Dictyoptera (Blattodea, Isoptera), Orthoptera, Phasmatodea and Dermaptera

Jean Yves Rasplus, Alain Roques

BioRisk 4(2): 807–831 (2010)
doi: 10.3897/biorisk.4.68
www.pensoftonline.net/biorisk

RESEARCH ARTICLE

A peer-reviewed open-access journal
BioRisk

Dictyoptera (Blattodea, Isoptera), Orthoptera, Phasmatodea and Dermaptera Chapter 13.3

Jean-Yves Rasplus[1], Alain Roques[2]

1 *UMR Centre de Biologie et de Gestion des Populations, CBGP, (INRA/IRD/CIRAD/Montpellier SupAgro), Campus international de Baillarguet, CS 30016, 34988 Montferrier-sur Lez, France* **2** *NRA UR633, Zoologie Forestière. Centre de recherche d'Orléans, 2163 Avenue de la Pomme de Pin, CS 40001 Ardon, 45075 Orléans Cedex 2, France*

Corresponding authors: *Jean-Yves Rasplus* (rasplus@supagro.inra.fr), *Alain Roques* (alain.roques@orleans.inra.fr)

Academic editor: *David Lees* | Received 26 March 2010 | Accepted 25 May 2010 | Published 6 July 2010

Citation: Rasplus J-Y, Roques A (2010) Dictyoptera (Blattodea, Isoptera), Orthoptera, Phasmatodea and Dermaptera. Chapter 13.3. In: Roques A et al. (Eds) Alien terrestrial arthropods of Europe. BioRisk 4(2): 807–831. doi: 10.3897/biorisk.4.68

Abstract

For convenience, we treat all "polyneopteran" orders together. Five orders of hemimetabolous "Polyneoptera" include species alien *to* Europe, namely Blattodea, Isoptera, Orthoptera, Phasmatodea and Dermaptera. A total of 37 species alien *to* Europe have been recorded. These belong to 14 different families. Most of these species show a detritivorous feeding regime (22 spp.), whereas 12 species are phytophagous and two are predators. The majority of species were first observed between 1900 and 1975. Unlike other arthropod groups, the mean number of polyneopteran species newly recorded per year showed no acceleration since 1975. The alien "Polyneoptera" mostly originated from Central/ South America and Asia (10 species each, 27.0%), followed by Africa (7, 18.9%). Germany hosts the largest number of alien Polyneoptera (15 spp.), followed by Denmark (14), Spain (11) and France (10). All but one alien species represent unintentional introductions. More than 75% of the species are associated with artificial habitats (houses, buildings and greenhouses) and cultivated areas. Blattodea and Isoptera have huge economic and/or medical importance. The cost of treatments and sanitary measures against termites and cockroaches, in particular, is significant in Europe.

Keywords

Alien, Orthoptera, grasshoppers, Blattodea, coackroaches, Isoptera, termites, Phasmatodea, walking sticks, Dermaptera, earwigs

13.3.1 Introduction

For convenience, we group all the orders belonging to the "Polyneoptera" assemblage into the same chapter. This non-monophyletic assemblage of eleven "orthopteroid" orders includes five orders which contain species alien *to* Europe. Some of these orders are very familiar such as grasshoppers (Orthoptera), cockroaches (Blattodea), termites (Isoptera), earwigs (Dermaptera) and walking sticks (Phasmatodea). Lesser known groups include web-spinners (Embioptera), angel insects (Zoraptera) and ice-crawlers (Grylloblattodea). We describe here the characteristics of the species alien *to* Europe.

Blattodea contains over 4500 species worldwide, with about 150 species in Europe. They are among the most ancient winged insects, the earliest fossils dating back to the Carboniferous. The group is well defined by a combination of characters: eggs usually contained in oothecae (egg cases), leathery forewings, male genitalia asymmetrical and *cerci** with one or more segments. Most cockroaches are tropical and found in a wide variety of habitats such as dead or decaying leaves or trees, caves, under stones, in nests of social insects etc. Cockroaches are mostly scavengers eating organic material. Less than 1% (30 species) are associated with humans, but these species contribute to the unpopular reputation of these insects. Cockroaches exhibit diverse reproductive biology. Most species have sexual reproduction, but some populations of *Pycnoscelus surinamensis* are parthenogenetic. These hemimetabolous insects produce hardened oothecae deposited on a substrate or membraneous oothecae that are incubated in a brood sac within the female's body. Some species exhibit a high level of parental care.

Isoptera consists of over 2600 species (mostly tropical). Termites are the oldest social insect group with complex societies dating back at least to the early Cretaceous (140 Mya). Only 12 species occur in Europe. Recent studies have shown that Isoptera are basically social cockroaches forming a monophyletic clade within the Blattodea, most likely the sister group of the Cryptocercidae (woodroaches) (Inward et al. 2007). Termites are the only hemimetabolous insects that exhibit true social behavior. They build large nests housing an entire colony. These colonies contain adult reproductives (one queen and one king) plus hundreds or thousands of immatures that serve as workers and soldiers. Termites are important decomposer animals in lowland tropical ecosystems. They mostly feed on dead plant material and are able to digest cellulose with the help of symbiotic gut symbionts.

Orthoptera comprises more than 20000 species worldwide and 1044 species in Europe belonging to two suborders, Caelifera (grasshoppers) and Ensifera (ladykids). This group of median-sized insects is well characterized by (1) long hind legs modified for jumping; (2) hardened, leathery forewings (tegmina) which are spread in flight and covering membranous hindwings at rest; (3) unsegmented cerci; and (4), a pronotum usually with large descending lateral lobes. Orthopterans are common in most terrestrial habitats, but are more diverse in the tropics. They are mostly phytophagous and include some outstanding agricultural pests (locusts and certain katydids).

Phasmatodea (also known as Phasmida) comprises 3000 species worldwide with only 15 species known in Europe. Stick-insects are found in nearly all temperate and tropical ecosystems. Species are mostly nocturnal and phytophagous. Phasmatodea bears several common morphological characters that clearly define the order: an emarginated labrum, a pair of exocrine glands located inside the prothorax, and a thorax fused with the first abdominal sternum. Phasmids undergo an incomplete metamorphosis (four to eight instars), with the young nymphs resembling miniature, albeit wingless, adults.

Dermaptera comprises about 1800 species and about 80 species in Europe. These small- to median-sized insects have the head *prognathous** and are clearly characterized by two or more apomorphies: long unsegmented (not always forceps-like) cerci, and details of hindwing structure. The biology of Dermaptera is poorly known. Most species appear to be omnivorous but some are phytophagous and a few are predators. The development is hemimetabolous. Earwigs have larvae (four to five instars) that resemble the adult, except that the wings are only buds.

Several characteristics group species in these orders together. The polyneopteran group treated here comprises mostly phytophagous species (consuming fresh plants, dead wood or leaves), but some species are detrivorous. None of the species alien *to* Europe is parasitic and very few are predators. These species are rarely transported with cultivated plants, even if eggs of stick-insects are introduced with soil. Consequently, polyneopterans are rarely introduced into Europe through the plant trade. Most species are relatively large and conspicuous, the smallest insects belonging to Isoptera and Dermaptera. All of them are hemimetabolous and consequently their larvae are biologically similar to adults. The diversity of these groups in the Holarctic region is relatively limited and most species are tropical. These characteristics may partly explain the relatively low number of species in the alien fauna that has colonized Europe, compared to worldwide Polyneopteran diversity.

13.3.2. Taxonomy of alien species

A total of 37 species alien *to* Europe have been recorded. These species belong to five different orders and 14 different families (Table 13.3.1; Figure 13.3.1). Blattodea account for 18 species and is the order with by far the greatest number of aliens to Europe. Eleven species belong to Orthoptera, four to Phasmatodea, while Dermaptera and Isoptera include two alien species each. Within Orthoptera, Ensifera are well represented with seven species (63% of Orthoptera). Among these alien species, 22 are detritivorous, 12 phytophagous and two are predators, the biology of one species being unknown. This results show that within invasive Polyneoptera, a majority of species are detritivorous or phytophagous (94%). Table 13.3.2 presents some species of the same orders considered as alien in Europe (native to a European region but introduced in another through human activity).

