

THE CONTINENTAL DISTRIBUTION OF BRITISH AND IRISH MILLIPEDES, PART 2.

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INTRODUCTION

This article shows and discusses the known distributions of the non-julid millipedes of Britain and Ireland on the Continent of Europe, and compliments the article on the julids published in Volume 15 of the Bulletin of the British Myriapod Group in 1999.

For the time being these two articles include all the British and Irish species except those found in hothouses and *Anthogona britannicum* Mauriès, which has yet to be found on the Continent. Suffice it to say that Dr. Jean-Paul Mauriès and I have checked all our adult specimens of *Anthogona* from France (it was formerly believed to be a monospecific genus endemic to France): we have verified that they are all *A. variegatum* Ribaut, which occurs from Normandy southwards to the Pyrenees and is strictly Atlantic in distribution.

The millipedes listed are numbered to correspond with the distribution maps. On these maps black filled circles indicate precise records in 50 X 50km UTM squares. On this occasion open circles are used where there are records from a region in which precise geographical coordinates are unknown to me. To save space, the Atlantic islands are not shown on the maps. A black circle in the boxes 'A', 'M' and 'C' indicates that the species concerned is found in the Azores, Madeiran or Canary Islands respectively.

DISTRIBUTION OF SPECIES

Order POLYXENIDA

1. *Polyxenus lagurus* (Linné, 1758)

This pioneering pan-European millipede is the only species of its order to occur in the northern areas of the Continent. It has also been recorded from Israel, Algeria and the United States of America. It tends to inhabit crevices in walls, rocks, below stones and especially beneath the bark of trees; it is also regularly found below foliose lichens and clumps of moss on trees and rocks and occurs regularly in leaf litter. In southern areas it inhabits litter much more. Whether or not it is owing to high summer temperatures the sub-corticolous habit is not very evident in Southern Europe. *Polyxenus lagurus* may have the largest range of all European millipedes, it occurs further north out of doors than any other apart from *Proteroiulus fuscus* which is not recorded from almost all southern regions. I know that I am still lacking some available precise information About *Polyxenus lagurus* from France, Italy, Austria and Yugoslavia at least. There are nearly twenty other species of polyxenids in the Mediterranean zone.

Order GLOMERIDA

2. *Glomeris marginata* (Villers, 1789)

Glomeris marginata has an extended Atlantic distribution. It is one of the most studied millipedes, known to be very common in most of the Atlantic zone, though not in the colder parts. Particularly in woods on limestone it may dominate the diplopod biomass. It extends into the Central, Alpine and Mediterranean zones to some degree. I have not included a couple of records from botanical gardens outside its range in the Balkans. Its limits of general distribution are quite well known, except in Spain.

3. *Geoglomeris subterranea* Verhoeff, 1908.

Stygioglomeris crinata Brölemann, 1913

Geoglomeris jurassica Verhoeff, 1915

Whatever we call this small glomerid it has become apparent that it is quite a common member of the soil fauna in some (limestone) areas. At the same time soil extractions in calcareous areas frequently fail to reveal it - its ecological requirements remain to be worked out. Its distribution might be a more restricted form of that of *G. marginata*; there are not yet records from the Netherlands, the extreme north of Germany and Scandinavia. At the same time there are few records from the Atlantic zone in France and none from Spain, while the other five species of the genus all occur in the Mediterranean. There are not yet enough records of this small species to clearly delimit its range.

4. *Adenomeris gibbosa* Mauriès, 1960

Apart from Declan Doogue's discoveries around Dublin this species has been recorded on only three occasions in the western half of the Pyrenees. Clearly, it might have been introduced into Ireland. It has to be said, however, that collecting, let alone soil sampling, has occurred very rarely in the western areas of France. In view of the fact that the species was not described until 1960 either, it could certainly have been overlooked. There is the possibility that it has an Atlantic distribution. There are two other species of *Adenomeris* described from the Pyrenean region, *hispidata* in 1909 (7 records) and *viscaiana* in 1985 (1 record) which may be local or regional endemics. I am not aware of any synanthropic records for any of these species (with the possible exception of Dublin of course!). As the known sites for *A. gibbosa* are in rather remote places an introduction to Ireland would have been fortuitous.

5. *Trachysphaera lobata* (Ribaut, 1954)

There are well over a dozen sites in the western half of France from which this small species, which is presumed to be calcicolous, has been recorded during the past half-century. Most were from caves examined by speleologists, others were from litter in woodland and the most northerly of these records is from a quarry near Paris. Evidently *T. lobata* has an Atlantic distribution, strictly at present, and its occurrence in the Isle of Wight might be natural. An introduction cannot be ruled out, but is not required to explain its presence.

Order POLYZONIDA

6. *Polyzonium germanicum* Brandt, 1831

The distribution of *Polyzonium germanicum* is best accounted for by the supposition that it has moved north from different refugia since the last glaciation. There is a large area comprising most of the eastern half of Europe which has presumably been occupied from the Balkans and a not insignificant population in most of France and the SE corner of England which presumably moved out of the Atlanto-Mediterranean refugium. Schubart (1934) studied individuals from the two areas and found no difference between them. *Polyzonium germanicum* is likely to have had a wider continuous distribution in the past and has not yet reoccupied all of the territory from which it had to retreat (Kime, 1990). Northwards from Switzerland and the Austrian Tyrol there is a huge tract of country including the eastern edge of France, Luxemburg, Belgium, the Netherlands and most of Germany (west of the Elbe) from which it has been reported on merely one occasion.

Order CHORDEUMATIDA

7. *Craspedosoma rawlinsi* Leach, 1815.

The taxonomy of the genus *Craspedosoma* is so complicated that it is difficult to prepare proper maps. Fortunately the situation with regard to *C. rawlinsi* has been eased since the publication by Spelda (1991) synonymising it with *C. alemannicum* and the article presented by Hauser (in press) at the last myriapodological congress in 1999. We are now able to say that it is a Central European species comprising all those former species, sub-species and varieties that occur north of the Alps. There are still other species in the Alpine regions and beyond. I present a map which I hope is reasonably accurate, with reservations about ex-Yugoslavia! Its range is consistent with its north east orientation in Britain. At the same time I note that Central species do have a tendency to creep westwards to varying degrees in Britain and Ireland, perhaps because there are vacant niches. *C. rawlinsi* is apparently markedly confined to the eastern parts of France, where there is no other species of *Craspedosoma* to the west of it.

8. *Nanogona polydesmoides* (Leach, 1815)

Nanogona polydesmoides is essentially an Atlantic species, despite a highly disjunct patch of a race attributed to the species in the North of Italy. There are five other species of *Nanogona* in the South of France: its origins are Atlanto-Mediterranean. Found mainly in woodland litter in the North it is increasingly found in caves as you go southwards and favours limestone. It is extremely localised in Belgium. Note that on the Continent this species occurs almost entirely to the west of *Craspedosoma*.

9. *Anamastigona pulchellum* Silvestri, 1898

Anamastigona is a Mediterranean genus. *A. pulchellum* is based in Italy and was found on Madeira and in France (Toulouse) before being discovered in Ireland. The records outside Italy are almost certainly introductions. It might be found more widely in the future.

10. *Brachychaeteuma melanops* Brade-Birks, 1918

On the evidence this is a strict Atlantic species confined to the western half of France on the European mainland. I find that it is common in the northern part of Aquitaine, generally in woodland on calcareous soil. Records are too few and scattered for its limits in France to be clear.

11. *Brachychaeteuma bradeae* (Brölemann & Brade-Birks, 1917)

The distribution of this and the following species are rather more difficult to elucidate. There is of course the possibility that they may be both in the same polymorphic species: Blower (1986) discusses this in detail.

The records of *B. bradeae* quite definitely suggest a Central European distribution with occurrences in Britain being mainly northern and eastern. There are many synanthropic records of this animal; it would be useful to know where it occurs in natural or semi-natural habitats.

12. *Brachychaeteuma bagnalli* Verhoeff, 1911

The geographical records of *B. bagnalli* in Britain and Ireland are hard to interpret at the moment. Schubart (1938) reported *B. bagnalli* from seven caves in Belgium and from Germany, only giving the Belgian locations. I regret that I have not yet been able to see the subsequent German paper giving details of the German site(s). In Belgium it is common in patches and, whereas several more records are from caves it has recently been found many times in soil and litter in calcareous woodland. These records are from the edge of the Atlantic and Central zones. The French record is in the Central zone but not all that far from the Atlantic. On the Continent *B. bagnalli* occurs between *B. bradeae* to the east and *B. melanops* to the west. (There are other species in the South as well). In Britain and Ireland it is logical that the first two should be found north of the latter but obviously the position is somewhat confused between *bradeae* and *bagnalli*. Overall *B. bagnalli* has a marginal position between Atlantic and Central. There is finally some logic in this.

13. *Chordeuma sylvestre* C. L. Koch, 1847

It is at first sight surprising that this species is found in Cornwall, because on the mainland of Europe the species has a central distribution, being found to the east of *Chordeuma proximum*. It is an abundantly common species within its range and the position is quite clear. It appears to be in the 'wrong place' in Britain and so probably introduced. However, the most northerly record on the Continent is from Springe south of Hanover at just over 52 N, approximately the latitude of Ipswich, Banbury and Hereford. *C. sylvestre* is particularly associated with rocky ground and does not occur on the North European Plain. In northern France it extends westwards into Normandy where it overlaps *C. proximum*. Its occurrence in Cornwall is compatible with its ecological requirements, and perhaps an extension of its French range. Does it occur in Brittany? We don't know.

14. *Chordeuma proximum* Ribaut, 1913

This animal has a classic Atlantic distribution, occurring in the western half of France, Britain and Ireland. In France it is more or less parapatric with *C. sylvestre*, the boundary between them running approximately along the Rhone-Saone valley and the Seine Valley further north. Yet, as mentioned above, the two species overlap in Normandy. *C. proximum* is a very characteristic woodland species in western France. Again, there are no records from Brittany!

15. *Melogona gallicum* (Latzel, 1884)

This species has a more extended Atlantic range than *C. proximum*, reaching the southern tip of the Netherlands, a bit to the east of the Rhine Valley in Germany, NW Switzerland and indeed Norway, a supposed introduction, but still in the Atlantic zone. It is a very common woodland animal in N and NE France, Belgium and Luxemburg. While it is common in Normandy there are still no records from Brittany! From my limited experience in south west France it seems more sporadic there than further north.

16. *Melogona voigti* (Verhoeff, 1899)

Roughly east of the Rhine Valley *M. voigti* replaces *M. gallicum*. It has a central distribution, reaching southern Sweden, Denmark and Scotland. It is common in the Netherlands where it crosses the Rhine and reaches Belgium. It is entirely logical that it should occur in Scotland. It might be found in the east of England.

17. *Melogona scutellare* (Ribaut, 1913)

There are a number of species of millipedes that occur in the Alpine zone and which have disjunct populations mainly to the north and west of these mountains. One of these is *Melogona scutellare*. The type species was found at Grenoble and the animal was subsequently shown to occur in the Alps and Jura of France and Switzerland over a very large altitudinal range - from 360m to 2315m according to Pedrolì-Christen (1993). It is local and uncommon: its biotopes vary considerably. In England Brade & Birks (1916) described the variety *broelemanni* from Lancashire and later described *bagnalli* from Derbyshire. However, Blower (1985) showed that there is variation between *typica*, *broelemanni* and *bagnalli* in English material and so there may not be regional varieties (Another variety had been described from a further disjunct population in Piedmont in Italy by Verhoeff). Demange (1981) cites a record from the French Pyrenees (Haute-Garonne). Just lately it has been reported from Belgium by Van den Haute (1999). What are we to make of all this? Are we left with relict populations of a formerly widespread species or have there been introductions into depauperate faunas? Either or both seem possible. On present evidence, as there are no reports at all from the whole of northern France the latter is perhaps the more likely. Yet there has been little intensive searching in northern France. By far most of the data for the species now come from Britain and Ireland.

Order POLYDESMIDA

18. *Polydesmus angustus* LATZEL, 1884

This very familiar species has an extended Atlantic distribution. It is such a common animal that the few sporadic reports of it east of its main range may well be introductions. In general, to the east, *P. angustus* is entirely replaced by *P. complanatus*. *P. angustus* has been introduced into N America and Mexico.

Note that in theory the species is common throughout France. A look at the distribution map indicates the gaps in which collecting may most usefully be done.

19. *Polydesmus barberii* Latzel, 1889

This species of the Italian and French Rivieras has presumably been introduced into south west England.

20. *Polydesmus coriaceus* Porat, 1870

A very clear Atlantic distribution is revealed in this case, with an extension of subspecies or varieties into north east Spain (Catalonia), including Mallorca. The animal occurs from Madeira, the Azores and Portugal to Belgium. The species has reached the Cape Verde Islands to the south and the USA in the west. It seems to be the most common polydesmid by far in the north of Spain.

21. *Polydesmus denticulatus* C. L. Koch, 1847

I am not quite sure how to describe the distribution of *P. denticulatus*. A glance at the map indicates a fairly central range, but in fact the species occurs rather widely north of the Mediterranean Basin. It is something of an ecological oddity as well, synanthropic in the north and east (the most northerly records in Sweden are from greenhouses) as well as occurring in woodland, recorded from inundation forests and wet woodlands, elsewhere from dry grasslands and a whole range of sites. From some regions there is a shortage of precise localities and environmental data. My French data are not yet complete. It has been introduced into Newfoundland.

22. *Polydesmus inconstans* Latzel, 1884

Like the preceding species *Polydesmus inconstans* has a large range in Europe and has been introduced, this time quite widely, into N America. It is found near the Mediterranean only in the west; it is not known from the Balkans. It occurs from Spain to Norway in the Atlantic zone. It also occurs in the North from Iceland to Finland and Russia. These northern and eastern records are mainly synanthropic. In western Europe it is regularly found in grassland and quarries. It might be an Atlantic species which has greatly extended its range by pioneering. One very striking difference between the distribution of this species and that of *P. denticulatus*, not perhaps immediately apparent, is the real scarcity of records of this species from SW Germany, one of the best-worked parts of Europe, whereas *P. denticulatus* is very common there. Furthermore, in Switzerland, *P. inconstans* is found only here and there in the Rhone Valley area in the west. Thus it is very unlikely to be a Central species, and much more likely to be based on the Atlantic. It should be remembered, too, that it is closely related to *P. coriaceus* of certain Atlantic origin, and with which it was for a long time confused.

23. *Polydesmus testaceus* C. L. Koch, 1847

The most northerly published records of this species are from southern England and Germany. It is evidently thermophile and occurs on limestone formations, very often in calcareous grassland, in the Atlantic and west-central zones. It is also petrophile and cavernicolous. It appears to be absent from the North European Plain. In the South it reaches Italy where there are very similar species and where there has been some taxonomic confusion in the past. I would say that it has an extended Atlantic distribution but I would like to find more of it in the west of France! It is sufficiently common on limestone in the Perigord to make this very likely. There are so far no reports from the limestone areas of the Pyrenees and northern Spain. I have collected huge numbers of *P. testaceus* in Belgium and Luxemburg, mostly from pitfall traps in grassland and sometimes from rocky woodland.

