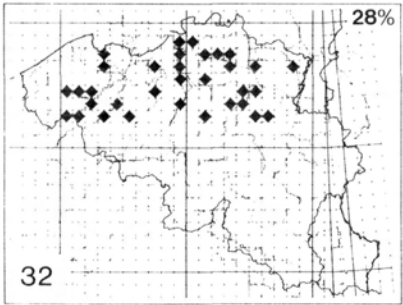
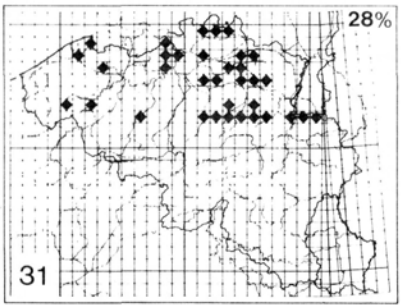
1975



1976



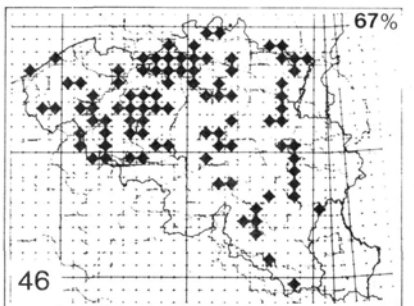
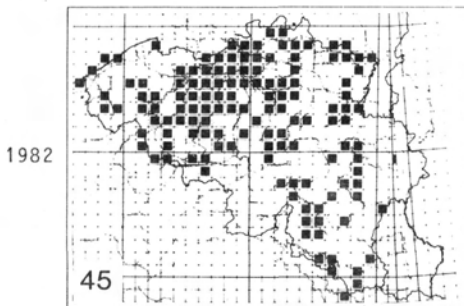
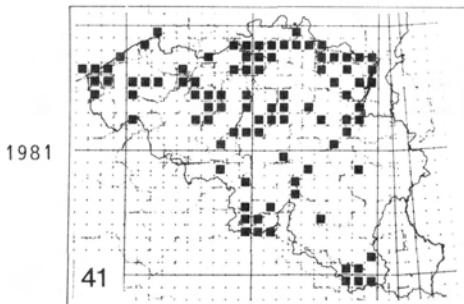
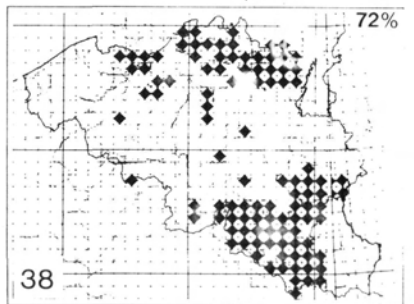
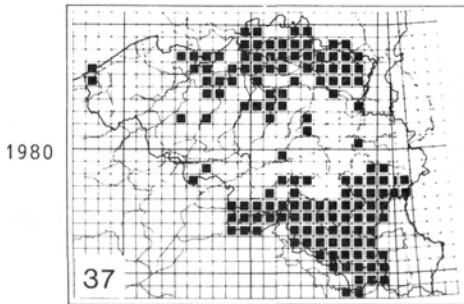
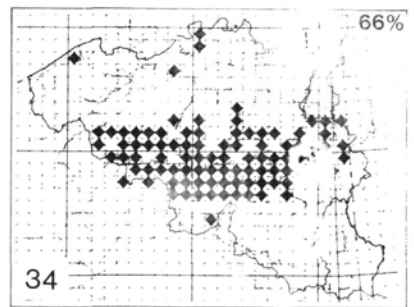
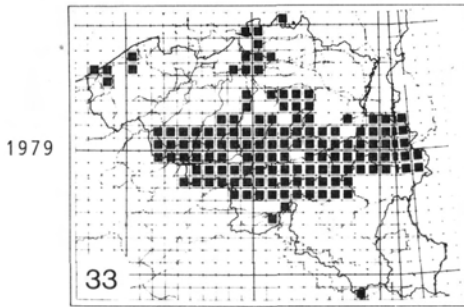
1977



1978

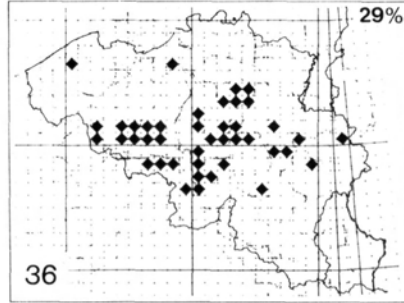
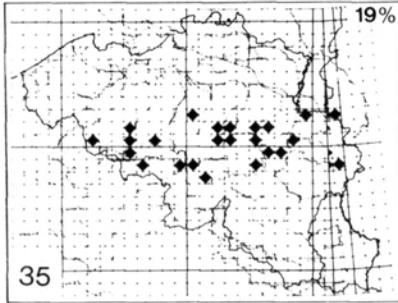
All records of landsnails