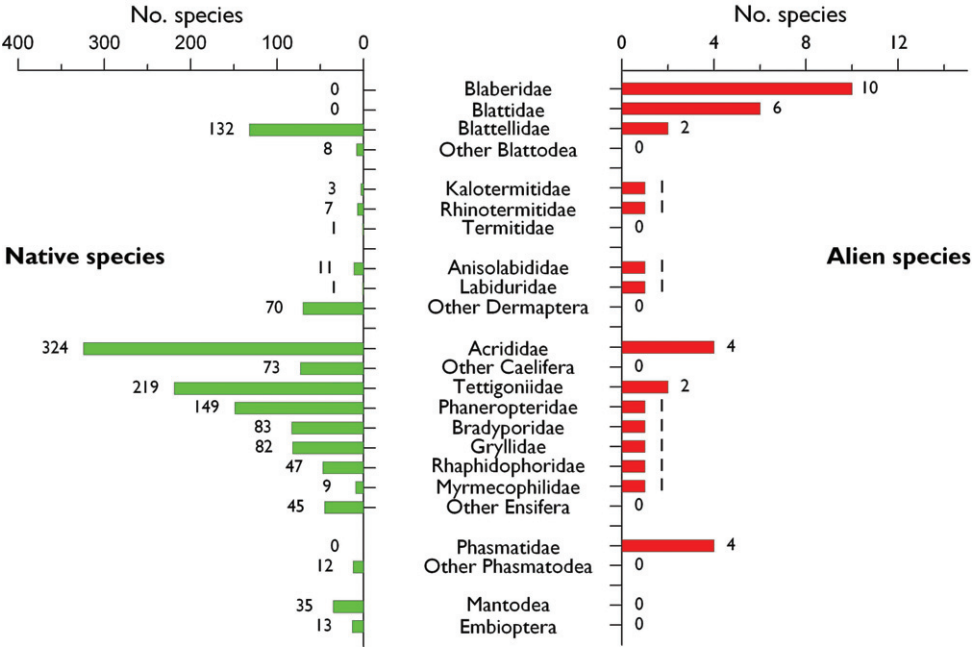

Figure 13.3.1. Relative importance of the families of Blattodea, Isoptera, Orthoptera, Phasmatodea, and Dermaptera in the alien and native entomofauna *in* Europe. Families are presented per order in a decreasing ranking based on the number of alien species. Species alien *to* Europe include cryptogenic species. The number over each bar indicates the number of species observed per family.

Blattodea

Blaberidae. This small family contains ten species in Europe, all of them introduced from tropical countries. These cockroaches are ovoviviparous, some species being parthenogenetic. Several Blaberidae species have been introduced into urban areas of Europe. Among them, *Blaberus atropos* is a native to South America that exhibits a death's-head markings on the mesonotum and metanotum. *Nauphoeta cinerea* lives mostly around the outside of buildings but also occurs in houses. *Panchlora nivea* is commonly associated with bananas and palm trees. This species was introduced in Northern Europe with shipments of bananas. *Pycnoscelus surinamensis*, a Malaysian cockroach, as been introduced several times to Europe. It occurs in greenhouses and cannot live outdoors. Its European populations appear to be parthenogenetic. This trait has been wrongly identified to explain the strong invasive ability of this cockroach (Grandcolas et al. 1996). *Rhyparobia maderae*, an afrotropical cockroach, was probably transported to southern Europe with banana shipments and occurs indoors.

Blattellidae. Among the ca. 135 species of Blatellidae occurring in Europe, only two species, *Nyctibora laevigata* and *Supella longiplapa,* have an alien origin, both having been introduced from tropical regions. The last one is an afrotropical species with synanthropic habits, occurring in houses and greenhouses in Europe. These long- legged cockroaches carry the eggcase externally.

Blattidae. Only six species are known in Europe, all of them having been introduced from tropical or subtropical regions. *Blatta orientalis*, *Periplaneta* spp. and *Neostylopyga rhombifolia* are synanthropic species that have long been introduced to Europe. A more recent arrival is that of *Shelfordella lateralis,* the Turkestan cockroach, which has been discovered in 2007 in Cagliari, Sardinia. This species has previously been introduced in the 1970s in the Southern United States (California, Texas, Arizona) probably with military people coming back from the Middle East (Fois et al. 2009). These blattid species mostly develop indoors, in heated buildings but can also develop in greenhouses and in the city streets.

Isoptera

Kalotermitidae. This family comprises only four species in Europe, of which only *Cryptotermes brevis* is alien *to* Europe. This species infests dry wood and can damage woodwork, furniture and floors. *C. brevis* has been found both in Northern and Southern Europe but it has been more widely introduced to tropical countries. Recent studies showed that the early European shipment of exports from coastal Peru and Chile caused the release and initial dispersal of *C. brevis* from its natural range (Scheffrahn et al. 2009).

Rhinotermitidae. This family comprises seven species in Europe, including one alien species originating from North America, *Reticulitermes flavipes* (= *R. santonensis* (Feytaud); see Austin et al. 2005), where it is considered to be a significant pest. Subterannean termites in the genus *Reticulitermes* Holmgren (Isoptera: Rhinotermitidae) are the major termite pests infesting wooden structures in Europe and the near East.

Dermaptera

Anisolabididae. This family comprises 12 species in Europe. *Euborellia stali*, of Asian origin, preys on stem borers associated with rice entering the borer tunnel. This widespread species has recently been introduced in Italy.

Labiduridae. Only two species of Labiduridae are known from Europe, including a species originating from tropical/subtropical regions, *Nala lividipes.* This species is considered as a pest with local economic importance, but it is rare in Europe.

Orthoptera

Acrididae (Caelifera). This diverse family (about 350 species in Europe) only contains four species alien to Europe. Furthermore, the status of two of them, *Notaustorus albicornis* and *Dociostaurus tartarus*, is unclear, and these species could be native to Southeastern Europe.

Bradyporidae (Ensifera). A total of 84 species occur in Europe, one of them being possibly alien *to* Europe, *Ephippigerida nigromarginata*, originating from Africa.

Gryllidae (Ensifera). A total of 83 species of gryllids occur in Europe, but only one is an alien species. *Gryllodes sigillatus* is probably native to southwestern Asia and has been spread by commerce to different part of the world. This species is found indoors.

Myrmecophilidae (Ensifera). This small family of crickets contains 11 European species, one having been possibly introduced to Europe, the cryptogenic *Myrmecophilus americanus*. *Myrmecophilus* ant crickets are symbionts associated with ant nests. They are kleptoparasitic and feed on food resources in ant nests and induce ants to regurgitate liquid food. *M. americanus* is associated with an invasive ant species *Paratrechina longicornis.*

Phaneropteridae (Ensifera). Only one alien species, *Topana cincticornis*, has been recorded to be compared with the 149 species of this family native to Europe. This species, of South American origin, has only been observed in France (Morin 2001).

Rhaphidophoridae (Ensifera). This family contains 53 species in Europe. Only one of them is alien to Europe, *Tachycines asynamorus.* This oriental species mostly develops indoors (houses, greenhouses) in Northern Europe but also outdoors during the summer in Southern Europe.

Tettigoniidae (Ensifera). This family contains 221 species in Europe, two of them (namely *Copiphora brevirostris* and *Phlugiola dahlemica*) having been introduced from Central and South America. The latter species was described inhabiting greenhouses in the Botanical Gardens of Berlin (Weidner 1938).

Phasmatodea

Phasmatidae. The family contains only four species in Europe, all of them introduced and occurring in Southern Great Britain. Three of these species (The Prickly Stick Insect, *Acanthoxyla geisovii*, The Unarmed Stick Insect, *Acanthoxyla inermis*, and the Smooth Stick Insect, *Clitarchus hookeri*) arrived from New Zealand with plants, most likely as eggs in the soil (Lee 1993). The last species *Carausius morosus* is native of the Oriental region but was also introduced in Germany (Weidner 1981). Some stick insects used as pets may also have escaped from captivity but we have no data about that.

In conclusion, the only group of polyneopterans with a significant number of introduced species compared to the native European fauna is that of cockroaches (Figure 13.3.1). Blaberidae and Blattidae are represented in Europe only by exotic species non-intentionally introduced by humans.