24. *Brachydesmus superus* Latzel, 1884

Brachydesmus superus is a pan-European species found almost everywhere, including many Atlantic islands; it has reached the USA and, indeed, Robinson Crusoe Island (Juan Fernandez Is.) in the Pacific. I have not been able to locate all the records; as with other common species lists of precise localities are often missing from accounts of distribution. In this case I am aware that I am particularly short of locations in Poland, North Germany and parts of France where it should be plentiful. In the Mediterranean region there are other species of *Brachydesmus* which cohabit or replace it. In many if not all regions it has strong synanthropic tendencies.

25. *Eumastigonodesmus boncii* Brölemann, 1908

I have never seen this animal which comes from the high Pyrenees. I can't imagine how it got to rural County Durham where I once unsuccessfully looked for it.

26. *Macrosternodesmus palicola* Brölemann, 1908

This species is proving to be quite common in calcareous soil and, in winter, in the litter of woods on such soils in the Atlantic zone. It seems to be a regular component of the soil fauna in beech woods. It extends eastwards to Sweden as a synanthrope.

27. *Ophiodesmus albonanus* (Latzel, 1885)

This has a similar distribution to *M. palicola*, but I, personally, have found it far less often on the Continent, especially so in France.

28. *Stosatea italica* (Latzel, 1886)

Common in the central part of the Mediterranean Basin, this animal has colonised to the north and west as far as Ireland. It has been found on Madeira. I have found it on a few occasions. In my experience it appears and then tends to disappear from a site. In north west Europe these sites are regularly synanthropic but occasionally in unexpectedly rural situations. It has been associated in the imagination with the boots of Roman legionnaires, although in the case of Ireland it was trading boats instead!

DISCUSSION

The majority of species' distributions conform with expected patterns. But there are so few records of some others that it is difficult to be entirely certain of their limits: more investigations are needed in several parts of the Continent. Western France, Spain and Portugal are of particular importance to British and Irish investigators. The bulk of British and Irish species fall into either the western (Atlantic) category or the Central European category. Because the latter group have spread to the west in Britain and Ireland this situation is not always evident from the national maps. Knowing which category an animal belongs to should give some insight into its particular ecological needs. The Central species are usually most active in spring, with a smaller autumn peak, they often burrow in the winter and in the summer as well, especially if it is hot or dry. The Central chordeumatids e.g. *Craspedosoma* are however active in winter and tolerant of cold conditions. On the European scale, chordeumatids correlate well with the distribution of oceanic plants; they are mainly in the west or up in mountains with adequate rainfall. Forty per cent of the French

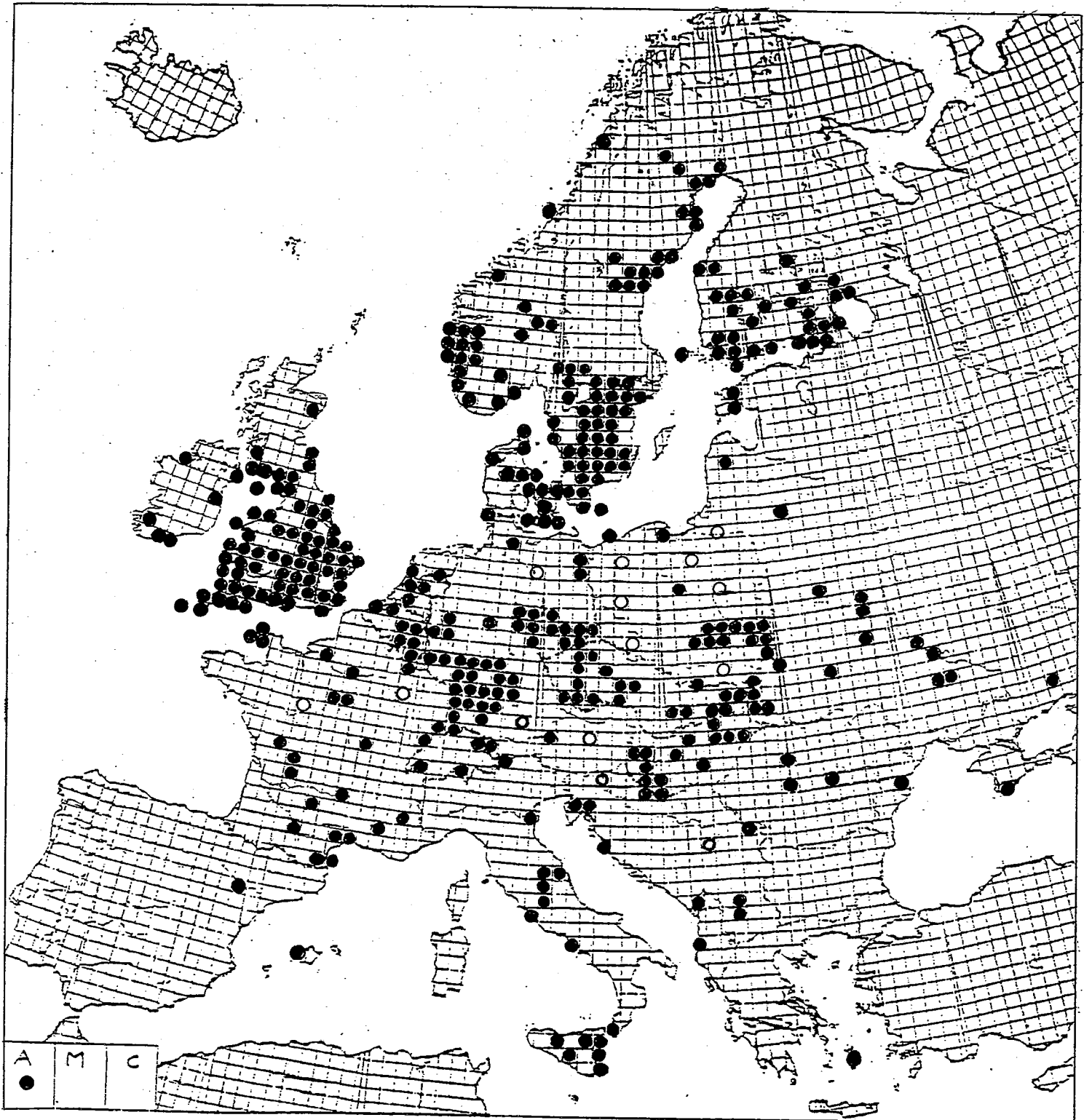
millipedes are chordeumatids (Geoffroy, 1996), the highest proportion in Europe. There is plenty of scope for recording chordeumatids in late autumn (when many become adult), winter or early spring. A good time to go south! For the other orders spring appears to be the best time. In the southern part of the Atlantic zone the winters are not cold, at least not near sea level, and collecting of many species can proceed from October until April.

ACKNOWLEDGEMENTS

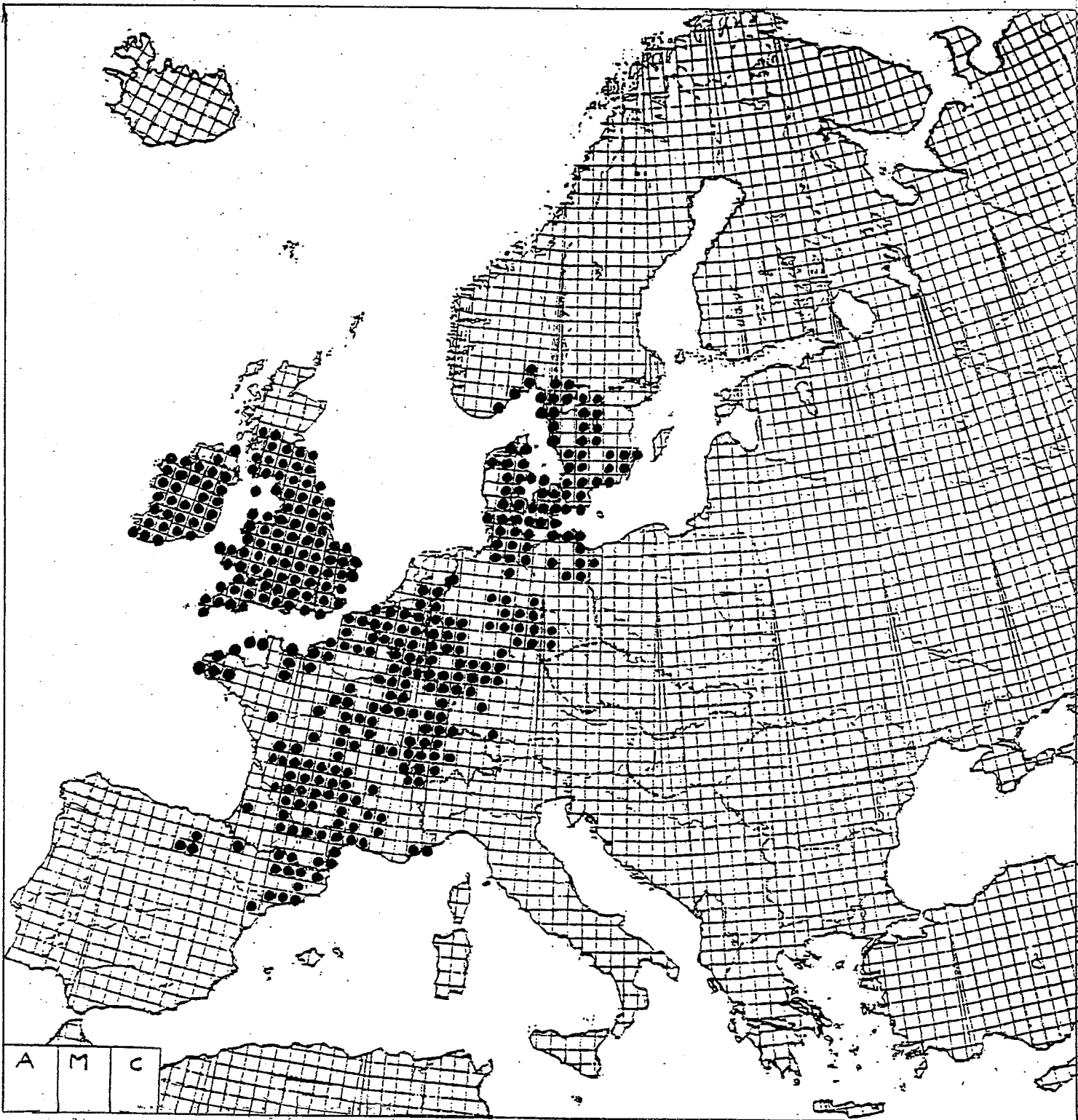
Thanks are gladly given to the British Myriapod Group membership for the wealth of records from these islands. I particularly thank Paul Harding for providing me with maps. I hope my British and Irish records are more up to date than they were two years ago. The main aim of this paper is to show Continental distribution in particular. So I am most grateful to all the many colleagues who have sent me data to this end and, here, especially to Jean-Paul Mauriès and Jean-Jacques Geoffroy of the CIM in Paris who have made me welcome and have provided me with a wealth of information. Professor Henrik Enghoff has made a huge contribution, sending me information over many years and Sergei Golovatch has contributed much from the East. The omissions and mistakes that remain are entirely mine.

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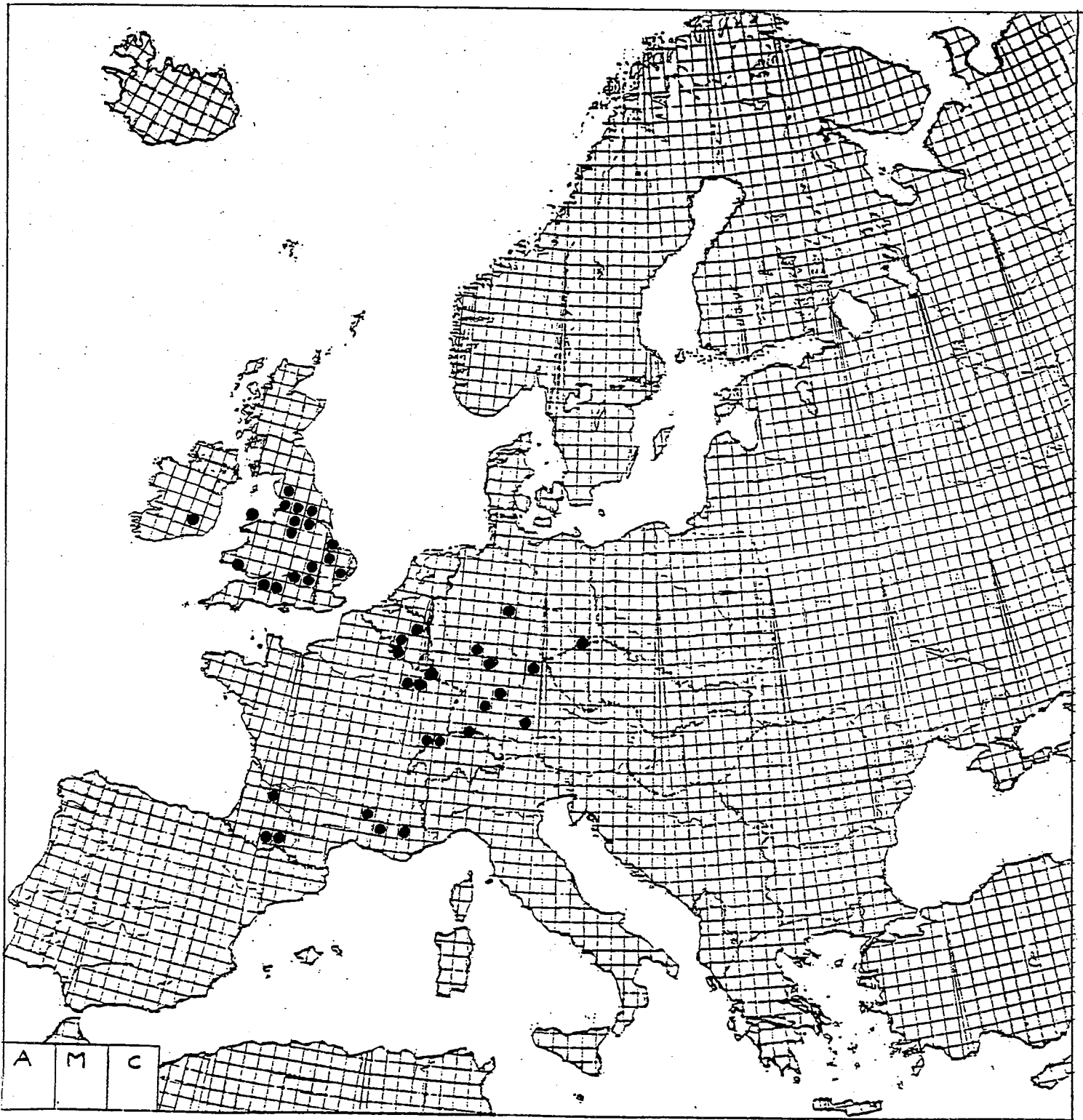
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MAP 1. POLYXENUS LAGURUS.