All records of *D. reticulatum*

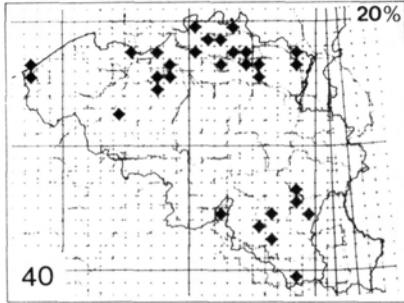
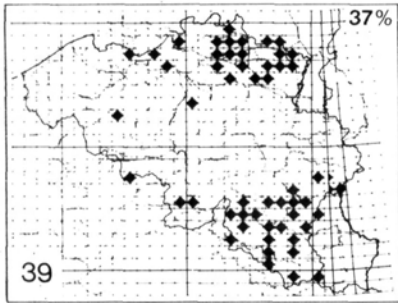


All records of *D. laeve*

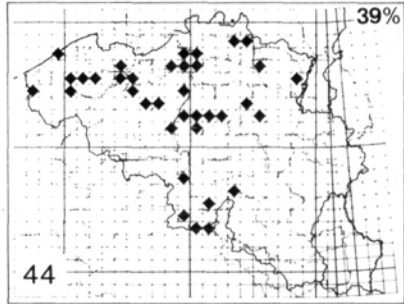
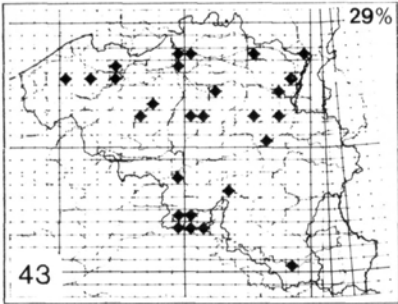
All records of *D. caruanae*



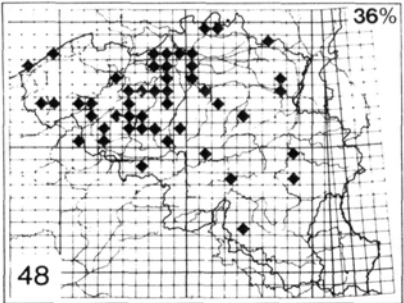
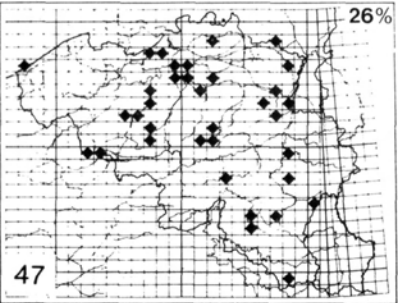
1979



1980

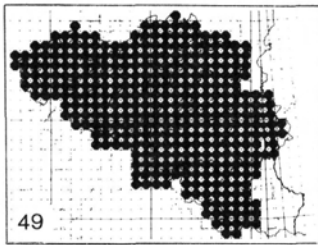


1981

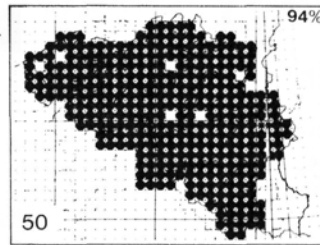


1982

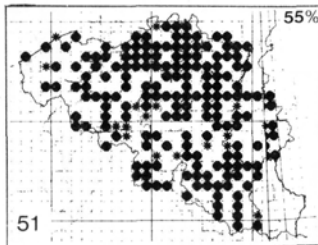
Figs 50-52 show the effectiveness of the survey carried out during eleven years. Before 1972, relatively few localities close to human habitats were sampled. During this survey, collections were also made in numerous gardens, fallows, etc.



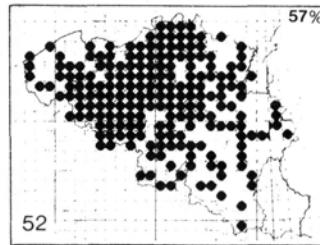
49
All landsnail records in Belgium,
December 1982



50
All records of *D. reticulatum*,
December 1982



51
All records of *D. laeve*,
December 1982



52
All records of *D. caruanae*,
December 1982

The result is a maximal cover of *D. reticulatum* with respect to the total number of sampled U T M squares /fig. 50/.

