

DISTRIBUTIONAL PATTERNS OF THE RELICTUAL SUBFAMILY RAYMONDIONYMINAE (COLEOPTERA: ERIRHINIDAE): A TRACK ANALYSIS

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RESUMEN. Las Raymondionyminae son gorgojos endógeos y ciegos, que han sido asignados recientemente a la familia Eirirhinidae. Se clasifican en dos tribus: Myrtonymini y Raymondionymini. Los Myrtonymini comprenden un solo género descrito, *Myrtonymus*, de Nueva Zelanda. Los Raymondionymini poseen 12 géneros: *Alaocephala*, *Derosasius*, *Pararaymondionymus* y *Tarattostichus* de Europa; *Ubychia* de Europa y Asia occidental; *Alaoocyba*, *Raymondiellus* y *Raymondionymus* de Europa y el norte de África; *Gilbertiola* y *Schizomicrus* de América del Norte; *Neoubychia* de México; y *Bordoniola* de América del Sur (Venezuela). Los trazos individuales de los diferentes géneros se superponen solo en Europa sudoccidental y el norte de África (región Paleártica), que constituye el área más compleja.

PALABRAS CLAVE: Eirirhinidae. Raymondionyminae. panbiogeografía. trazos, Tethys.

ABSTRACT. Raymondionyminae are endogean, blind weevils, which have been recently assigned to the family Eirirhinidae. They are currently classified into two tribes: Myrtonymini and Raymondionymini. Myrtonymini comprise a single described genus, *Myrtonymus*, from New Zealand. Raymondionymini comprise 12 genera: *Alaocephala*, *Derosasius*, *Pararaymondionymus*, and *Tarattostichus* from Europe; *Ubychia* from Europe and western Asia; *Alaoocyba*, *Raymondiellus*, and *Raymondionymus* from Europe and northern Africa; *Gilbertiola* and *Schizomicrus* from North America; *Neoubychia* from Mexico; and *Bordoniola* from South America (Venezuela). The individual tracks constructed for the different genera overlap only in southwestern Europe and northern Africa (Palaeartic region), which thus represents the most complex area.

KEY WORDS: Eirirhinidae. Raymondionyminae. panbiogeography. tracks. Tethys.

Raymondionymine weevils were first recognized by Aubè (1861). They are endogean, blind weevils that are only collected sifting or washing soil or deep humus in montane or coastal forests. The taxonomic placement of Raymondionyminae has been highly controversial. Osella (1977), after critical analysis of their previous placement (Aubè, 1861; Lacordaire, 1866; Wollaston, 1873; Casey, 1892; Heyden *et al.*, 1906; Ganglbauer, 1906; Winkler, 1924-32; Voss, 1955; Gilbert, 1956), treated them as an independent subfamily within Curculionidae. Kuschel (1990)

demoted them to a tribe of Curculioninae. Their plesiomorphic male genitalia, however, prompted Thompson (1992) to exclude Raymondionyminae from Curculionidae and give them independent family status. Most recently, Morrone (1998) and Marvaldi and Morrone (2000) treated them as a subfamily of Erihthinae.

The analysis of Raymondionyminae distributional patterns may help understand their spatial evolution, thus providing clues to help elucidate their phylogenetic relationships. Our objective is to undertake a panbiogeographic analysis in order to determine the existence of generalized tracks for the subfamily Raymondionyminae.

MATERIAL AND METHODS

Data were taken from the literature (Osella, 1971, 1977, 1979, 1980; Merigalli, 1983; Osella and Giusto, 1983; Osella and Abbazzi, 1985; Gilbert and Howden, 1987; Kuschel, 1990; Osella and Zuppa, 1993, 1995, 1998; Osella and Riti, 1995; Osella and Di Marco, 1996; Secq, 1996; Magnano and Mifsud, 1998).

Known localities of distribution of the Raymondionyminae genera were mapped and tracks were constructed connecting them (Figs. 1-9). The panbiogeographic or track methodology basically consists of plotting distributions of different taxa on maps, connecting their separate localities together with lines called individual tracks. These tracks represent the geographical coordinates of species or higher taxa; operationally they are lines drawn on a map of their localities, connected according to their geographical proximity. When different individual tracks are superimposed, the resulting summary lines are considered generalized tracks, which are interpreted as indicating the preexistence of ancestral biotas, which subsequently become fragmented by tectonic and/or climatic changes. For details of the panbiogeographic methodology see Morrone and Crisci (1995) and Craw *et al.* (1999).