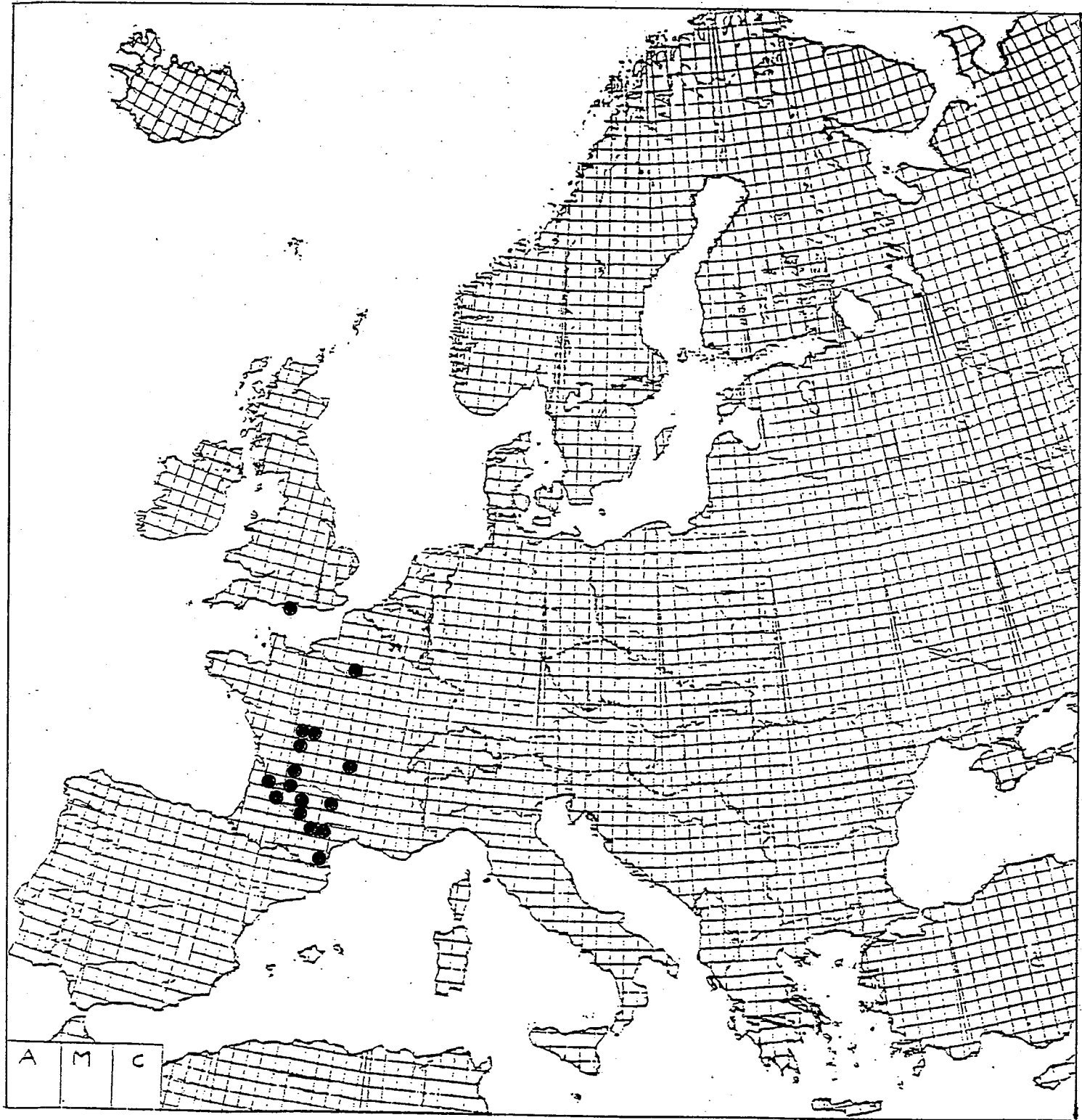
MAP 2. *GLOMERIS MARGINATA*.



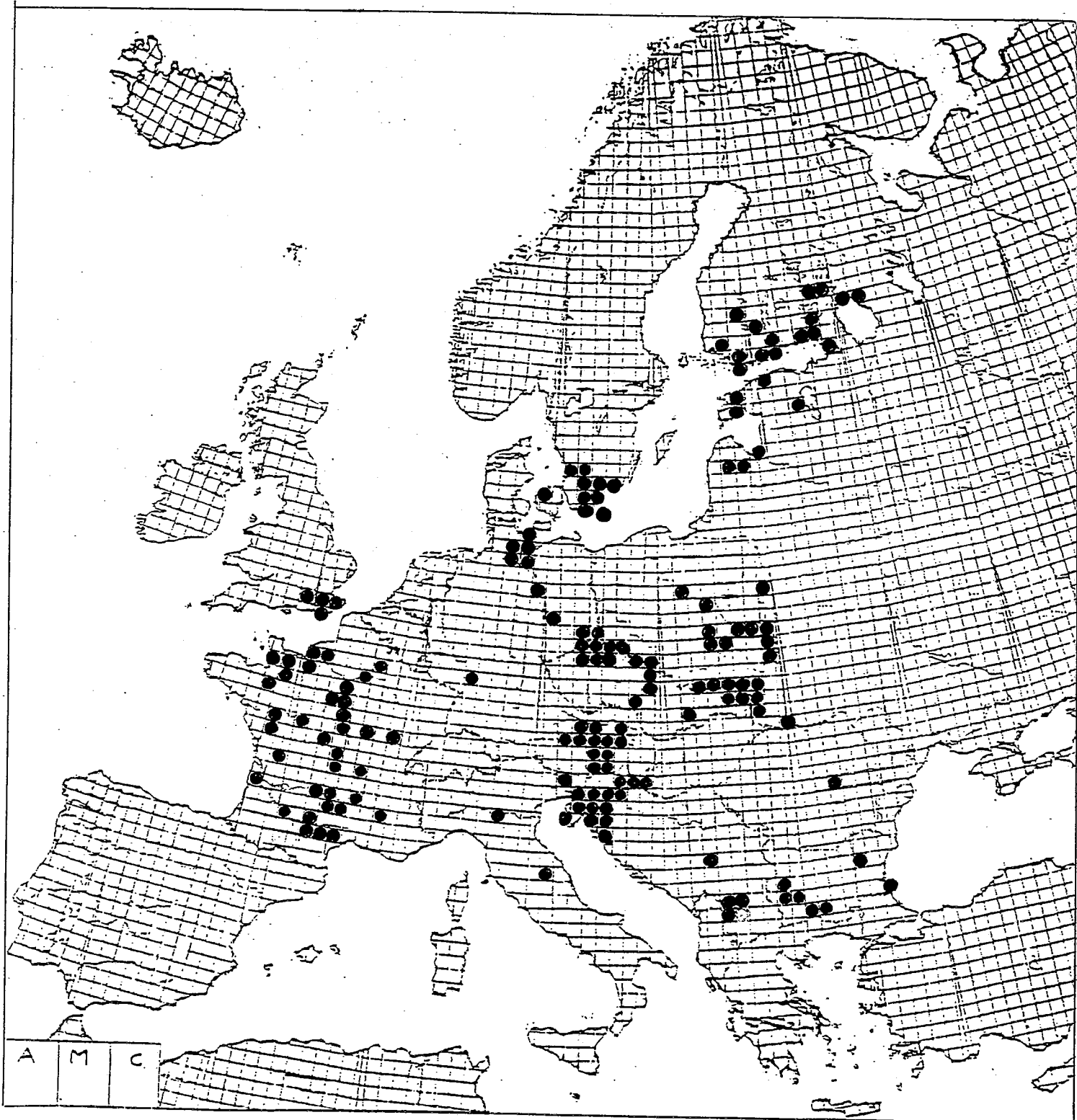
MAP 3. GEOGLOMERIS SUBTERRANEA.



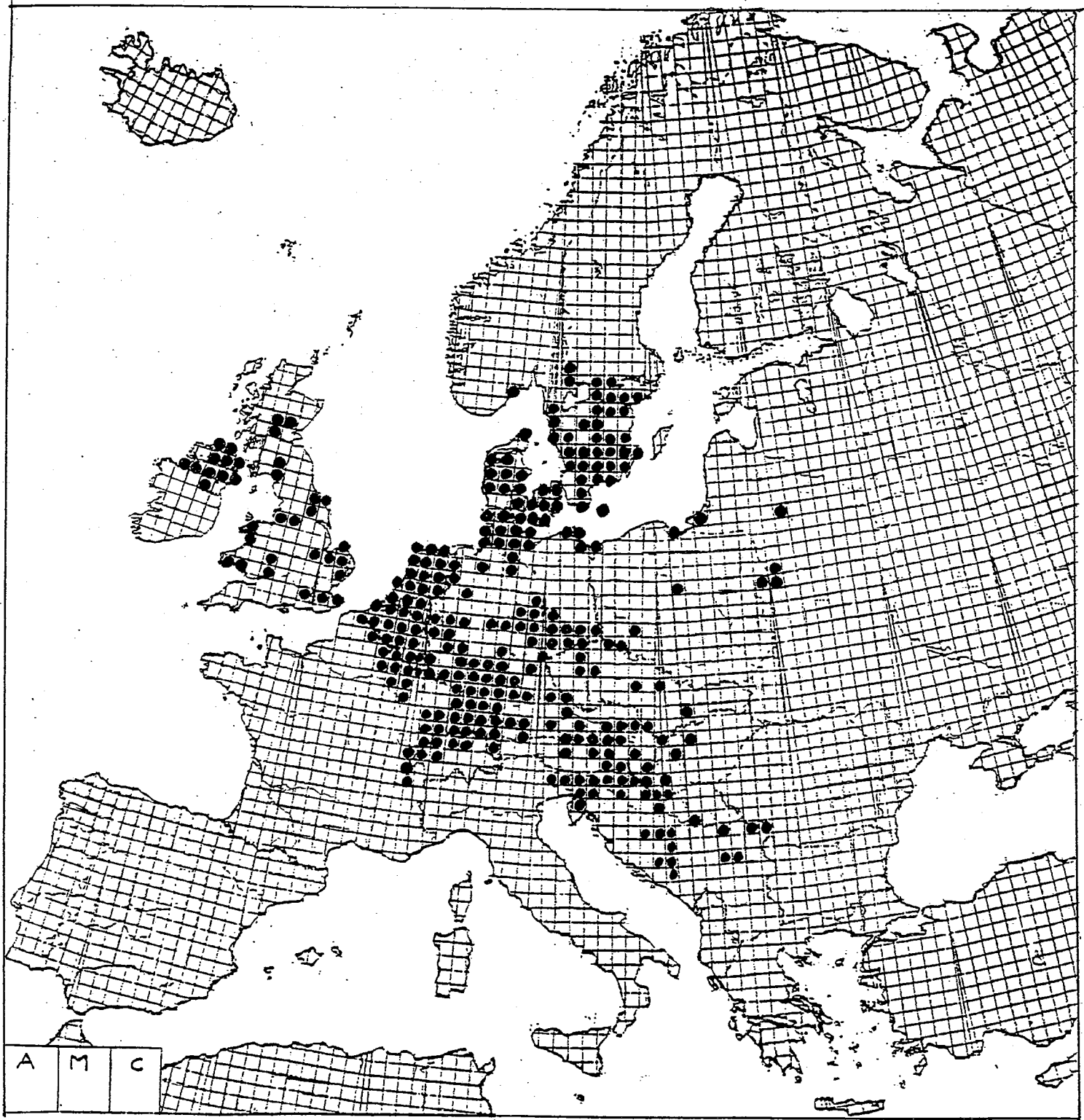
MAP 4. ADENOMERIS GIBBOSA.



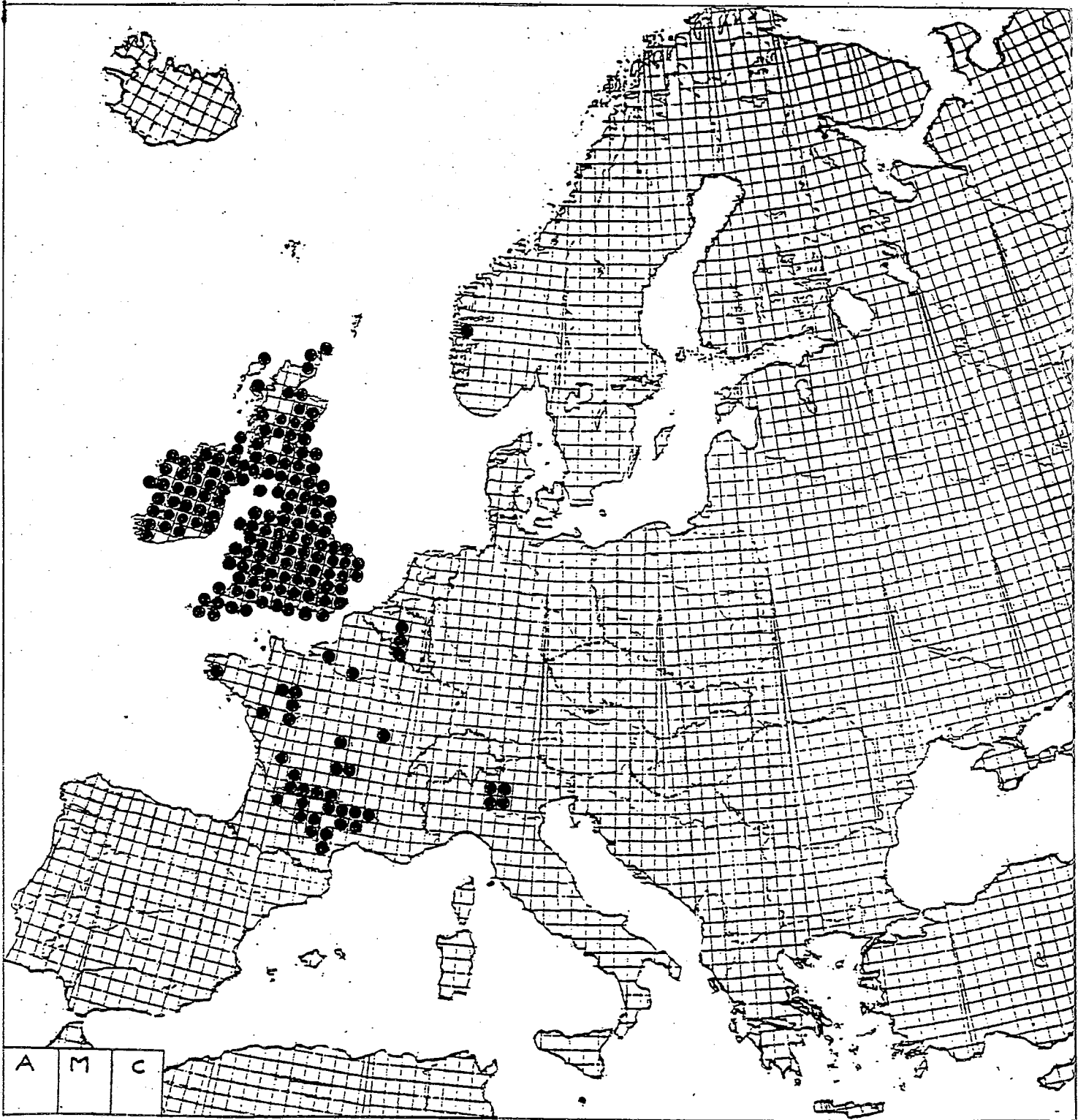
MAP 5. TRACHYSPHAERA LOBATA.