13.3.3 Temporal trends

The dates of introduction of most alien cockroaches are largely unknown although it is likely that most of these synanthropic species were introduced to Europe long ago,

following human movements and trade. For instance, the first record for *Blatta orientalis* dates back to 1500 in a region corresponding at present to the Czech Republic.

Finally, first records in Europe of alien Polyneoptera, excluding four species considered as cryptogenic, were obtained for 21 out of the 33 remaining alien species (64 %). Most of these 21 species were first observed between 1900 and 1975. Interestingly, the mean number of new records per year has not accelerated during the last 200 years, unlike most other groups of arthropods (Figure 13.3.2). On the average, less than one species was newly observed every five years during the period 1900 to 2006.

13.3.4. Biogeographic patterns

Origin of alien species

A region of origin could be traced for 35 (95%) of the alien Polyneoptera introduced to Europe. Central/South America and Asia, with 10 species each (27.0 %), provided equally the greatest part of these alien species followed by Africa (7 spp.; 18.9 %) (Figure 13.3.3). This pattern largely differs from the one observed in most other groups of insects where South America contributes much less to the alien fauna. Indeed, most Blattodea are of tropical origin and generally became sub-cosmopolitan species that occur in buildings and exceptionally outdoors in Europe. Within Orthoptera, most Ensifera also have a tropical origin and several species can presently survive only within greenhouses in Europe. To the contrary, Caelifera are mostly Palaearctic species that naturally occur in areas adjacent to Europe. Alien Isoptera originate from North and South America. Most alien Phasmatodea originate from Australasia and were introduced into England with plants.

Distribution of alien species in Europe

Alien polyneopteran species and families are not evenly distributed throughout Europe and large differences exist between countries (Figure 13.3.4; Table 13.3.3). The number of taxonomists and the intensity of studies and sampling may also have influenced these differences. Little information is available for some central and northeastern European countries, and consequently these areas appear to host comparatively less alien species.

Germany hosts the largest number of alien Polyneoptera (15 spp.), followed by Denmark (14), Spain (11) and France (10). Most European countries host a low number of introduced species (five or less). No correlation with the country surface area has been found. However, it appears that northern countries in Europe host globally more alien species.

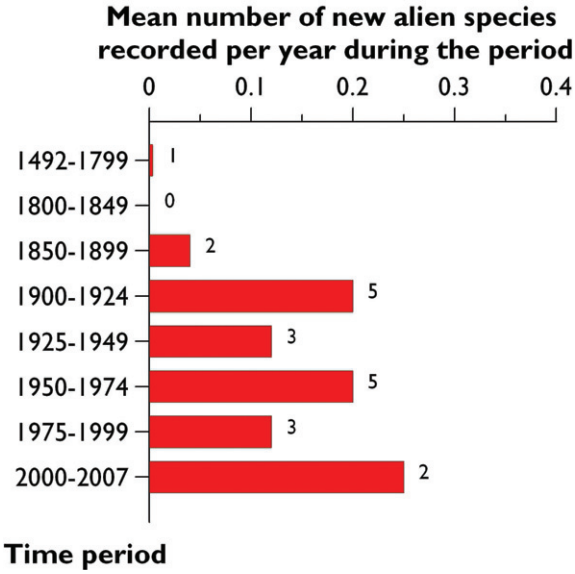

Figure 13.3.2. Temporal changes in the mean number of new records per year of 'Polyneoptera' alien *to* Europe from 1492 to 2006. Cryptogenic species excluded. The number above the bar indicates the number of species introduced.

13.3.5. Main pathways to Europe

The main pathway for introduction of most polyneopteran species alien to Europe is unknown. Where known, most introductions were unintentional. Whilst Blattodea species have followed humans and have long been introduced in Europe probably as stowaways as more recently observed for *Blaberus atropos, Panchlora nivea*, and *Rhyparobia maderae* found within banana shipments (Sein 1923). Some recent invaders also seem to have been introduced through wood transport (Isoptera) or introduction of plant material (Phasmatodea and Ensifera).

Nauphoeta cinerea has been introduced intentionally and only one species (*Euborellia stali*) have been introduced for biological control purposes.

13.3.6. Most invaded ecosystems and habitats

A large proportion of polyneopteran species alien *to* Europe (>75%) are associated with artificial habitats (houses, buildings and greenhouses) and cultivated areas (Figure 13.3.5). The proportion is somewhat lower (>55%) for the species alien to countries within Europe. These results are mostly linked to the strong associations of some Blattodea, Isoptera and Ensifera with humans. Only few species (10 spp.) have yet colonized natural and semi- natural habitats (grasslands, heathland or coastal habitats).

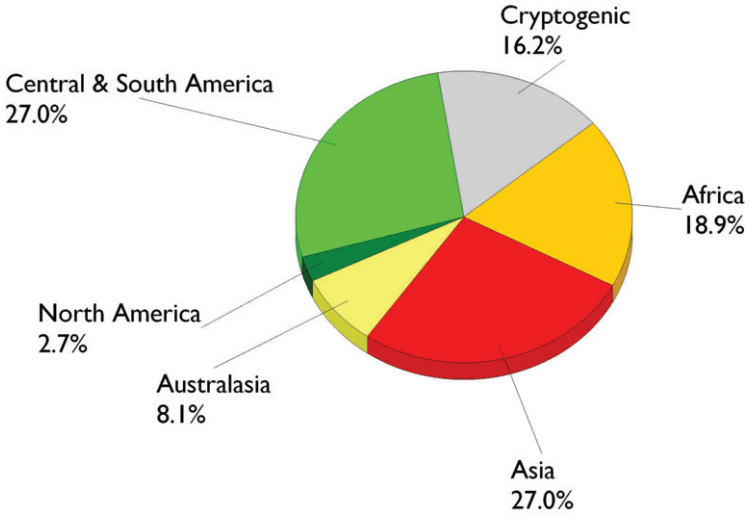

Figure 13.3.3. Origin of the species of Polyneoptera alien *to* Europe.

13.3.7. Ecological and economic impact

While most 'Polyneoptera' species introduced to Europe have only limited ecological or economic impact, two orders are considered as important pests: Blattodea and Isoptera. Blattodea have great medical significance (Baumholtz et al. 1997) and several species of cockroaches represent a potential threat to human health and well-being. These species are the most common household insect pests and there are two areas of concern regarding their potential for causing disease in humans. First, cockroaches are recognized as being an important source of indoor allergens. These allergens are found in their body, saliva and faecal matter. They cause asthmatic reactions in humans and are also implied in skin reactions. In recent studies, a strong association has been found between the presence of cockroaches and increase in the severity of asthma symptoms in individuals who are sensitive to cockroach allergens. Finally, oedema of the eyelids and dermatitis has been attributed to cockroaches.

Second, because of high humidity, high temperature and presence of food, cockroaches normally breed well in houses, grocery stores, restaurants and hospitals. They feed on a variety of foodstuffs (meat, grease, candies, chocolate, cheese, bread and other unprotected materials), regurgitate fluid from their mouth, and deposit faeces on foodstuffs. Because of their movement between waste and food materials, cockroaches can acquire, carry, and directly transfer to food and eating utensils the bacterial pathogens that cause food poisoning, diarrhea (Burgess and Chetwyn 1981), or typhoid. About 40 species of bacteria pathogenic to humans have been naturally found in or on cockroaches. Among them are found, several agents of dangerous infections such as bubonic plague (*Yersinia pestis* (Lehmann and Neumann) van Loghem), dysentery (*Shigella alkalescens* (Andrewes)), diarrhea (*Shigella paradysenteriae* Duval-Sonne), uri-