RESULTS

The single known representative of the tribe Myrtonymini, *Myrtonymus zelandicus*, occurs in New Zealand (Fig. 1).

Raymondionymini comprise 12 genera. *Alaocephala* has a single species and three subspecies, which occur in Spain and France: *A. delarouzei catalonica* (Catalunya), *A. d. coiffati*, and *A. d. delarouzei* (eastern Pyrenees) (Fig. 2).

Alaocyba has eight species. Four occur in Italy: *A. carinulata* (Sardinia), *A. marcuzzii* (southern Italy), *A. lampedusae* (Lampedusa island), and *A. separanda* (Pantelleria island); two in Tunisia: *A. coniceps* and *A. elongatula*; one in Tunisia and Algeria: *A. theryi*; and one in Malta: *A. melitensis* (Fig. 3).

Bordoniola has two species, that occur in Venezuela: *B. minutissima* and *B. decur* (Fig. 1).

Derosasius has a single species and three subspecies, which occur in Italy and

France: *D. damryi aritzensis*, *D. d. sardous* (central Sardinia), and *D. d. damryi* (southern Corsica) (Fig. 4).

Gilbertiola has two species, that occur in the USA: *G. helferi* and *G. schusteri* (Fig. 1).

Neoubychia has a single Mexican species: *N. mexicana* (Fig. 1).

Pararaymondionymus has 29 species and subspecies. Twelve occur in Italy: *P. andreinii*, *P. bartolii*, *P. gardinii*, *P. meggiolaroi*, *P. mingazzinii*, *P. sanfilippoii*, and *P. zoi* (northern Italy), *P. stricticollis picenus*, *P. s. stricticollis*, *P. n. sp.* *Osella in litt.* (central Italy), *P. magnificus*, and *P. mirabilis* (southern Italy); 12 in France: *P. burlei* (southern France), *P. laneyriei* (southern France), *P. benjamini* (Pyrenees), *P. fossor* (Provence), *P. hoffmanni* (Provence), *P. laevithorax* (Corsica), *P. lavagnei* (southern France), *P. longicollis* (Corsica), *P. ochsi* (Provence), *P. orientalis* (Provence), *P. pyrenaicus* (Pyrenees), and *P. vincenti* (Pyrenees); one in Spain: *P. carinirostris* (Catalunya); two in France and Spain: *P. hispanicus* and *P. perrisi*; one in Portugal: *P. lusitanicus*; and another in Portugal and Spain: *P. remilleti* (Fig. 5).

Raymondiellus has 17 species and subspecies. Eleven occur in Italy: *R. doderoi* (central northern Sardinia), *R. inopinatus* (central southern Italy), *R. latialis* (central Italy), *R. lagrecai* (eastern Sicily), *R. pacei* (southern Italy), *R. sardous insularis* (Sardinia and San Pietro island), *R. s. sardous* (central southern Sardinia), *R. sbordonii* (central Italy), *R. siculus* (western Sicily), *R. solarii* (central Sardinia), and *R. vignai* (eastern Sardinia); five in Algeria: *R. casalei*, *R. hipponensis*, *R. kabylianus*, *R. sericatus*, and *R. theresae sparsepunctatus*; and one in Tunisia: *R. t. theresae* (Fig. 6).

Raymondionymus has five species and subspecies. Two occur in Italy: *R. doriai* (northwestern Italy) and *R. marqueti apenninus* (Apennine); one in northeastern Italy, Slovenia, and Croatia (Istria and Dalmatia): *R. marqueti venetus*; one in Switzerland, France and England: *R. m. marqueti*; and one in Tunisia: *R. marqueti mauritanicus* (Fig. 7).

Schizomicrus has a single species from the USA: *S. coecus* (Fig. 1).

Tarattostichus has two species, one occur in northern Italy: *T. irregularis*; and another one in Slovenia, Croatia, and northeastern Italy: *T. stussineri* (Fig. 8).