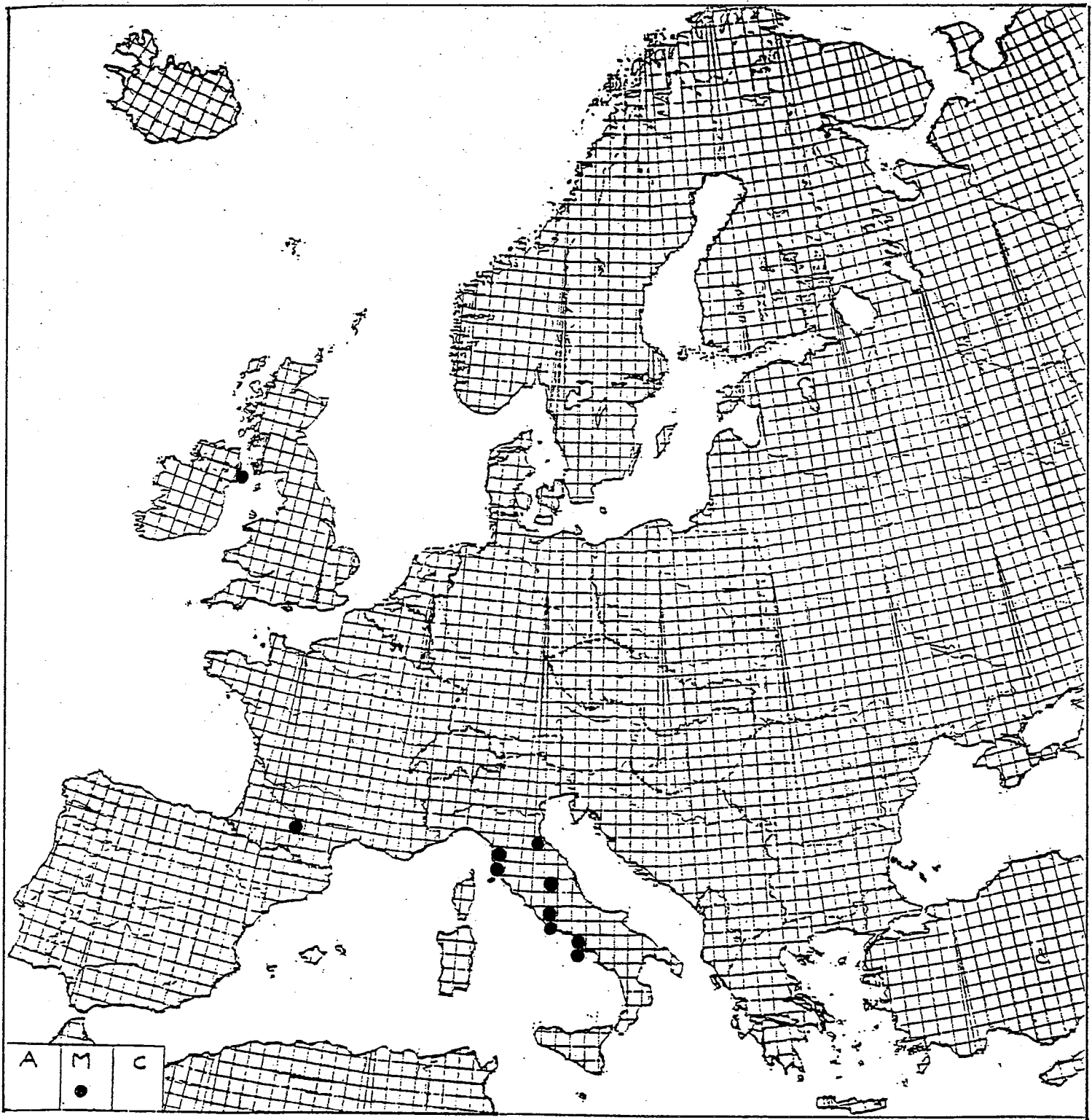
MAP 6. POLYZONIUM GERMANICUM.



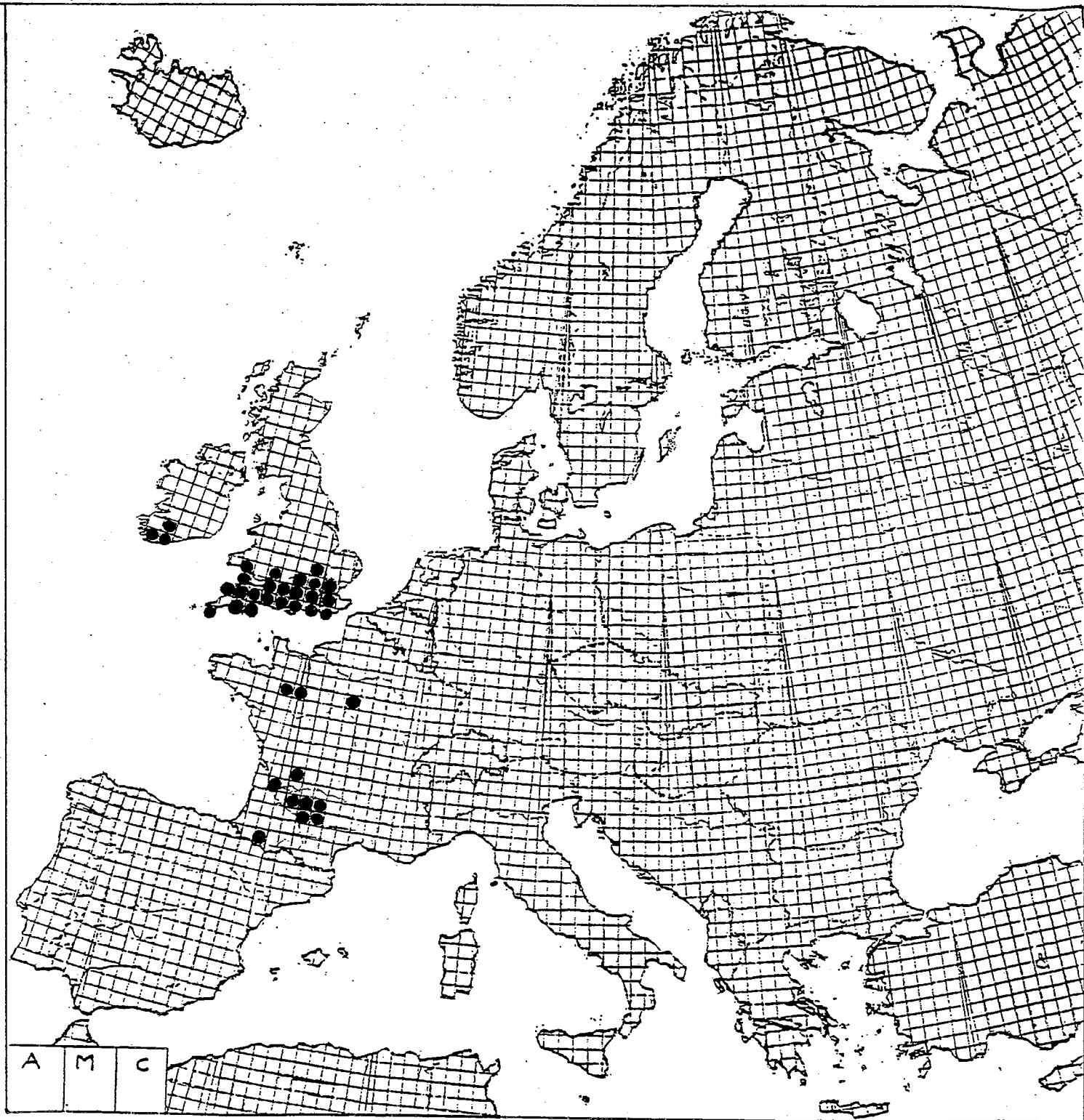
MAP 7. CRASPEDOSOMA RAWLINI.



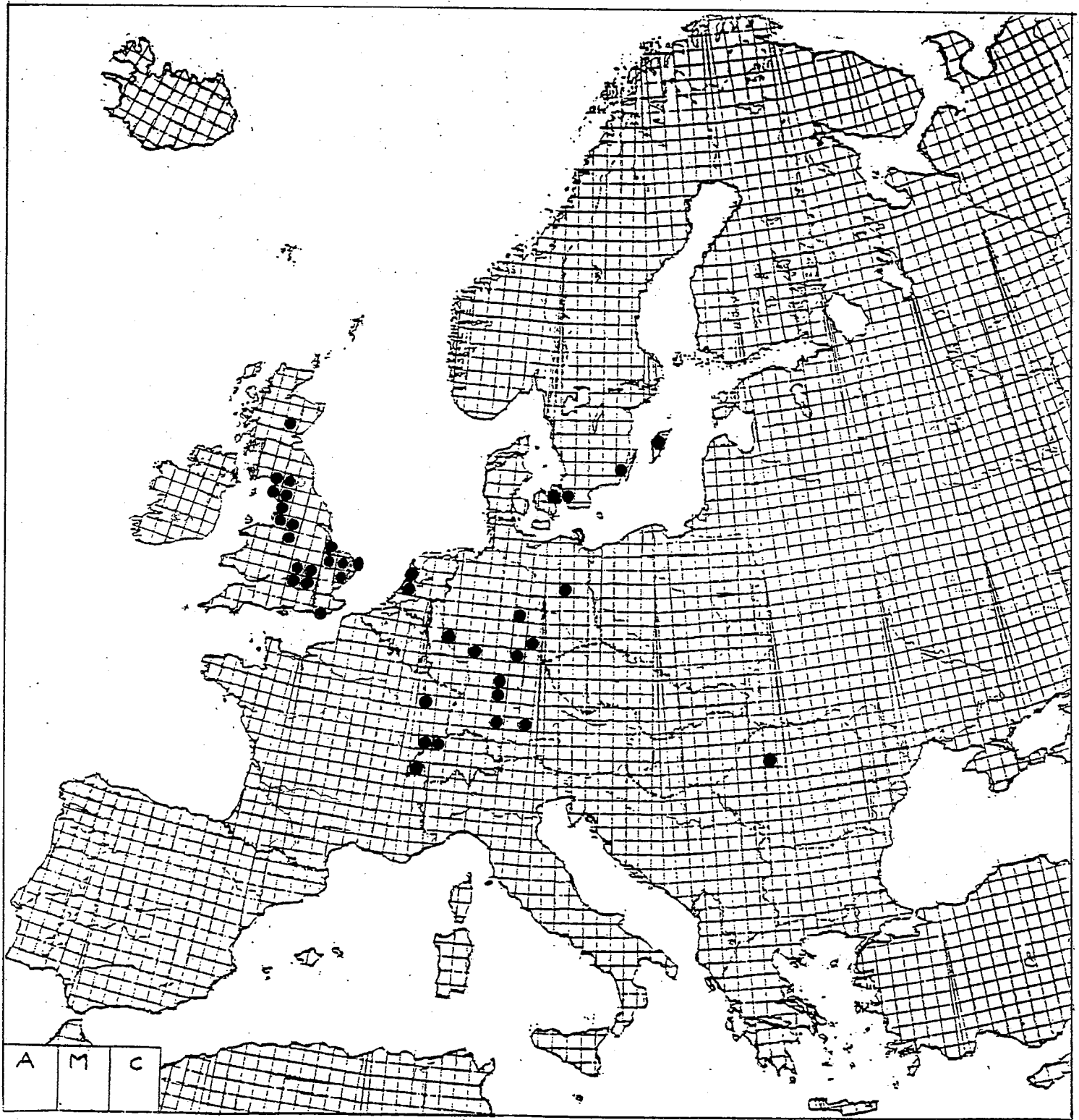
MAP 8. NANOGONA POLYDESMOIDES.



MAP 9. ANAMASTIGONA PULCHELLUM.



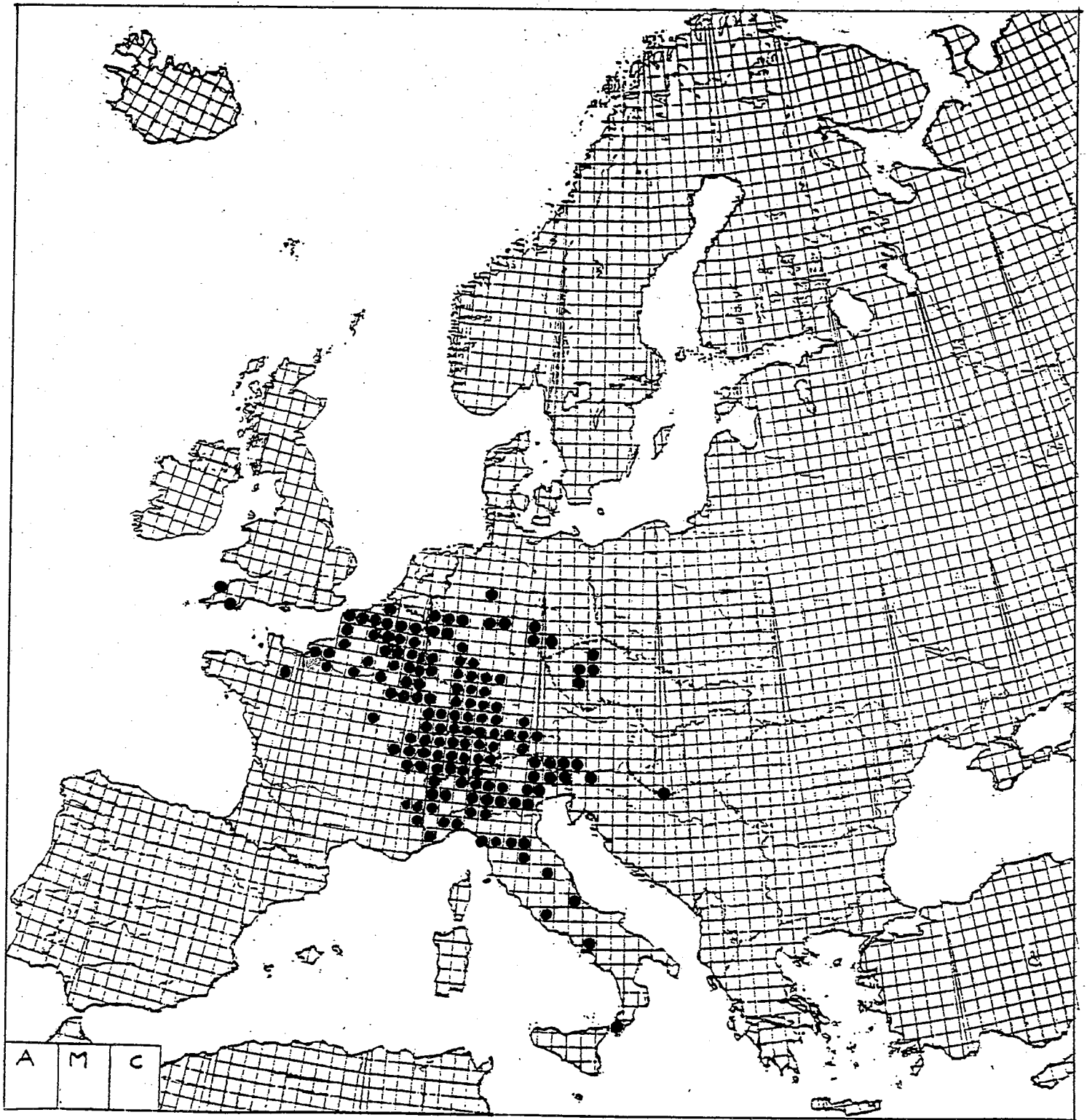
MAP 10. BRACHYCHAETEUMA MELANOPS.