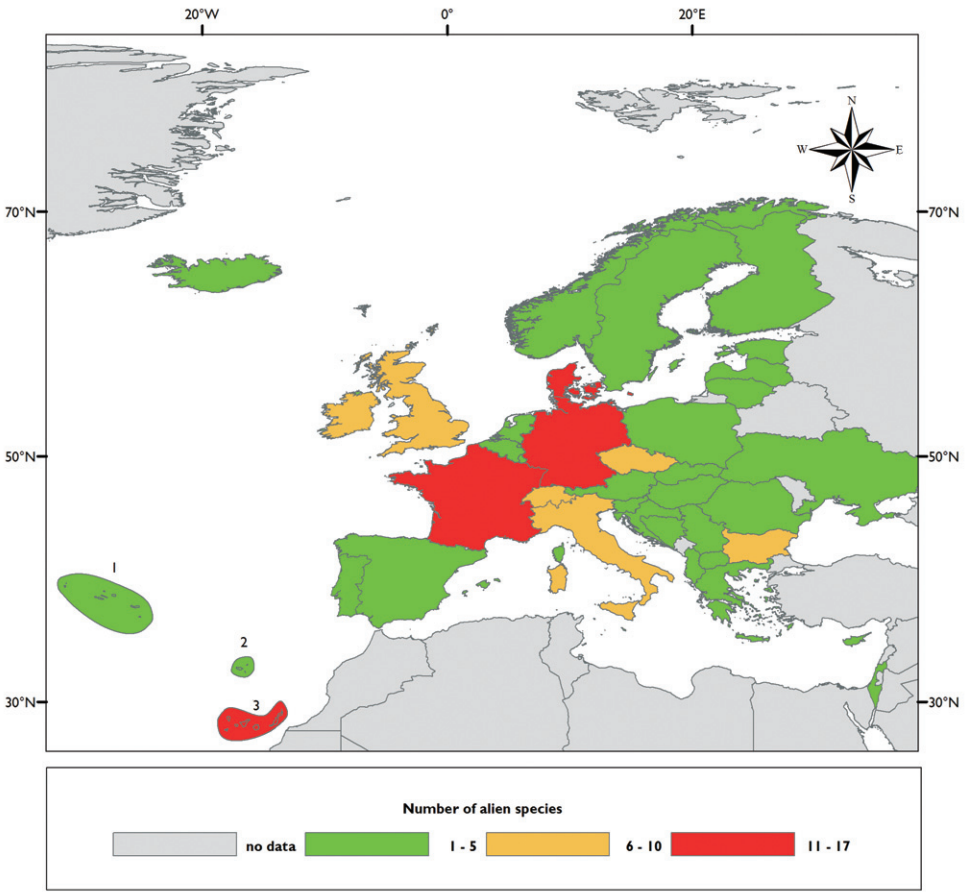

Figure 13.3.4. Comparative colonization of continental European countries and islands by the 'Polyneoptera' species alien *to* Europe. Archipelago: **1** Azores **2** Madeira **3** Canary islands.

nary tract infection (*Pseudomonas aeruginosa* (Schroeter) Migula), abscesses (*Staphylococcus aureus* Rosenbach), food poisoning (*Clostridium perfringens* (Veillon and Zuber) Hauduroy et al, *Escherichia coli* (Migula) Castellani and Chalmers, *Enterococcus faecalis* (Andrewes and Horder) Schleifer and Kilpper-Bälz, *P. aeruginosa*), gastroenteritis (*Salmonella* spp.), typhoid fever (*Salmonella typhi* (Schroeter) Warren and Scott), leprosy (*Mycobacterium leprae* (Hansen) Lehmann and Neumann), and nocardiosis (*Actinomyces* spp). Several species of helminths are also transmitted by cockroaches, among them *Schistosoma haematobium, Taenia saginata* Goeze, *Ascaris lumbricoides* L., *Ancylostoma duodenale* (Dubini), and *Necator americanus* (Stiles) (Goddeeris 1980). Helminth eggs have been found naturally occurring in cockroaches, or appear in the faeces (Cochran 1999). Furthermore several virus, protozoa and fungi have been reported as occurring naturally in cockroaches and could also be transmited by these insects. However, proving unequivocally that cockroaches transmit disease to humans remains difficult

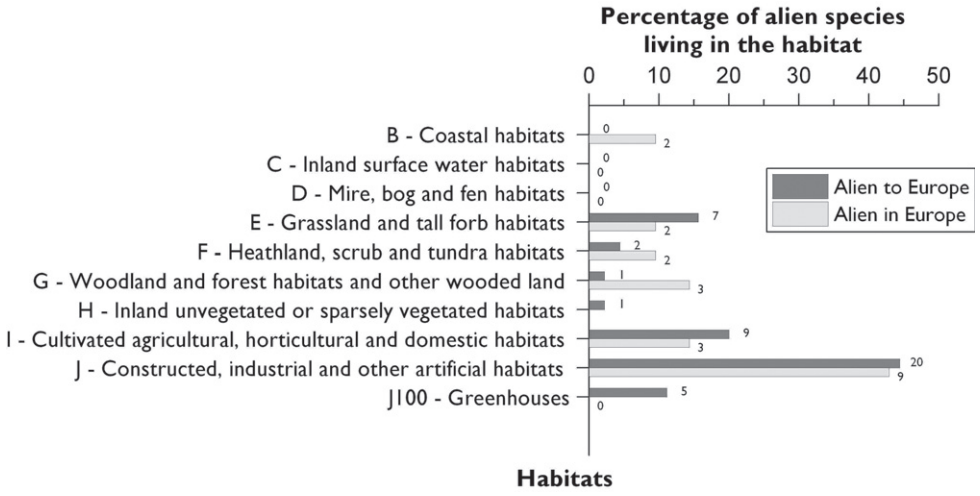

Figure 13.3.5. Main European habitats colonized by the 'Polyneoptera' species alien *to* Europe and alien *in* Europe. The number over each bar indicates the absolute number of alien species recorded per habitat. Note that a species may have colonized several habitats.

(Baumholtz et al. 1997). However, costs associated with cockroaches are also linked to their control, either directly or indirectly through the use of pesticides that may facilitate emergence of pathogen resistance to some chemicals. Cockroaches are suspected to be important agents in the transmission of antibiotic resistant microbes in livestock production systems. Livestock production uses antibiotics therapeutically but this facilitates the emergence of resistant bacteria that may subsequently affect the human population. Finally, cockroaches can also damage household items, by eating glue in wallpaper, books, and furniture.

The second group of 'Polyneoptera' with huge economic impact is termites. Termites play a critical ecological and agricultural role and some of them are pests. Some species (e.g. *Cryptotermes brevis*) has been introduced by human activity to almost every part of the world and cause severe damage to wooden structures. *Reticulitermes* Holmgren (Isoptera: Rhinotermitidae) are the major termite pests infesting structures and trees in Europe and the near East (Lohou et al. 1997). This genus contains the most significant termite pests of North America (the *R. flavipes* (Kollar) complex) and Europe (the *R. lucifugus* (Rossi) complex), and significant pest species in Asia (*R. speratus* (Kolbe)). Consequently, some of these species are susceptible to become major pests if they are introduced to Europe in the future. In Germany, *R. flavipes* appears to have been introduced on multiple occasions from USA with pine (*Pinus* spp.) logs (Harris 1962; UNEP 2000; Weidner 1978). This species had caused significant damage and costs for repair and control. The overall cost of treatments against termites in Europe may account for 1 billion euros by 2005 (UNEP 2000) whilst the estimated cost of termite damage could reach $20 billion annually (Su 2002).