The results for *D. laeve*, found in 55% of the sampled U T M squares /fig. 51/ appear to be more realistic than the 19% obtained pre 1972 /fig. 3/. It seems even possible to us that *D. laeve* could be found in nearly all the 375 U T M squares, as is certainly the case for *D. reticulatum*, but it would be more difficult and time-consuming to prove it. Indeed, *D. laeve* prefers very damp places and consequently is more limited within the individual U T M squares than is *D. reticulatum*.

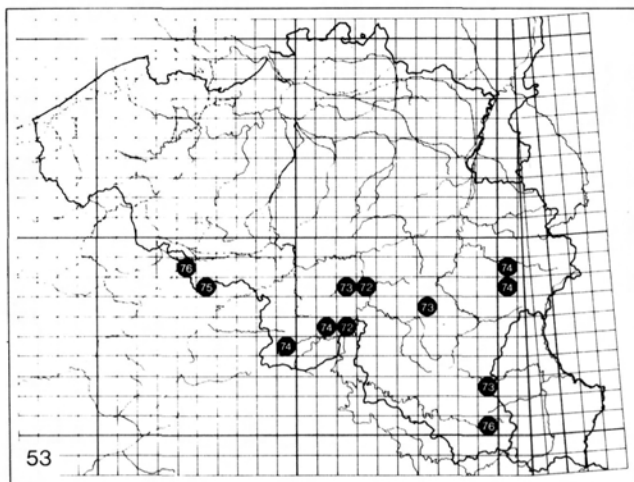
For comments on the distribution of *D. caruanae*, see further.

D. agreste was recorded for the first time in Belgium in 1972 : Dinant, 3 specimens, leg. M. LAMBIOTTE; Gochenée, 1 specimen, leg. W.N. NEUTEBOOM /see J. VAN GOETHEM, 1974/. So far only 13 records are known from the period 1972-76 /fig. 53/. It is curious that this species was not found in 1979 or 1980 /see figs 33,37/. However, we still believe that *D. agreste* could be autochthonous in Belgium. The authors will revisit the sampled sites of *D. agreste* in order to check if the populations found in 1972-76, still exist.

DISPERSAL OF DEROCERAS CARUANAE

D. caruanae was originally described from Malta /in 1891/, and subsequently only found in the Mediterranean region. We feel that its original home must be situated there.

As mentioned before, *D. caruanae* was found for the first time in Belgium in 1968 /see J. VAN GOETHEM, 1974/. It was not collected again during the period from 1969-1971. But from 1972 the number of records increased very rapidly, showing an explosive dispersal of this slug. A series of cumulative maps /figs 54-65/ clearly shows this phenomenon.



All records of *Deroceras agreste* (numbers indicate the year of recording)

Undoubtedly, *D. caruanae* was introduced to Belgium shortly before 1968. Most probably there have been a number of subsequent introductions. However, it would certainly be impossible to ascertain them. It seems obvious to us that the dispersal of this slug took readily place over the whole country, but especially in the northern part. This contrasts with the dispersal of another slug during the same period : *Boettgerilla pallens* SIMROTH, 1912, originally known from the Caucasus. The latter became specially widespread in the southern part of Belgium /see J. DE WILDE, J. VAN GOETHEM & R. MARQUET, in press/.

Without any doubt, man is responsible for the introduction and the rapid dispersal of *D. caruanae* in Belgium : e.g. transport of vegetables, garden plants, wood, etc. *D. caruanae* is highly synanthropic in Belgium. For detailed argumentation and conclusions, see J. DE WILDE, J. VAN GOETHEM & R. MARQUET, 1984a and 1984b.

CONCLUSION

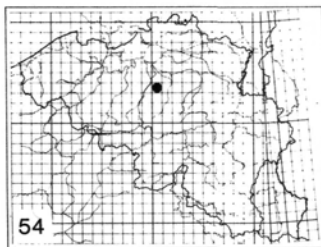
Deroceras reticulatum and *D. laeve* are autochthonous species in Belgium. At present they are very widespread and common, the first being probably the most common landsnail species in Belgium.

D. reticulatum can be found in any 10 x 10 km square in Belgium and generally in large numbers. Records from 94% of the sampled 10 x 10 km squares are at our disposal, the remaining 6% having no special significance. The species lives in almost any kind of habitat and scarcely fails on rubbish-tips. It is a synanthropic species, to be regarded as a major pest of many crops.

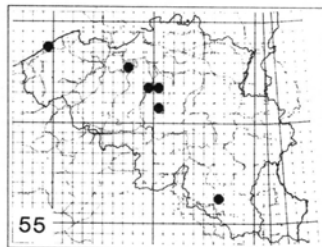
D. laeve has been recorded up to now in 55% of the sampled 10 x 10 km squares in Belgium, in a wide variety of damp or very damp biotopes.