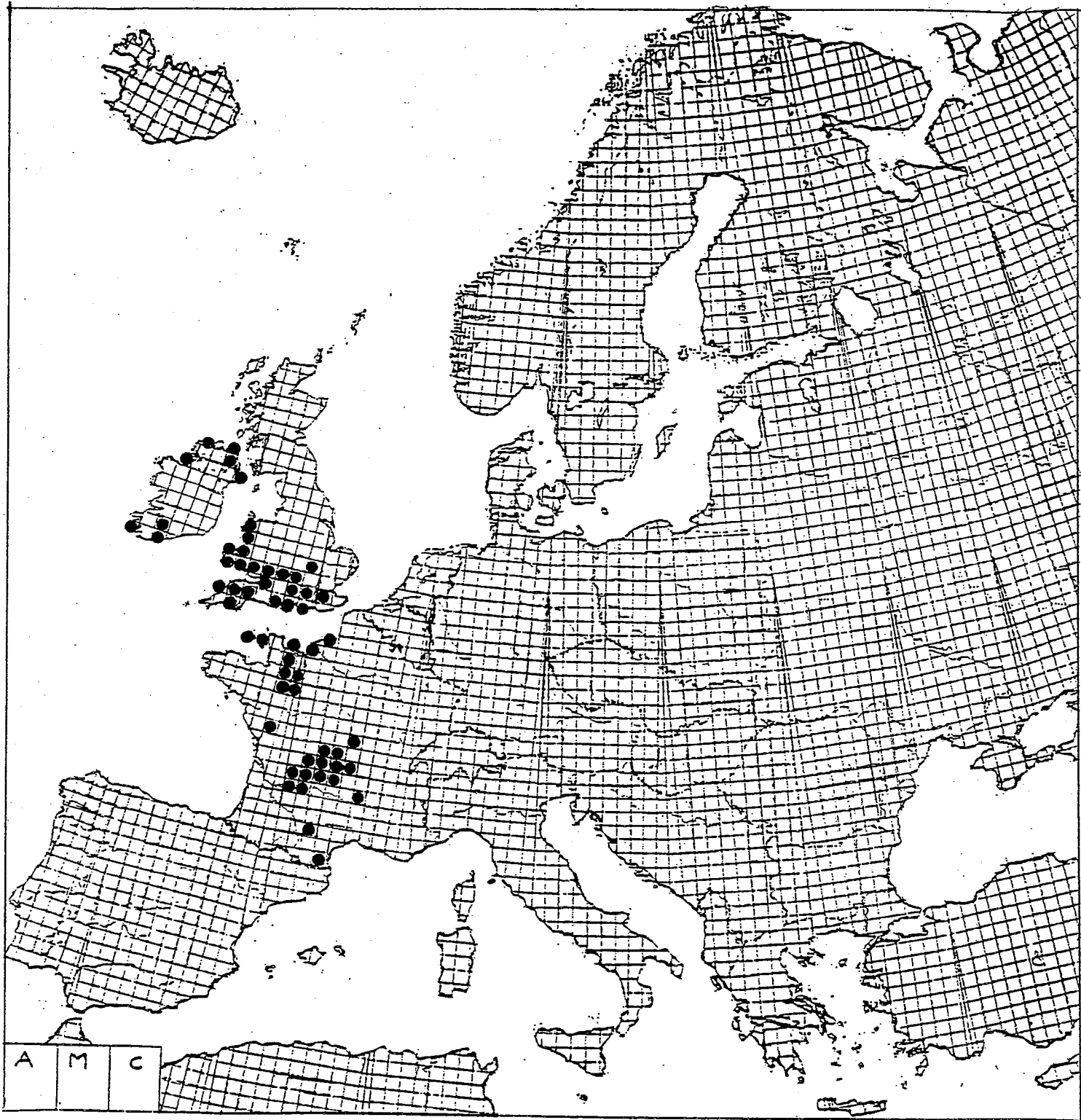
MAP 11. BRACHYCHAETEUMA BRADEAE.



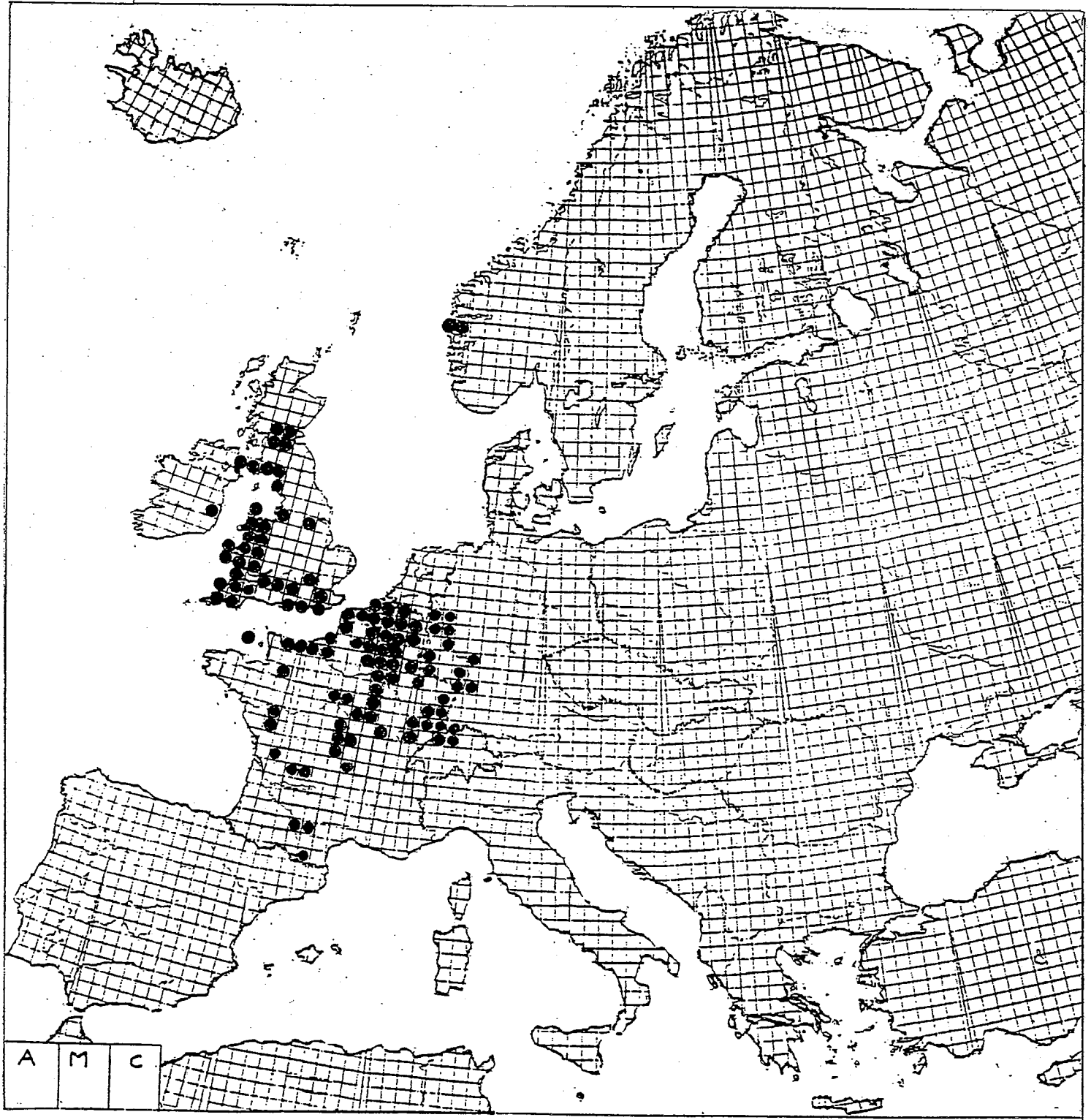
MAP 12. BRACHYCHAETEUMA BAGNALLI.



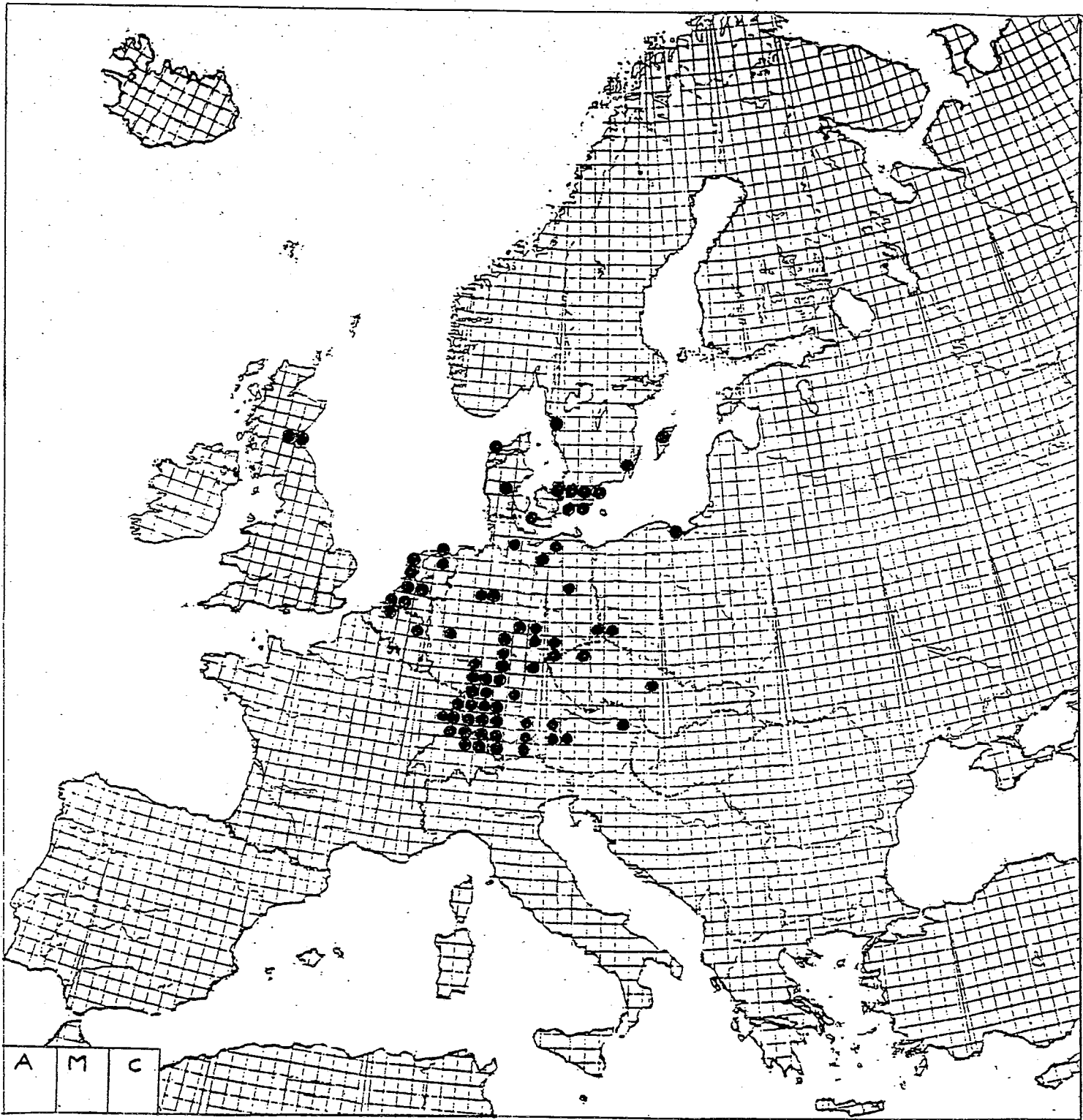
MAP 13. *CHORDEUMA SYLVESTRE*.