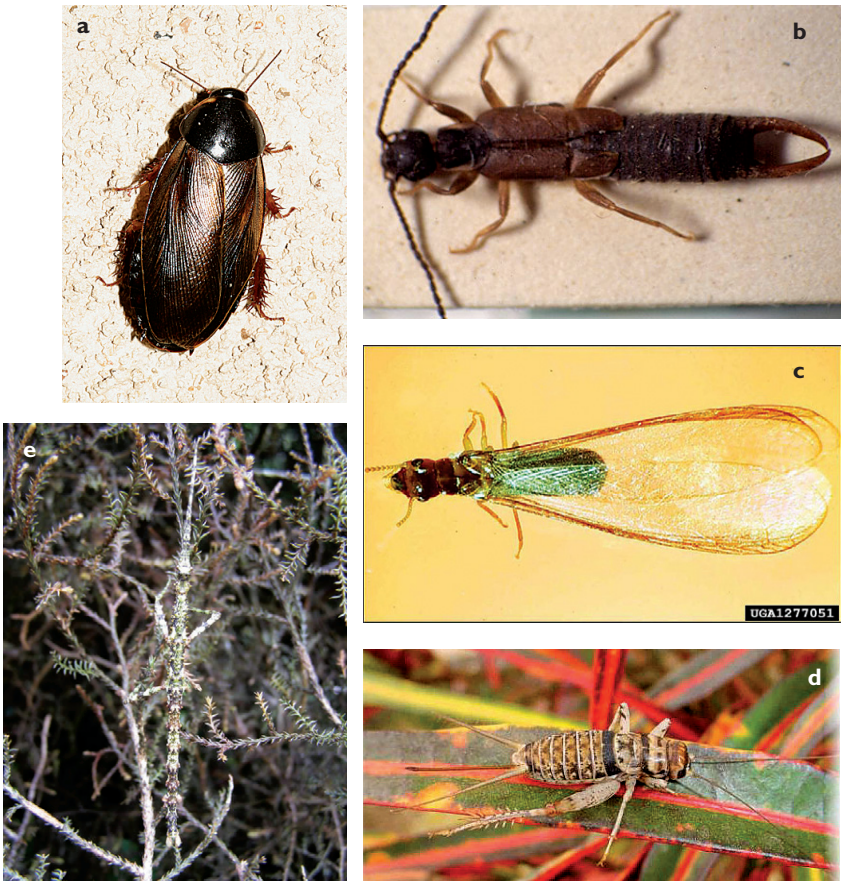

Figure 13.3.6. Some Polyneoptera alien to Europe. **a** Pycnoscelus surinamensis (Blattodea) (Credit : Tom Murray) **b** Nala lividipes (Credit : MNHN Paris) **c** *Cryptotermes brevis* (Isoptera) (Credit : RH Scheffrahn) **d** *Gryllodes sigillatus* (Orthoptera) (Credit : JJ Argoud) **e** late instar nymph of *Ancanthoxyla geisovii* (Phasmatodea). (Credit: R. Hoare).

References

Albouy V, Caussanel C (1990) Dermaptères ou Perce-Oreilles. Faune de France, vol. 75. Paris: Fédération Française des Sociétés de Sciences Naturelles. 245 pp.

Alexander JB, Newton J, Crowe GA (1991) Distribution of Oriental and German cockroaches, *Blatta orientalis* and *Blattella germanica* (Dictyoptera), in the United Kingdom. *Medical and Veterinary Entomology* 5: 395–402.

Asshoff R, Coray A (2003) *Tachycines asynamorus*, *Periplaneta australasiae* and *Pycnoscelus surinamensis* (Ensifera and Blattodea) in the Botanical Garden of Basel, Switzerland. *Mitteilungen der Entomologischen Gesellschaft Basel* 53: 42–55.

Austin JW, Szalanski AL, Ghayourfar R, Kence A, Gold RE (2006) Phylogeny and genetic variation of *Reticulitermes* (Isoptera: Rhinotermitidae) from the eastern Mediterranean and Middle East. *Sociobiology* 47: 873–890.

Austin JW, Szalanski AL, Scheffrahn RH, Messenger MT, Dronnet S, *et al.* (2005) Genetic evidence for the synonymy of two *Reticulitermes* species: *Reticulitermes flavipes* and *Reticulitermes santonensis*. *Annals of the Entomological Society of America* 98: 395–401.

Baumholtz MA, Parish LC, Witkowski JA, Nutting WB (1997) The medical importance of cockroaches. *International Journal of Dermatology* 36: 90–96.

Becker G (1970) Reticulitermes in Mittel und West Europa. *Zeitschrift für Angewandte Entomologie* 65: 268–278.

Becker G, Kny U (1977) Survival and development of the drywood termite *Cryptotermes brevis* (Walker) in Berlin. *Anzeiger für Schaedlingskunde Pflanzenschutz Umweltschutz* 50: 177–179.

Bland RG, Gangwere SK, Morales Martin M (1996) An annotated list of the Orthoptera (sens. lat.) of the Canary Islands. *Journal of Orthoptera Research* 5: 159–173.

Borges PAV, Myles T (2007) Térmitas dos Açores. Resultados do workshop "Medidas para gestão e combate das termitas nos Açores" Principia, Portugal. 125 pp.

Budrys E, Pakalniskis S (2007) The Orthoptera (Insecta) of Lithuania. *Acta Zoologica Lituanica* 17: 105–115.

Burgess NR, Chetwyn KN (1981) Association of cockroaches with an outbreak of dysentery. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 75: 332–333.

Chopard (1922) Faune de France. Orthoptères et Dermaptères. Paris: P. Lechevalier. 200 pp.

Clément J-L, Bagnères AG, Uva P, Wilfert L, Quintana A, et al. (2001) Biosystematics of Reticulitermes termites in Europe: morphological, chemical and molecular data. *Insectes Sociaux* 48: 202–215.

Cochran DG (1999) Cockroaches: their biology, distribution and control. *WHO/CDS/CPC/WHOPES/99.3. World Health Organization Geneva*: 1–83.

Cornwell PB (1968) The Cockroach, Vol. I. London: Hutchinson. 391 pp.

Couvreur J-M, Godeau J-F (2000) Atlas des Orthoptères de la Famenne (Criquets, sauterelles et grillons): Gembloux: Centre de Recherche de la Nature, des Forêts et du Bois. 110 pp.

Decleer K, Devriese H, Hofmans K, Lock K (2000) Voorlopige atlas en "rode lijst" van de sprinkhanen en krekels van België (Insecta, Orthoptera): Werkgroep Saltabel, Rapport van het Instituut voor Natuurbehoud 2000.10, Brussel. 75 pp.

Detzel P (2001) Verzeichnis der Langfühlerschrecken (Ensifera) und Kurzfühlerschrecken (Caelifera) Deutschlands. *Entomofauna Germanica* 5: 63–90.

Ebner R (1958) Nachträge und Ergänzungen zur Fauna der Orthopteroidea und Blattoidea von Österreich. *Entomologisches Nachrichtenblatt der Österreichisch-Schweizerischen Entomologischen Gesellschaft* 10: 6–12.

Essl F, Rabitsch W (Eds) (2002) Neobiota in Österreich. *Umweltbundesamt*, Wien. 432 pp.

Feytaud J (1924) Le termite de Saintonge. *Comptes Rendus de l'Académie des Sciences* 178: 241–244.

Fois F, Cillo D, Piras P, Scano G, Deiana AM (2009). Note sulla recente introduzione di *Shelfordella lateralis* (Blattaria: Blattidae) in Sardegna: attuale distribuzione e considerazioni bioecologiche. Poster, XXII Congresso Nazionale Italiano di Entomologia. Ancona, 15–18 Giugno 2009. Available at [http://www.unica.it/UserFiles/File/News/Fois_NOTE SULLA RECENTE INTRODUZIONE DI SHELFORDELLA LATERALIS[1].pdf]

Fontana P, Buzzetti FM (2003). Nuova segnalazione di *Cryptotermes brevis* (Walker, 1853) in Italia settentrionale (Insecta, Isoptera, Kalotermitidae). *Bollettino del Museo civico di Storia Naturale di Venezia* 54: 35–44.

Gay F (1969) Species introduced by man. In: Krishna K, Weesner F (Eds) Biology of termites, vol I. New York, London: Academic Press, 459–494.

Geiter O, Homma S, Kinzelbach R (2002) Bestandsaufnahme und Bewertung von Neozoen in Deutschland. Untersuchung der Wirkung von Biologie und Genetik ausgewählter Neozoen auf Ökosysteme und Vergleich mit den potentiellen Effekten gentechnisch veränderter Organismen. Berlin: Umweltbundesamt pp.

Goddeeris B (1980) The role of insects in dispersing eggs of tapeworms, in particular *Taeniarhynchus saginatum*. I. Review of the literature. *Annales de la Société Belge de Médecine Tropicale* 60: 195–202.

Grandcolas P, Dejean A, Deleporte P (1996) The invading parthenogenetic cockroach: A natural history comment on Parker and Niklasson's study. *Journal of Evolutionary Biology* 9: 1023–1026.