D. agreste could be autochthonous in Belgium, attaining here the westernmost edge of its actual range. The species seems to be rare in Belgium with a limited number of local populations in the four southern provinces. So far, only 13 records are known from the period 1972-76. However, these populations could also be the result of introductions. Since *D. agreste* is not synanthropic, the species is mainly thrown on natural ways for dispersal. It is clear that in such a case a rapid dispersal is excluded.

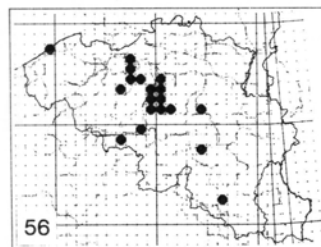
DISPERSAL OF *DEROCERAS CARUANA*



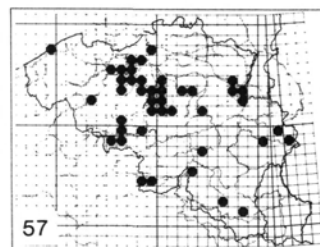
1968-1971



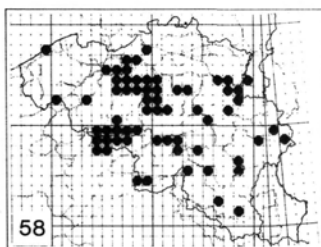
Up to 1972 inclusive



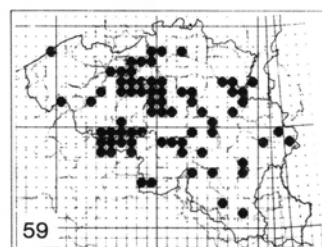
Up to 1973 inclusive



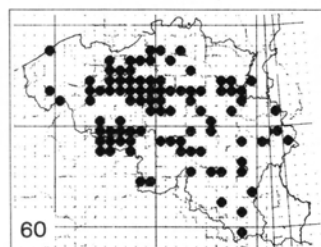
Up to 1974 inclusive



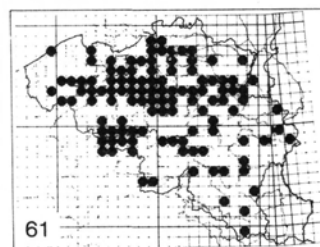
Up to 1975 inclusive



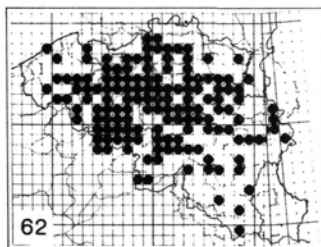
Up to 1976 inclusive



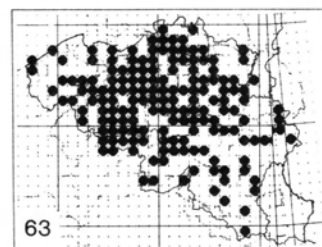
Up to 1977 inclusive



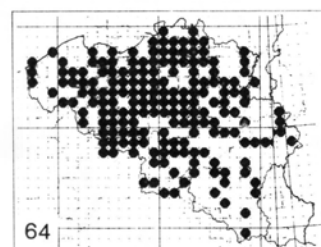
Up to 1978 inclusive



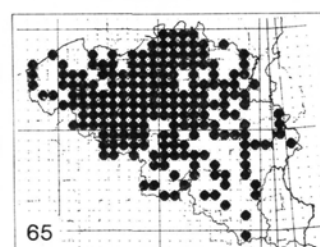
Up to 1979 inclusive



Up to 1980 inclusive



Up to 1981 inclusive



Up to 1982 inclusive

D. caruanae is definitely not autochthonous in Belgium. The slug was introduced to Belgium shortly * / before 1968. Most probably there have been a number of subsequent introductions. From 1972 on, the number of records increased very rapidly, showing an explosive dispersal of this slug. Fourteen years after the first record, *D. caruanae* became one of our commonest land snails, having been recorded in 57% of the sampled 10 x 10 km squares in Belgium. It is obvious that *D. caruanae* is a synanthropic species in Belgium and occupies a similar niche as *D. reticulatum*. This could explain the imposing extension in relation with human activities. At present *D. caruanae* is more densely distributed than *D. laeue* except in the Ardennes.

For detailed argumentation and conclusions, see J. DE WILDE, J. VAN GOETHEM & R. MARQUET, 1984a and 1984b.

ACKNOWLEDGEMENTS

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*) Regarding its rapid dispersal from 1972 on, it is hardly believable that this slug remained unobserved for a long period.