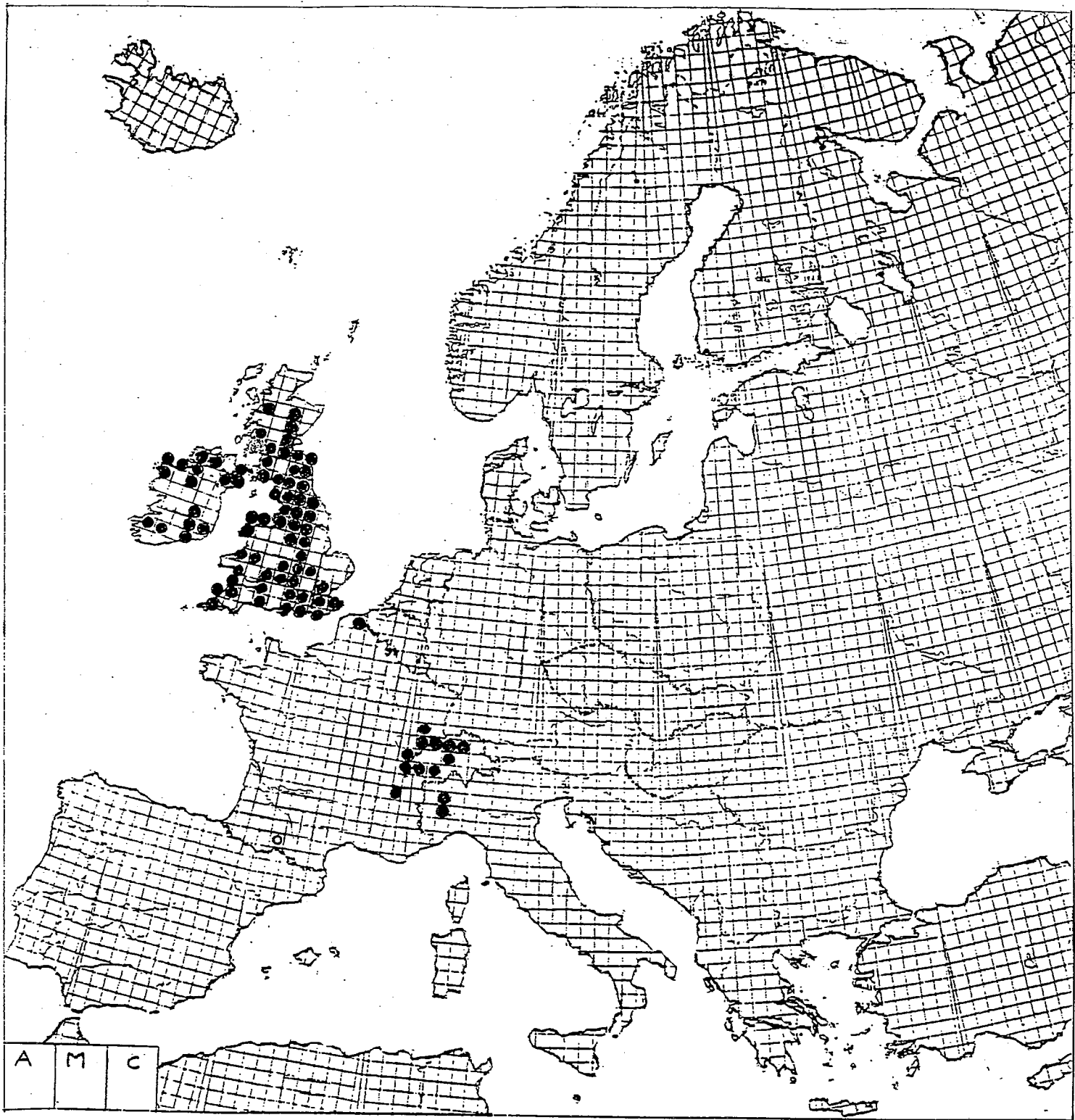
MAP 14. CHORDEUMA PROXIMUM.



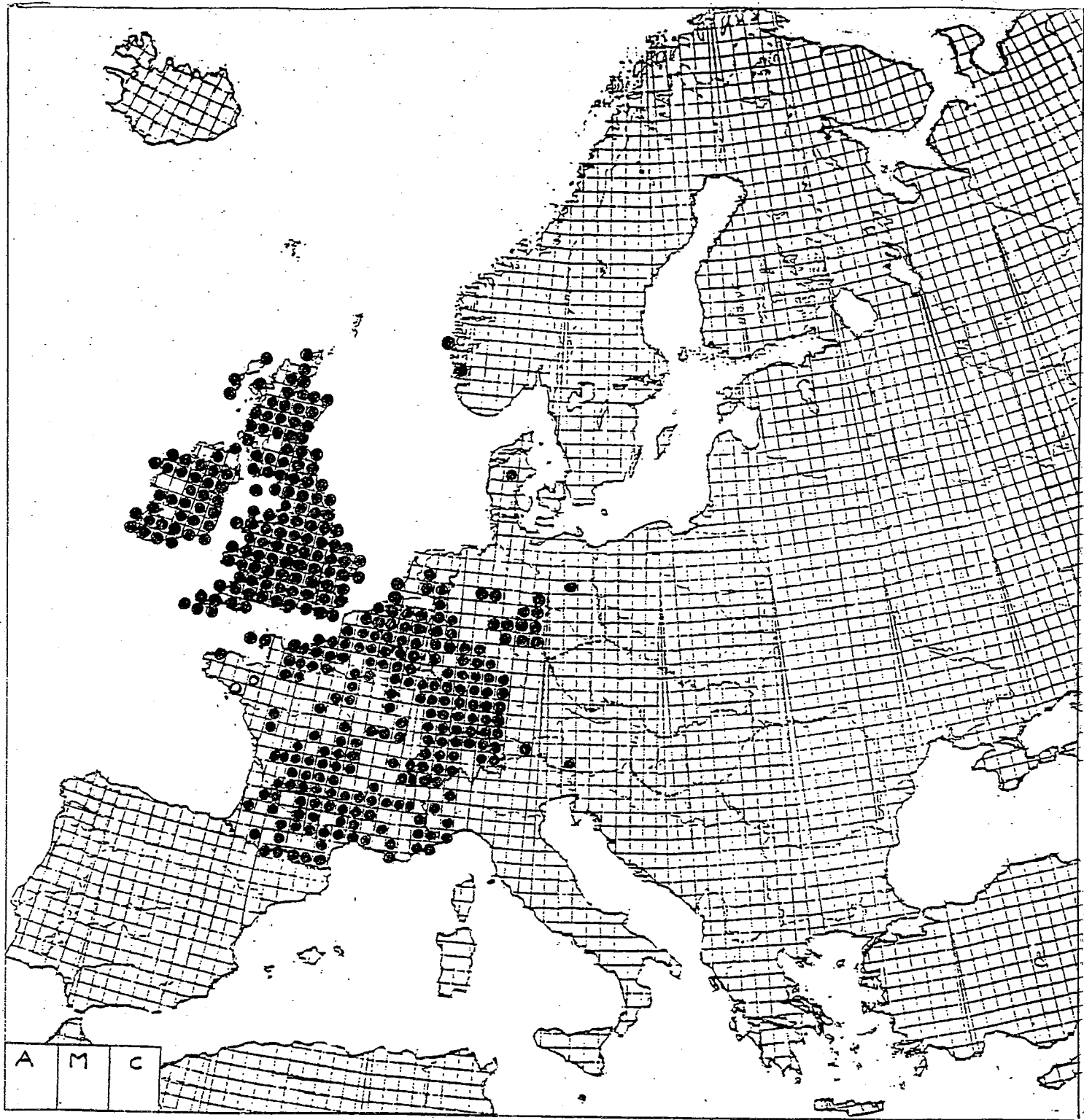
MAP 15. *MELOGONA GALLICUM*.



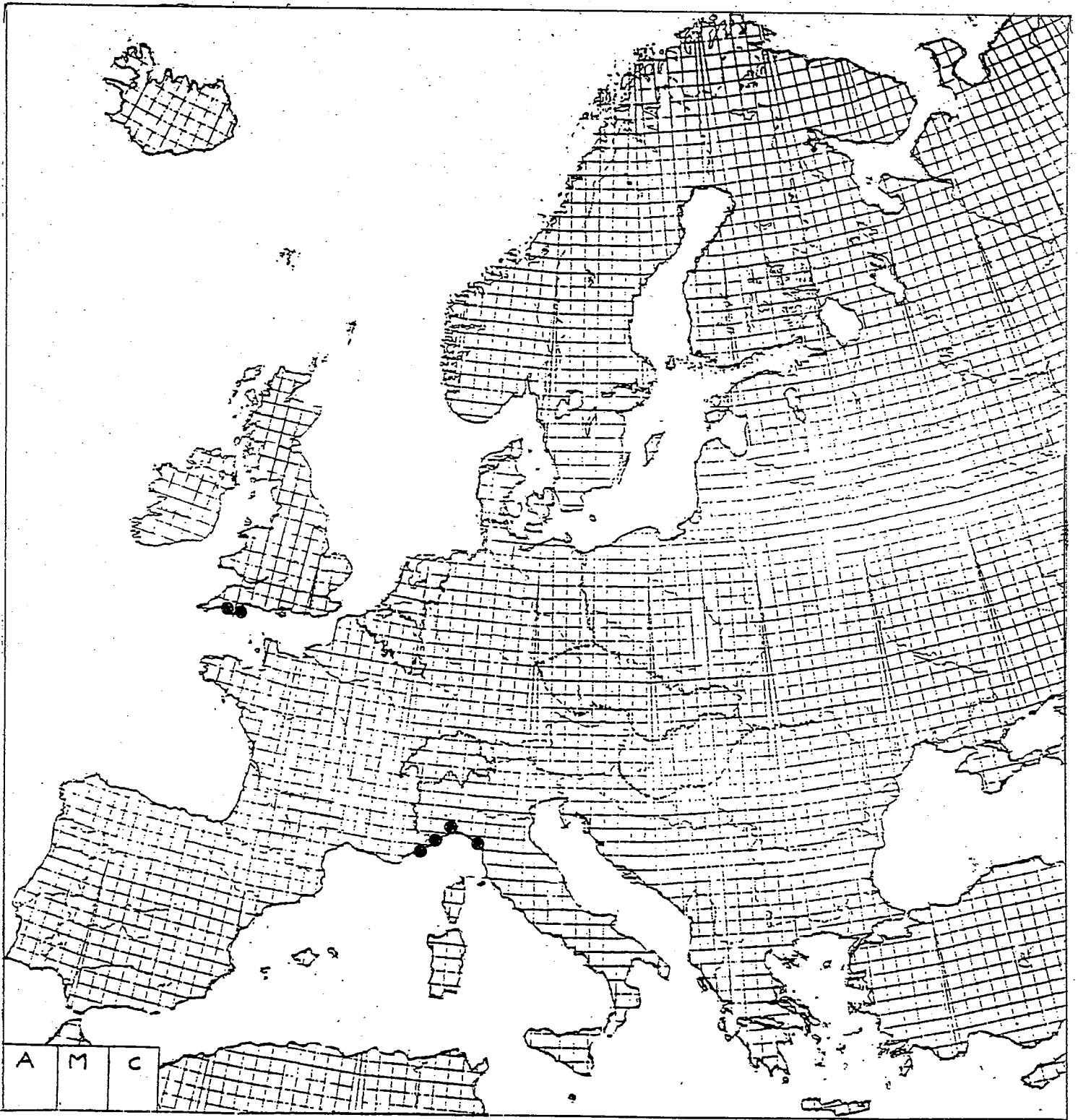
MAP 16. MELOGONA VOIGTI.



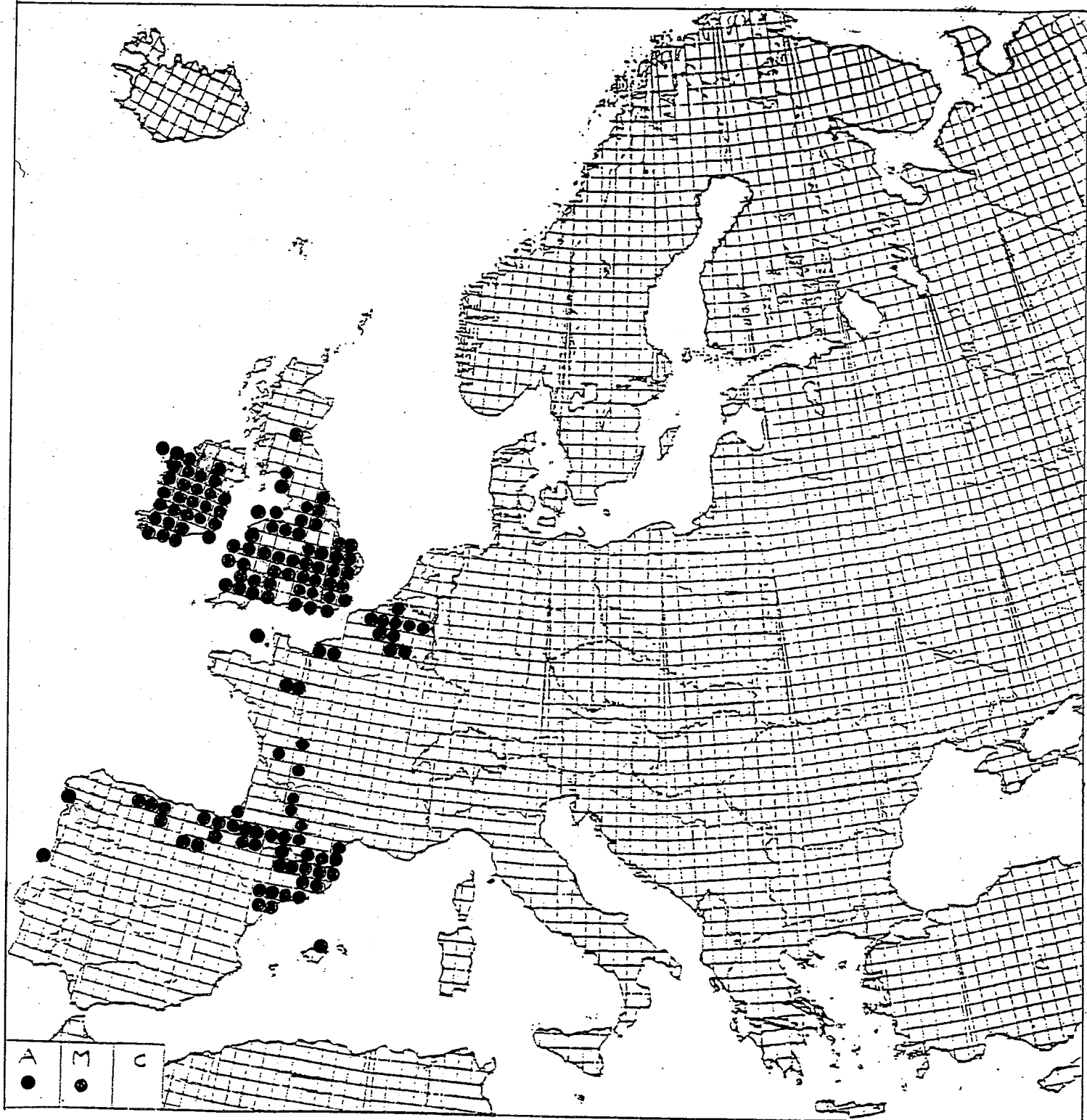
MAP 17. MELOGONA SCUTELLARE.