Harris WV (1962) Termites in Europe. *New Scientist* 13: 614–617.

Holst KT (1986) The Saltatoria (Bush-Crickets, Crickets and Grasshoppers) of Northern Europe. Fauna Entomologica Scandinavica, Vol. 16. Leiden, Netherlands; Copenhagen, Denmark: E. J. Brill/Scandinavian Science Press Ltd. 127 pp.

Hubenov Z, Beschovski V, Beshkow S, Kolarov J, Kumanski K, et al. (1998) Insects of Bulgaria, Part 2: Blattodea, Mantodea, Isoptera, Orthoptera, Dermaptera, Embioptera, Megaloptera, Raphidoptera, Neuroptera, Mecoptera, Hymenoptera, Trichoptera, Lepidoptera, and Diptera. Bulgaria's Biological Dversity: Conservaton Status and Needs Assessment, Volumes I and II. Washington, D.C.: Curt Meine. 236–243; 255–257 pp.

Inward DJG, Beccaloni GW, Eggleton P (2007) Death of an order: a comprehensive molecular phylogenetic study confirms that termites are eusocial cockroaches. *Biology Letters* 3: 331–335.

Kleukers RMJC (2002) Nieuwe waarnemingen aan sprinkhanen en krekels in Nederland (Orthoptera). *Nederlandse Faunistische Mededelingen* 17: 87–102.

Lee M (1993) A survey into the distribution of the stick insects of Britain. *Phasmid Studies* 4: 15–23.

Lohou C, Burban G, Clément J-L, Jequel M, Leca. J-L (1997) Protection des arbres d'alignement contre les termites souterrains. L'expérience menée à Paris. *Phytoma* 492: 42–44.

Mielke von U (2001) Nachweis der Australichen Schabe (*Periplaneta australasiae* (Fabricius, 1775)) in Sachsen-Anhalt. *Anzeiger für Schaedlingskunde Pflanzenschutz Umweltschutz* 74: 111–112.

Morin D (2001) Importation accidentelle de *Topana cincticornis* en Gironde (France) et signalisation d'autres espèces du groupe *Topana-Atopana-Pycnopalpa* en Guyane Française (Orthoptera, Tettigoniidae, Phaneropterinae). *Bulletin de la Société Linnéenne de Bordeaux* 29: 27–28.

Morin D (2007) Orthoptères du Languedoc: *Ephippigerida nigromarginata* Lucas, 1849 (Ensifera, Bradyporinae) toujours à Lespignan (France, Hérault). *Bulletin de la Société Linnéenne de Bordeaux* 35: 233–235.

Noël F, Dusoulier F, Barrier Y (2002) *Antaxius spinibrachius* (Fischer, 1853), nouvelle espèce pour la France (Orthoptera, Ensifera). *Bulletin de la Société Entomologique de France* 107: 141–147.

Nunes L, Gaju M, Krecek J, Molero R, Teresa Ferreira M, et al. (2010) First records of urban invasive *Cryptotermes brevis* (Isoptera: Kalotermitidae) in continental Spain and Portugal. *Journal of Applied Entomology* on line first.

Petkovski (2009) National Catalogue (Check List) of Species. Macedonia. *Biodiversity and Protected Areas Consultant (National) within the Project 00058373 "Strenghtenening the Ecological, Institutional and Financial Sustainability of Macedonia's National Protected Areas System*: 1–325.

Presa JJ, García MD, Clemente ME (2007) Catalogue of Orthoptera Caelifera from the Iberian Peninsula and Balearic Islands (Orthoptera: Caelifera). *Journal of Orthoptera Research* 16: 175–179.

Princis K (1947) Beitrag zur Kenntnis der adventiven Blattarien Skandinaviens und Finnlands. *Notulae Entomologicae* 27: 8–13.

Princis K (1966) Orthopterorum Catalogus. pars 8. Gravenhage: Junk pp.

Ragge DR (1965) Grasshoppers, Crickets, and Cockroaches of the British Isles. Chapter 3. London: Frederick Warne & Co. Ltd pp.

Ragge DR (1973) Chapter 10. Dictyoptera. In: Smith KGV (Ed) Insects and other arthropods of medical importance. London: BMNH.

Raineri V, Rey A, Marini M, Zaffagnini V (2001) A new discovery of *Cryptotermes brevis* in Genoa, Italy (Isoptera). *Bollettino della Società Entomologica Italiana* 133: 99–102.

Rehn JAG (1945) Man's uninvited fellow traveler - the cockroach. *The Scientific Monthly* 61: 265–276.

Rey G (1936) Contribution à la faune des Orthoptères de France. *Annales de l'Association des Naturalistes de Levallois-Perret* 22: 77–82.

Scheffrahn RH, Krecek J, Ripa R, Luppichini P (2009) Endemic origin and vast anthropogenic dispersal of the West Indian drywood termite. *Biological Invasions* 11: 787–799.

Scheffrahn RH, Su NY, Chase JA, Forschler BT (2001) New termite (Isoptera: Kalotermitidae, Rhinotermitidae) records from Georgia. *Journal of Entomological Science* 36: 109–113.

Šefrová H, Laštůvka Z (2005) Catalogue of alien animal species in the Czech Republic. *Acta Universitatis Agriculturae et Silviculturae Mendelianae Brunensis* 53: 151–170.

Sein FJr (1923) Cucarachas. Puerto Rico Insular Experiment Station. Circular 64. 12 pp.

Stejskal V (1993) Erster Nachweis der Schabe *Periplaneta brunnea* (Burm.) (Blattodea, Blattidae) in Mitteleuropa. *Anzeiger für Schaedlingskunde Pflanzenschutz Umweltschutz* 66: 150–151.

Su NY (2002) Novel technologies for subterranean termite control. *Sociobiology* 40: 95–101.

Tomov R, Trencheva K, Trenchev G, Cota E, Ramadhi A, Ivanov B, Naceski S, Papazova-Anakieva I, Kenis M (2009) *Non-indigenous insects and their threat to biodiversity and economy in Albania, Bulgaria and Republic of Macedonia*. Sofia-Moscow: Pensoft, publishers, 112 pp.

Turk SM (1985) Two New-Zealand stick insects naturalized in mainland Cornwall England UK. *Entomologist's Record and Journal of Variation* 97: 129–130.

UNEP, FAO (2000) United Nations Environment Programme and Food and Agriculture Organization. Termite biology and management workshop (Geneva: UNEP).

Uvarov BP (1944) A New Zealand Phasmid (Orthoptera) established in the British Isles. *Proceedings of the Royal Entomological Society of London, B* 13: 94–96.

Vigna Taglianti A (2005) Insecta Dermaptera. In: Ruffo S, Stoch F (Eds) Checklist e distribuzione della fauna italiana. *Memorie del Museo Civico di Storia naturale di Verona, 2 .serie, Sezione Scienze della Vita* 16: 141–142.

Weidner H (1937) Termiten in Hamburg. *Zeitschrift fiir Pflanzenkrankhr* 47: 593.

Weidner H (1938) Die Geradflügler (Orthopteroidea und Blattoidea) der Nordmark und Nordwest-Deutschlands. *Verhandlungen des Vereins für naturwissenschaftliche Heimatforschung zu Hamburg* 26: 25–68.

Weidner H (1978) Die Gelbfussige Bodentermite *Reticulitermes flavipes* (Kollar 1837) in Hamburg (Isoptera). Eine Dokumenation zur Geschichte der angewandten Entomologie in Hamburg. *Entomologische Mitteilungen aus dem Zoologischen Museum Hamburg* 6: 49–100.

Weidner H (1981) Einschleppung von Heuschrecken (Saltatoria und Phasmida) nach Hamburg. *Anzeiger für Schaedlingskunde Pflanzenschutz Umweltschutz* 54: 65–67.

Wetterer JK, Hugel S (2008) Worldwide spread of the ant cricket *Myrmecophilus americanus*, a symbiont of the Longhorn Crazy ant, *Paratrechina longicornis*. *Sociobiology* 52: 157–165.