Ubychia has 10 species and subspecies. Two occur in northern Italy: *U. leonhardi leonhardi* and *U. l. ticinensis*; two in Greece: *U. icari* (Egean islands) and *U. reitteri* (Jonian islands); one in Serbia: *U. ellipsoidalis*; two in Croatia: *U. ganglbaueri* and *U. salpingoides*; one in Bosnia: *U. holdhausi*, one is from Georgia: *U. stygia*; and another in Armenia and Georgia: *U. mingrelica* (Fig. 9).

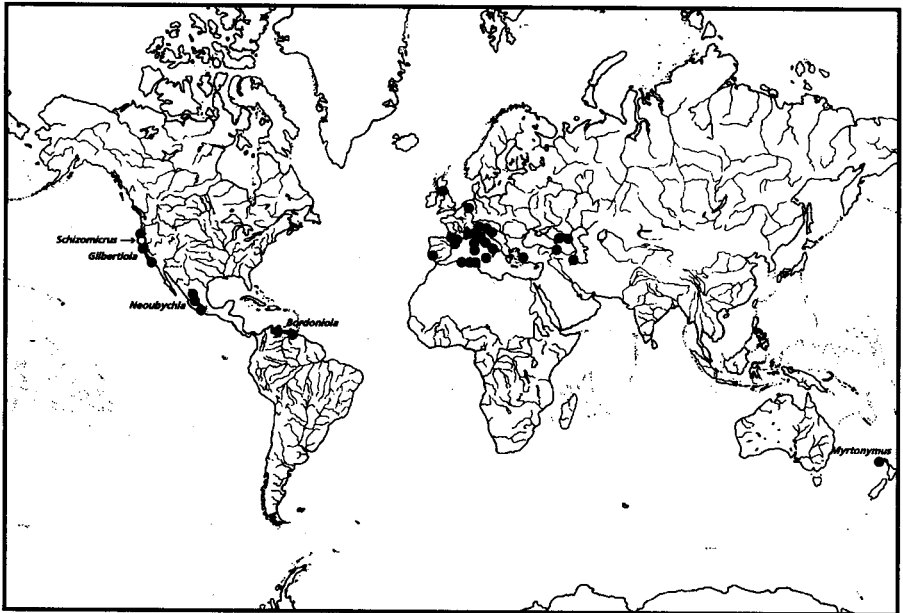
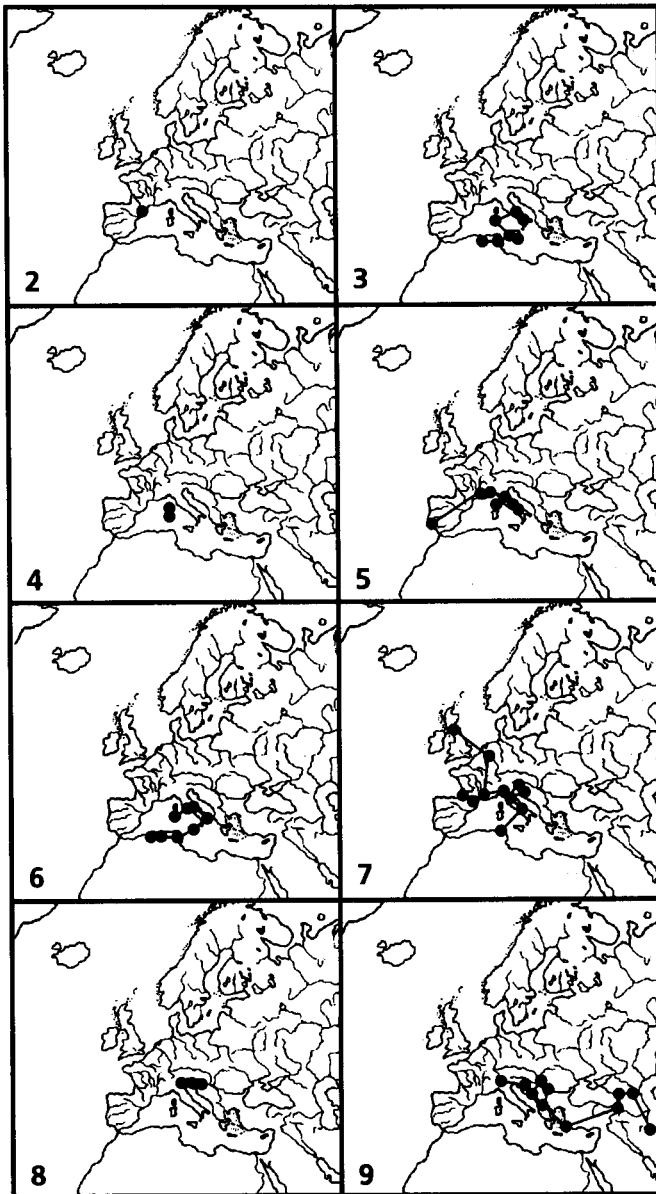