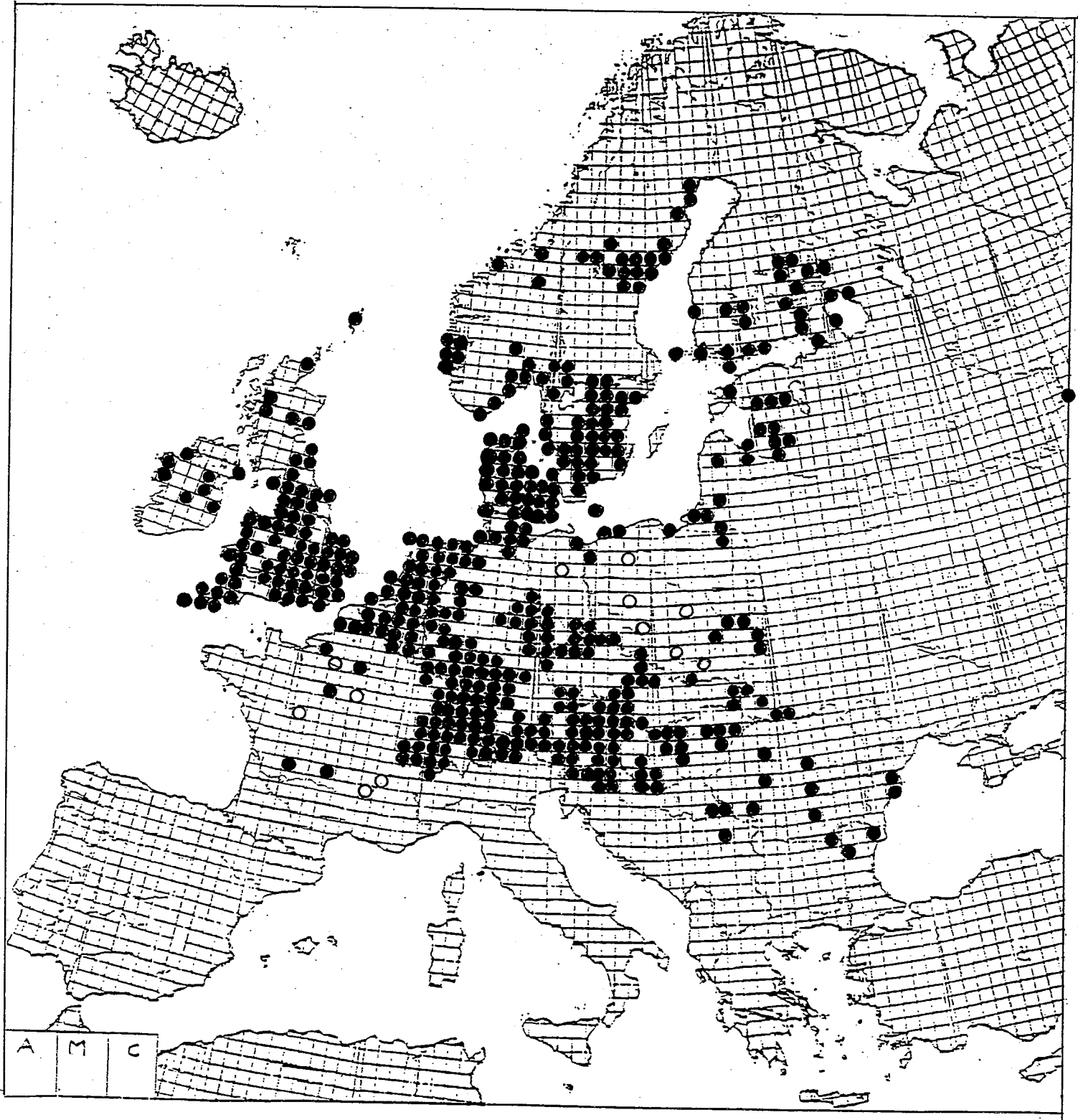
MAP 18. POLYDESMUS ANGUSTUS.



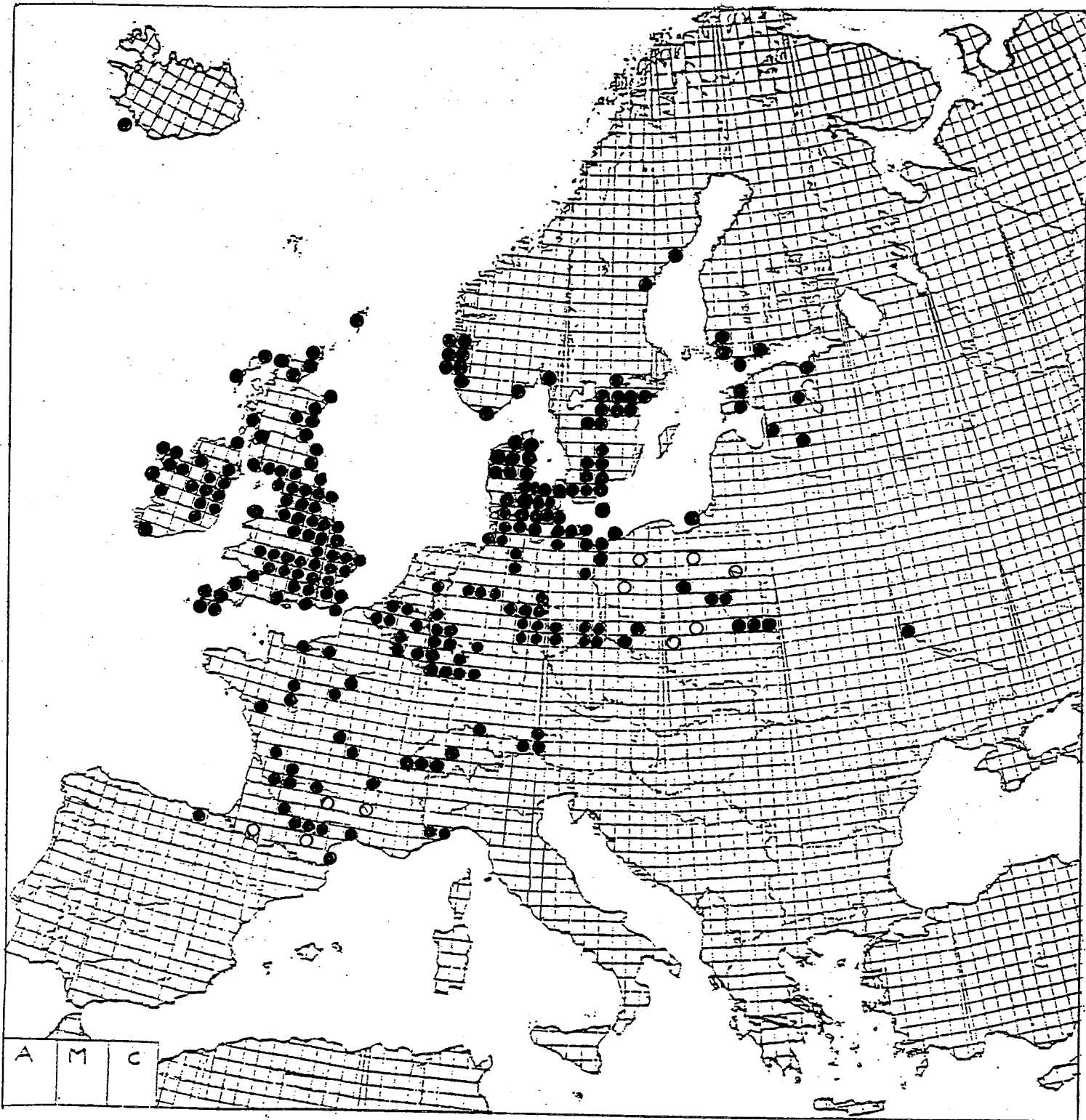
MAP 19. POLYDESMUS BARBERII.



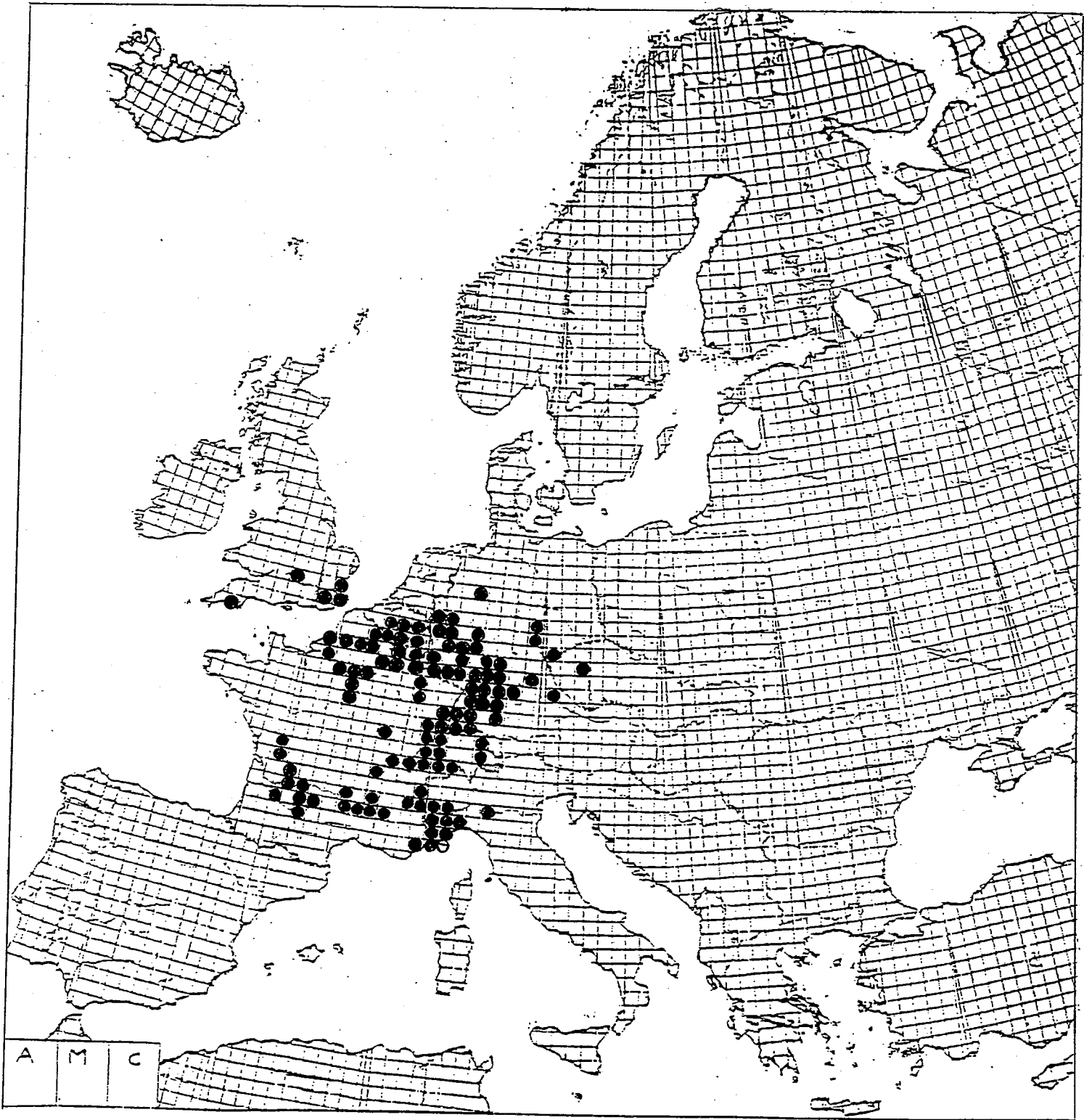
MAP 20. *POLYDESMUS CORIACEUS*.



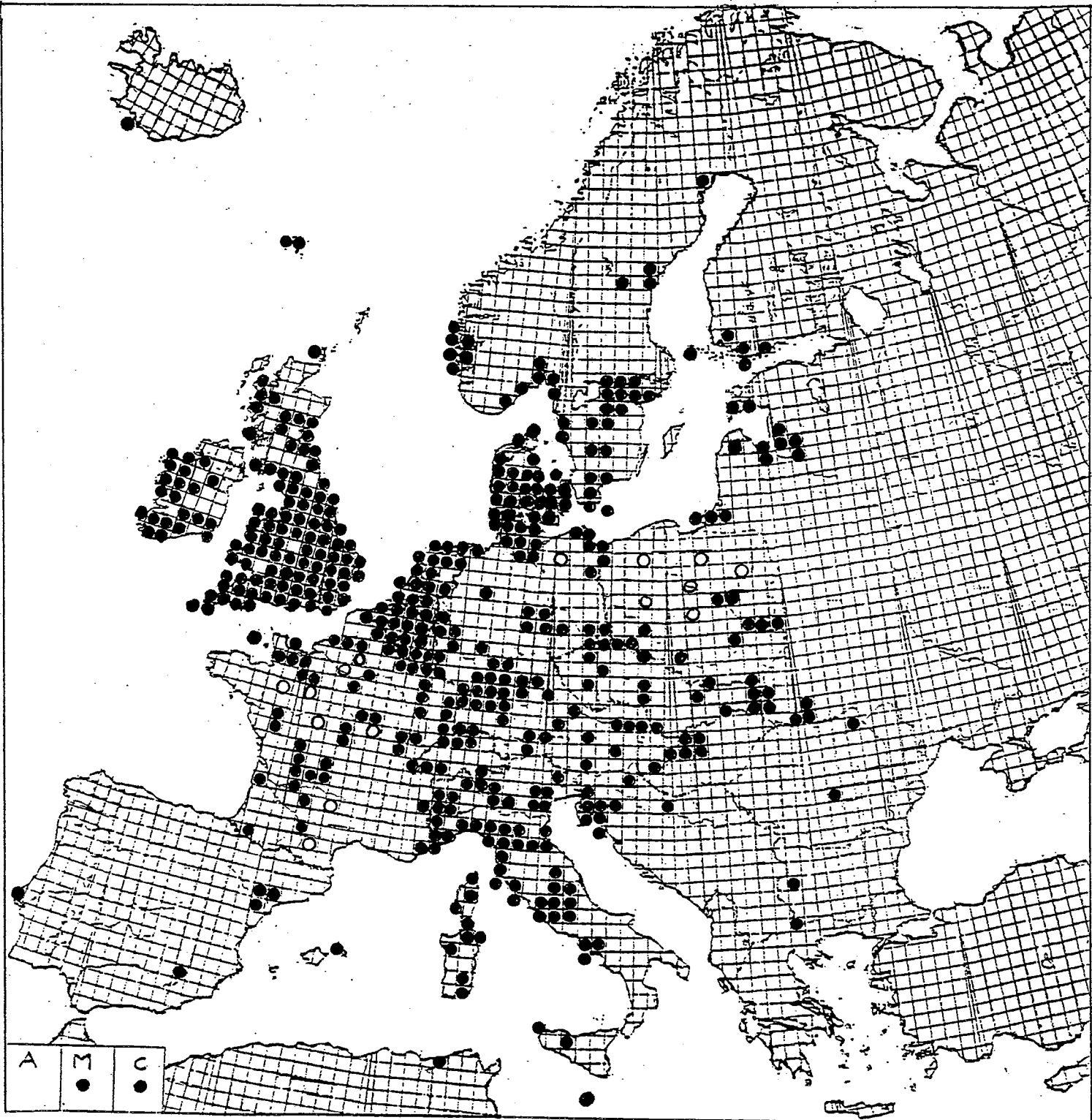
MAP 21. *POLYDESMUS DENTICULATUS*.