Table 13.3.1. Blattodea, Isoptera, Orthoptera, Phasmatodea and Dermaptera species alien *to* Europe. List and characteristics. Status: **A** Alien *to* Europe **C** cryptogenic species. Country codes abbreviations refer to ISO 3166 (see appendix I). Habitat abbreviations refer to EUNIS (see appendix II). Last update 01/03/2010

Families *Species*	**Status**	**Regime**	**Native range**	**First Record in Europe**	**Invaded countries**	**Habitat**	**Host**	**References**
BLATTODEA Blaberidae								
Blaberus atropos (Stoll, 1813)	A	detrito-vorous	Tropical, subtropical	Unknown	DE, DK	J	With banana	Cornwell (1968), Holst (1986), Princis (1947)
Blaberus parabolicus (Walker,1868)	A	detrito-vorous	C & S America	Unknown	DK	J		Holst (1986), Princis (1947)
Henschoutedenia flexivitta (Walker, 1868)	A	detrito-vorous	Africa	Unknown	DE, DK	J	Reared	Holst (1986), Princis (1947)
Nauphoeta cinerea (Olivier, 1789)	A	detrito-vorous	C & S America	Unknown	CZ, DE, DK, GB	J	Reared for reptile pet food	Cornwell (1968), Šefrová and Laštůvka (2005)
Panchlora fraterna Saussure & Zehntner, 1893	A	detrito-vorous	C & S America	Unknown	DK	J		Holst (1986), Princis (1947)
Panchlora peruana Saussure, 1864	A	detrito-vorous	C & S America	1912, DK	DK	J		Holst (1986), Princis (1947)
Phoetalia circumvagans (Burmeister, 1838)	A	detrito-vorous	Tropical, subtropical	Unknown	ES-CAN	J	in or near human habitations,	Bland et al. (1996)
Phoetalia pallida (Brunner, 1865)	A	detrito-vorous	Tropical, subtropical	Unknown	DK, ES-CAN	J	In or near human habitations,	Princis (1947)
Pycnoscelus surinamensis (Linnaeus, 1767)	A	detrito-vorous	Asia-Tropical	1950, CZ	CH, CZ, ES-CAN, FR, GB, IE, IL, IS, PL, PT-AZO, PT-MAD	J1	Tropical and subtropical moist places	Asshoff and Coray (2003), Chopard (1922), Cornwell (1968), Šefrová and Laštůvka (2005)

Families *Species*	Status	Regime	Native range	First Record in Europe	Invaded countries	Habitat	Host	References
Rhyparobia maderae (Fabricius, 1781)	A	detrito-vorous	Africa	Unknown	DE, ES, ES-CAN, FR-COR	J, I1	Food stores indoors, outdoors prefers to live in sugarcane fields, as well as palms, guava, and bananas growing next to the fields; fond of bananas and grapes.	Cochran (1999)
BLATTODEA Blatellidae								
Nyctibora laevigata (Beauvois, 1805)	C	detrito-vorous	Cryptogenic	Unknown	DK	J		Princis (1947)
Supella longipalpa (Fabricius, 1798)	A	detrito-vorous	Africa	1945, DE	AL, CH, CZ, DE, DK, ES-CAN, FI, FR, GB, GR-SEG, GR, HU, IE, IL, IT-SAR, IT-SIC, IT, RO, SK	J1	Omnivorous, synanthropic, warm and dry habitats	Chopard (1922), Ragge (1973), Rehn (1945), Šefrová and Laštůvka (2005)
BLATTODEA Blattidae								
Blatta orientalis Linnaeus, 1758	C	detrito-vorous	Cryptogenic	1500, CZ	AL, AT, BA, BE, BG, CH, CY, CZ, DE, DK, EE, ES-CAN, FI, FR-COR, FR, GB, GR-SEG, GR, HR, AT, HU, IE, IL, IS, IT-SAR, IT-SIC, IT, LV, LT, LU, MT, NL, NO, PL, PT-AZO, PT-MAD, PT, RO, SE, SI, SK, SE, UA	J1, J6	Omnivorous, synanthropic; decaying organic matter (sewers, drains, damp basements, porches, and other damp locations), outdoors in bushes, under leaf groundcover and mulch	Alexander et al. (1991), Šefrová and Laštůvka (2005)
Neostylopyga rhombifolia (Stål, 1861)	C	detrito-vorous	Cryptogenic	Unknown	CZ	G, I2	Omnivorous, synanthropic, warm climate; not cold tolerant, moist conditions	Šefrová and Laštůvka (2005)

Families *Species*	**Status**	**Regime**	**Native range**	**First Record in Europe**	**Invaded countries**	**Habitat**	**Host**	**References**
Periplaneta americana (Linnaeus, 1758)	A	detrito-vorous	Africa	1600, IT	AL, AT, BE, BG, CH, CZ, DE, DK, EE, ES-CAN, ES, FI, FR, GB, GR-CRE, GR-NEG, GR-SEG, GR, HR, AT, HU, IE, IL, IS, IT-SAR, IT-SIC, IT, LV, LT, LU, MT, NO, PL, PT-AZO, PT-MAD, PT, SI, SK, SE	J1, H1, J100	Omnivorous, synanthropic, warm climate; not cold tolerant, moist conditions	Princis (1966), Ragge (1945), Šefrová and Laštůvka (2005)
Periplaneta australasiae (Fabricius, 1775)	A	detrito-vorous/ phyto-phagous	Asia-Tropical	1927, DE	AT, CH, CZ, DE, DK, ES-CAN, FI, FR, GB, AT, IE, IS, IT-SAR, IT-SIC, IT, PL, SK, SE	J1, J100	Omnivorous, synanthropic, warm climates, moist, eat plants outdoors	Asshof and Coray (2003), Mileke (2001), Princis (1966), Ragge (1945), Šefrová and Laštůvka (2005)
Periplaneta brunnea Burmeister, 1838	A	detrito-vorous	Africa	Unknown	CZ, ES-CAN, PT-MAD, SK, SE	J1	Near human habitats in cold climate; mainly outdoors, under the bark of trees and in sewers in native and warm	Šefrová and Laštůvka (2005), Stejskal (1993)
Shelfordella lateralis (Walker, 1868)	A	detrito-vorous	Central Asia	2009, IT-SAR	IT-SAR	J	Herbaceous places near human habitats, along streets.	Fois et al. (2009)
DERMAPTERA Anisolabididae								
Euborellia stali (Dohrn, 1864)	A	parasitic/ predator	Asia	2002, IT	IT	I	Sugarcane field in native range	Vigna- Taglianti (2005)

Families *Species*	Status	Regime	Native range	First Record in Europe	Invaded countries	Habitat	Host	References
DERMAPTERA Labiduridae								
Nala lividipes (Dufour, 1828)	A	parasitic/ predator	Tropical, subtropical	1915, IT-SIC	ES-BAL, ES-CAN, ES, FR, IT-SAR, IT-SIC, IT, PT	I, J	Granivore, predator, Economic pest of agricultural crops; hosts: Beta vulgaris (beetroot), Glycine max (L.) (soybean), Glossipium sp.(cotton), Helianthus annuus L. (sunflower), Sorghum sp. (sorghum)	Albouy and Caussanel (1990)
ISOPTERA Kalotermitidae								
Cryptotermes brevis (Walker, 1853)	A	phyto-phagous	C & S America	1993, DE	DE, ES-CAN, GB, IT, PT-AZO, PT	J	Soil, buildings	Becker and Kny (1977), Fontana and Buzzetti (2003), Gay (1969), Nunes et al. (2010), Raineri (2001), Scheffrahn et al. (2001)
ISOPTERA Rhinotermitidae								
Reticulitermes flavipes (Kollar, 1837)	A	phyto-phagous	North America	1934, DE	AT, DE, FR	J	Soil, buildings	Austin et al. (2005, 2006), Clément et al. (2001), Feytaud (1924), Weidner (1937)
ORTHOPTERA Acrididae								
Dociostaurus tartarus Shchelkanovtsev, 1921	A	phyto-phagous	Asia	1962, BG	BG	E		Hubenov et al. (1998)
Locusta migratoria (L, 1758)	A	phyto-phagous	Africa	1886, FR	AL, BG, DK, FR, FR-COR, HU, LV, PT	F3	Migration ?	Budrys and Pakalniskis (2007), Presa et al. (2007), Rey (1936)