Figure 1. Individual tracks of the genera of Raymondionyminae. For details on the Palearctic genera see figures 2-9.



Figures 2-9. Individual tracks of the genera of Raymondionyminae from the Palearctic region: 2, *Alaocephala*; 3, *Alaoeyba*; 4, *Derosasius*; 5, *Pararaymondionymus*; 6, *Raymondieillus*; 7, *Raymondionymus*; 8, *Tarattostichus*; 9, *Ubychia*.

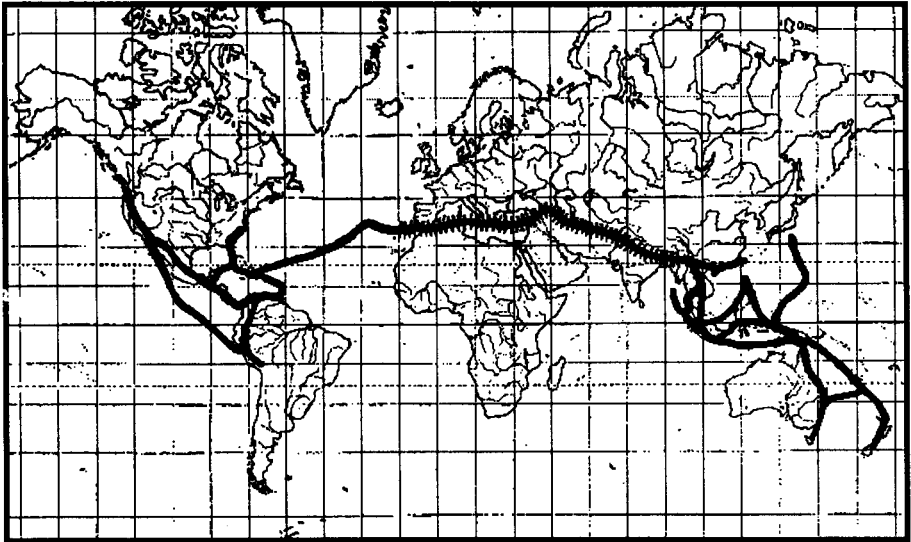


Figure 10. Croizat's diagrammatic representation of the geosynclines connected with the Tethyan geosyncline (cross hatched). Taken from Croizat (1964: 63, figure 16).

The individual tracks identified for the different genera do not constitute generalized tracks, although they partially overlap in two areas of the Palearctic region: southwestern Europe (Italy and Corsica) and northern Africa, where the individual tracks of the genera *Alaocyba*, *Derosasius*, *Pararaymondionymus*, *Raymondiellus*, *Raymondionymus*, *Tarattostichus*, and *Ubychia* are found.

DISCUSSION

These results seem to corroborate the highly relictual character of the Raymondionymine. Distributional patterns of these weevils are widely coincident with areas neighbouring the Tethys Sea during early Tertiary, as also discussed recently for other taxa (McKenzie, 1991; Glaubrecht, 2000).

This type of distribution has been already recognized by Croizat (1964), in his Tethyan geosyncline (Fig. 10), and coincides with other plant and animal distributions.

In Croizat's sense, the Tethyan geosyncline would allow to connect the circum-Mediterranean areas with Mesoamerica, the Caribbean, southwestern Asia, New Guinea, and New Zealand.

Our results, although preliminary due to the scarce records, seem to corroborate the biogeographic relevance that ocean basins have had in the spatial evolution of plant and animal taxa belonging them either to terrestrial, freshwater or marine habitats, as it has been previously discussed by several authors (Croizat, 1964; Craw and Page, 1988; Parenti, 1991; Craw *et al.*, 1999).

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