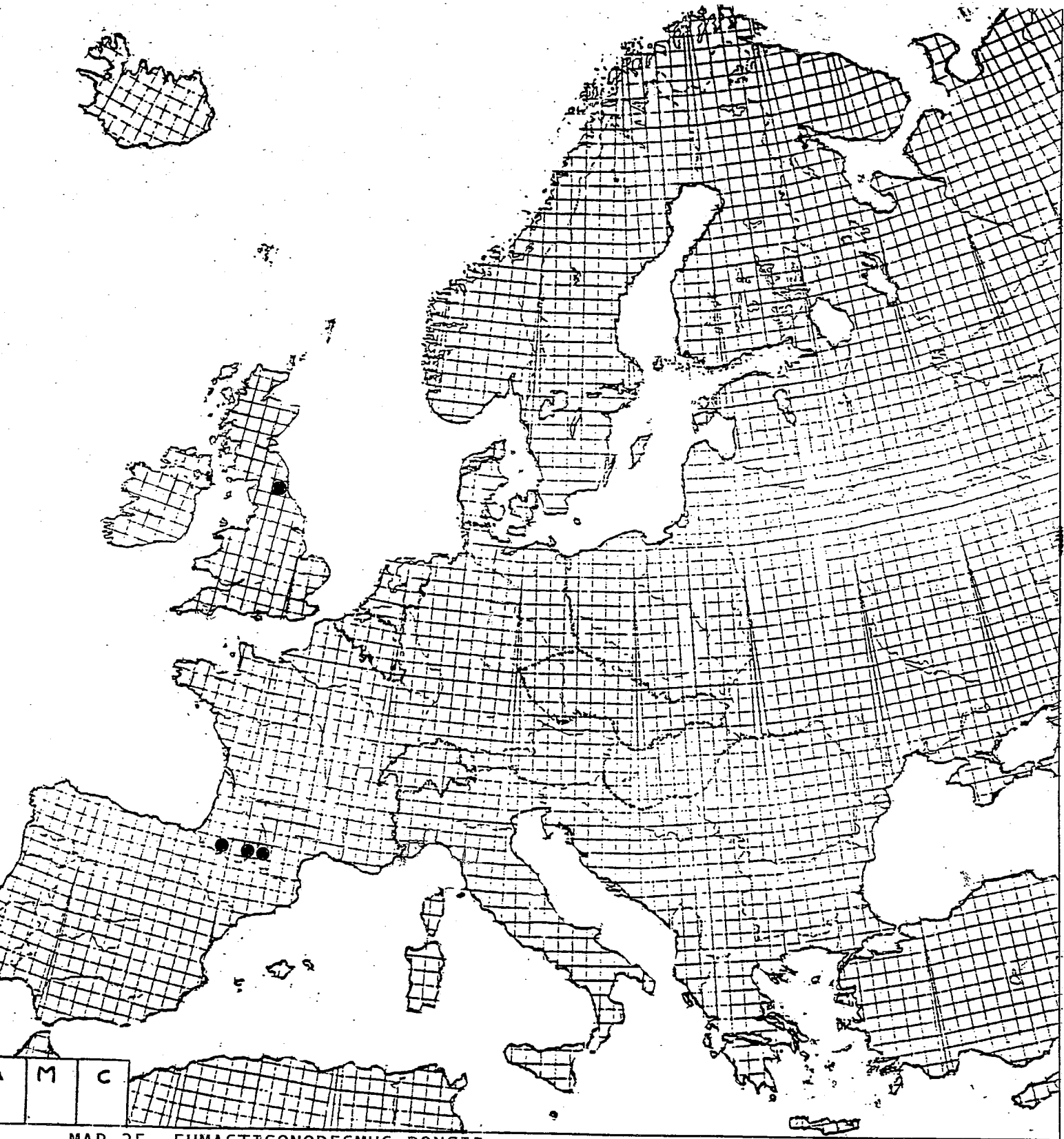
MAP 22. *POLYDESMUS INCONSTANS*.



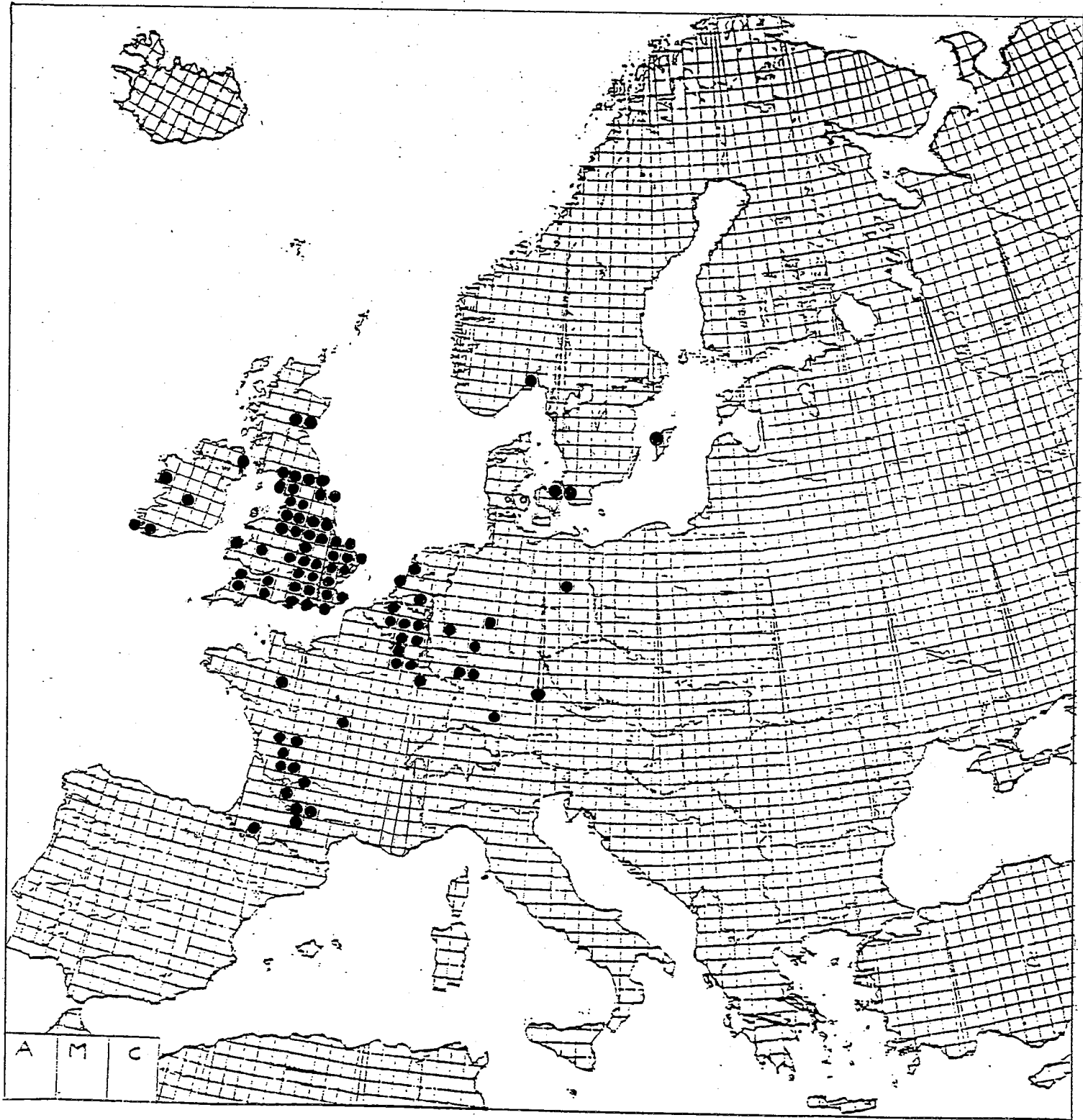
MAP 23. POLYDESMUS TESTACEUS.



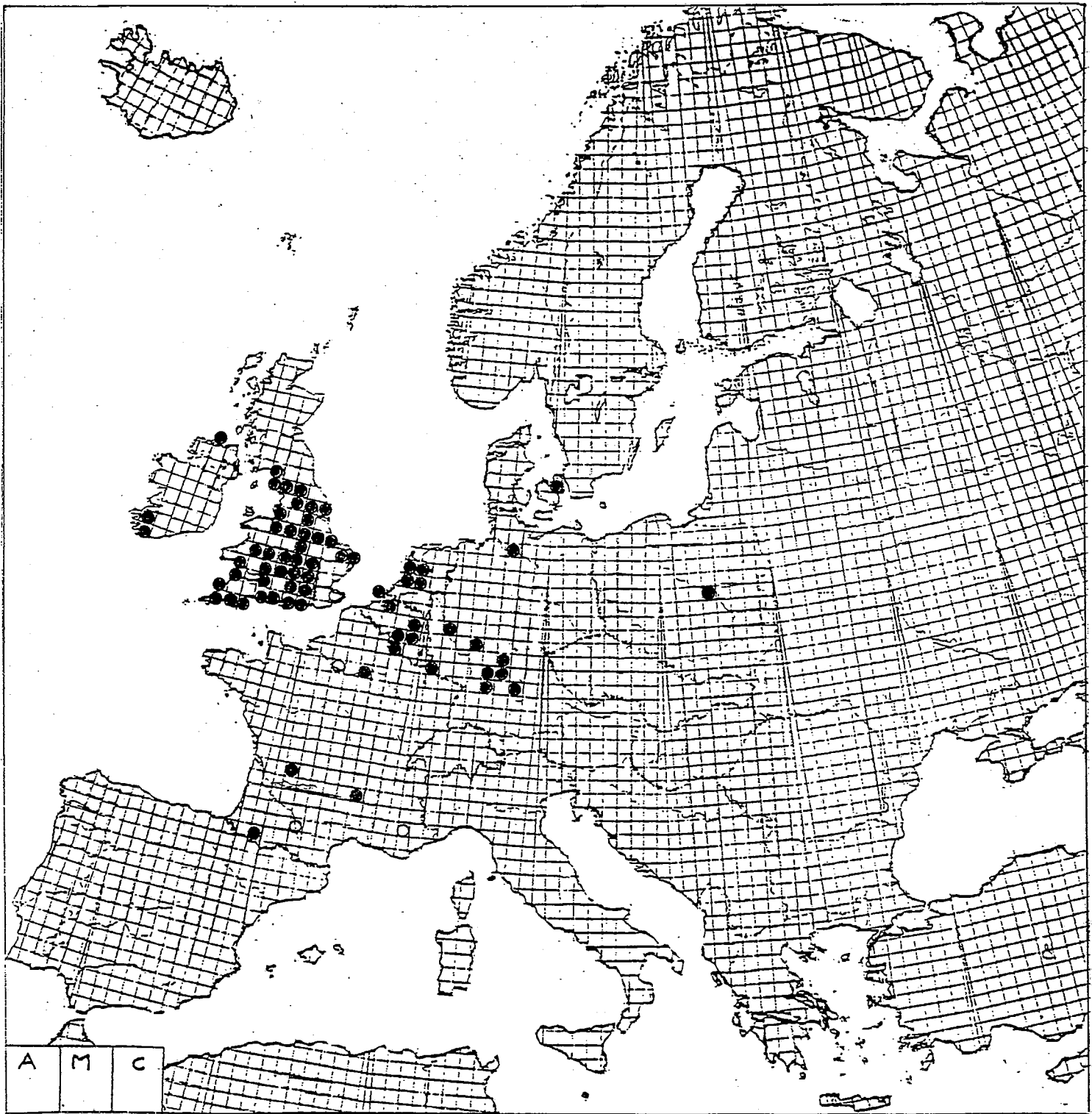
MAP 24. BRACHYDESMUS SUPERUS.



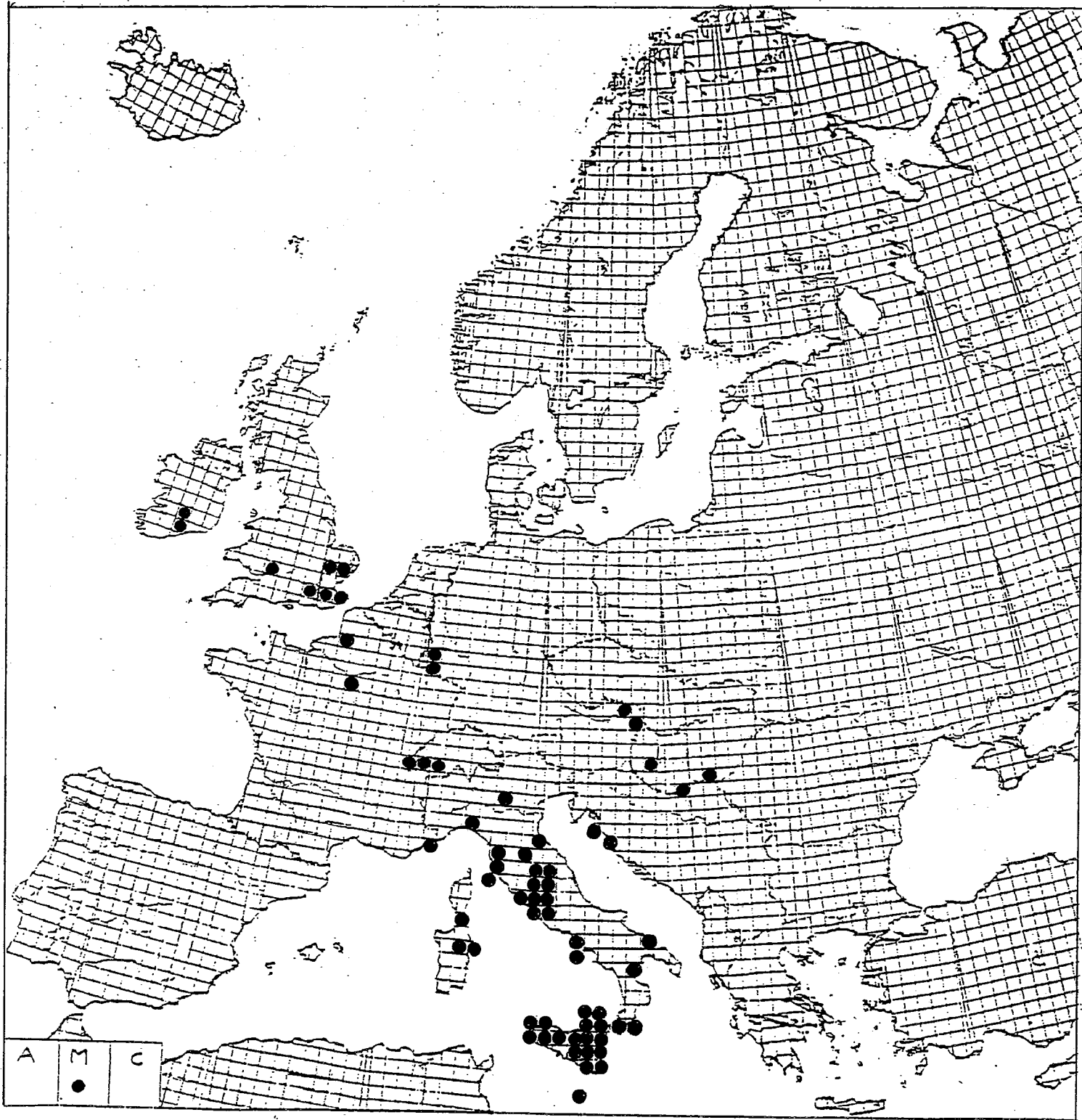
MAP 25. *EUMASTIGONODESMUS BONCII*.



MAP 26. *MACROSTERNODESMUS PALICOLA*.



MAP 27. OPHIODESMUS ALBONANUS.



MAP 28. STOSATEA ITALICA.