Families *Species*	**Status**	**Regime**	**Native range**	**First Record in Europe**	**Invaded countries**	**Habitat**	**Host**	**References**
Notostaurus albicornis (Eversmann, 1848))	A	phyto-phagous	Asia	1964, BG	BG	E		Tomov et al. (2009)
Ramburiella turcomana (Fischer von Waldheim, 1846)	A	phyto-phagous	Asia	1962, BG	BG, MK	E		Petkovski (2009)
ORTHOPTERA Bradyporidae								
Ephippigerida nigromarginata (Lucas, 1849)	A	unknown	Africa	1953, FR	FR, IT-SIC	F6	?	Morin (2007)
ORTHOPTERA Gryllidae								
Gryllodes sigillatus Walker 1869	A	detrito-vorous	Asia	Unknown	DE, GB, NL	J100		Geiter et al. (2002), Weidner (1981)
ORTHOPTERA Myrmecophilidae								
Myrmecophilus americanus Saussure 1877	C	detrito-vorous	Cryptogenic	Unknown	DE	U	Ant nests	Geiter et al. (2002), Wetterer and Hugel (2008)
ORTHOPTERA Phaneropteridae								
Topana cincticornis (Stal, 1873)	A	detrito-vorous	C & S America	1991, FR	FR	U		Morin (2001)
ORTHOPTERA Raphidophoridae								
Tachycines asynamorus Adelung, 1902	A	detrito-vorous	Asia	1892, DE	AT, BG, CH, DE, DK, EE, FR, GB, AT, IE, IT, LV	J100	Omnivorous, greenhouses and botanical gardens	Asshoff and Coray (2003), Detzel (2001), Geiter et al. (2002), Weidner (1981)
ORTHOPTERA Tettigoniidae								
Copiphora brevirostris Stäl, 1873	A	phyto-phagous	C & S America	Unknown	DE	J100	Greenhouses	Detzel (2001)

Families *Species*	**Status**	**Regime**	**Native range**	**First Record in Europe**	**Invaded countries**	**Habitat**	**Host**	**References**
Phlugiola dahlemica Eichler, 1938	A	phyto-phagous	C & S America	1924, DE	DE	I2	Botanic garden	Weidner (1938)
PHASMATODEA Phasmatidae								
Acanthoxyla geisovii (Kaup, 1866)	A	phyto-phagous	Australasia	1908, GB	GB	I2, E5	Bramble, Eucalyptus, Cupressus	Lee (1993), Turk (1985), Uvarov (1944)
Acanthoxyla inermis Salmon, 1955	A	phyto-phagous	Australasia	1981, GB	GB	I2, E5	Rose, Bramble, Eucalyptus	Lee (1993), Turk (1985)
Carausius morosus (Sinéty, 1901)	A	phyto-phagous	Asia	Unknown	DE, GB	I2, E5	Privet, Ivy, Hawthorn, Pyracantha, Bramble, Rose	Lee (1993), Weidner (1981)
Clitarchus hookeri (White, 1846)	A	phyto-phagous	Australasia	1900, GB	GB, IE	I2, E5	Bramble, Eucalyptus, Guava	Lee (1993)

Table 13.3.2. Blattodea, Isoptera, Orthoptera, Phasmatodea and Dermaptera species alien *in* Europe. List and characteristics. Country codes abbreviations refer to ISO 3166 (see appendix I). Habitat abbreviations refer to EUNIS (see appendix II). Last update 01/03/2010.

Families *Species*	Status	Regime	Native range	First Record in Europe	Invaded countries	Habitat	Host	References
DERMAPTERA Anisolabidae								
Anisolabis maritima (Bonelli, 1832)	E	parasitic/ predator	Mediterranean region ? (Cosmo-politan)	Unknown	DE, DK, GB, IL	B, J1, J6	Waste, algae in coastal areas	Albouy and Caussanel (1990)
DERMAPTERA Carcinophoridae								
Euborellia annulipes (Lucas, 1847)	E	parasitic/ predator, phyto-phagous	Mediterranean region ? (Cosmo-politan)	1837, IT	CZ, DE, DK, ES-BAL, ES-CAN, ES, FR, GB, GR-CRE, GR-SEG, GR, HR, IL, IT-SAR, IT-SIC, IT, MT, NL, PT-AZO, PT-MAD, PT, UA	B, J1, J6	Omnivorous, on plant and animal material; minor nuisance in gardens	Albouy and Caussanel (1990)
DERMAPTERA Labidae								
Forficula smyrnensis Serville, 1838	E	unknown	Mediterranean region	1882, FR-COR	FR-COR, FR	F9, J6	Under plane bark, along Adour river	Albouy and Caussanel (1990)
ISOPTERA Kalotermitidae								
Kalotermes flavicollis (Fabricius 1793)	E	phyto-phagous	Mediterranean region	2005, PT-AZO	PT-AZO	G, J	Dry wood, forests, buildings	Borges and Myles (2007)
ISOPTERA Rhinotermitidae								
Reticulitermes lucifugus (Rossi 1792)	E	phyto-phagous	Mediterranean region	Unknown, DE	DE	J	Soil, buildings	Becker (1970)
ORTHOPTERA Acrididae								
Anacridium aegyptium (Linnaeus 1764)	E	phyto-phagous	Mediterranean region	Unknown	AL, DE, DK	F6		Weidner (1981)

Families *Species*	Status	Regime	Native range	First Record in Europe	Invaded countries	Habitat	Host	References
ORTHOPTERA Meconematidae								
Meconema meridionale Costa, 1860	E	phyto-phagous	Mediterranean region	1900, AT	AT, BE, GB, AT, NL	I2	Urban parks; highway parkings	Couvreur and Godeau (2000), Decleer et al. (2000), Kleukers (2002)
ORTHOPTERA Phaneropteridae								
Leptophyes punctatissima (Bosc, 1792)	E	phyto-phagous	Southern Europe	1956, AT	AT	U	Gardens	Ebner (1958), Essl and Rabitsch (2002)
ORTHOPTERA Rhaphidophoridae								
Dolichopoda bormansi Brunner von Watt., 1882	E	detrito-vorous	Mediterranean region	Unknown	DE	G3, G4	Cliffs in pine stands (*pinus nigra*)	Geiter et al. (2002)
Troglophillus neglectus (Kraus, 1879)	E	detrito-vorous	Mediterranean region	1998, CZ	CZ	J6	Cave, cellars	Šefrová and Laštůvka (2005)
ORTHOPTERA Tettigoniidae								
Antaxius spinibrachius (Fischer, 1853)	E	detrito-vorous	Mediterranean region	1999, FR	FR	J	Slate quarry	Nöel et al. (2002)
PHASMATODEA Bacillidae								
Bacillius rossius (Rossi, 1788)	E	phyto-phagous	Mediterranean region	Unknown	GB	I2, E5	Bramble, rose	Lee (1993)
Clonopsis gallica (Charpentier, 1825)	E	phyto-phagous	Mediterranean region	Unknown	GB	I2, E5	Bramble, Broom	Lee (1993)

Table 13.3.3. Number of alien 'polyneoptera' per European country.

Countries	**N**	**Countries**	**N**
Germany mainland	17	Sweden	4
Denmark	14	Estonia	3
Spain Canary islands	11	Greece South Aegean	3
France mainland	11	Greece mainland	3
Great Britain	10	Spain mainland	3
Czech Republic	8	Belgium	2
Italy mainland	8	Croatia	2
Bulgaria	7	France Corsica	2
Ireland	7	Lithuania	2
Italy Sicily	6	Luxemburg	2
Switzerland	6	Malta	2
Italy Sardinia	6	Norway mainland	2
Austria	5	Netherlands	2
Portugal mainland	5	Romania	2
Slovakia	5	Slovenia	2
Albania	4	Bosnia	1
Finland mainland	4	Cyprus	1
Hungary	4	Greece Crete	1
Iceland	4	Greece North Aegean	1
Israel	4	Macedonia	1
Latvia	4	Serbia	1
Poland	4	Spain Balearic islands	1
Portugal Azores	4	Ukraine	1
Portugal Madeira	4		