

CHANGES IN DISTRIBUTION AND PEST STATUS OF YEW SCALE *PARTHENOLECANIUM POMERANICUM* (HEMIPTERA: COCCIDAE) IN BRITAIN BETWEEN 1944 AND 2010

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ABSTRACT

The yew scale *Parthenolecanium pomericum* (Kawecki) is native to Europe and feeds by sucking sap from the foliage and stems of *Taxus*. It was first detected in Britain at a commercial plant nursery in West Sussex, June 1928, and during the 1930s and 1940s became a damaging pest that was commonly reported to the Royal Horticultural Society by its membership. The distribution of yew scale in Britain was mapped in 1944 which showed that it was restricted to southern England, being most frequently reported from East and West Sussex, and Surrey. Since then it has increased its geographical distribution as far north as North Yorkshire and Lancashire in England, and Flintshire in Wales. The number of reports of it causing damage to yew, however, has decreased. The evidence presented supports the hypothesis that yew scale is not native to Britain but was introduced from continental Europe, probably by the horticultural plant trade during the 1920s.

INTRODUCTION

Scale insects (Hemiptera: Coccoidea) are among the most poorly studied of all insect groups in Britain and the geographical distribution of the majority of species is inadequately known. This is due, at least in part, to the adult females being larviform and consequently they do not resemble typical insects. They are also small with cryptic habits and easily overlooked. One species, however, whose distribution in Britain has been investigated in more detail than most is the yew scale *Parthenolecanium pomericum* (Kawecki) (Coccidae) (Plate 9, Figs 1–4). This is because it can be a damaging pest of yew (*Taxus baccata* L., Taxaceae) and is therefore more likely to be noticed and reported by gardeners (or at the least the symptoms are) than most scale insects.

Large infestations of *P. pomericum* can cause conspicuous damage as they cover the stems and foliage in excreted honeydew which serves as a medium for the growth of black sooty moulds and attracts ants and flies. Infested plants may exhibit chlorosis and die-back. The Royal Horticultural Society (RHS) recorded a sharp increase in the number of samples of *P. pomericum* submitted by its members in the early 1940s and G. Fox Wilson, the then entomologist at the Wisley Laboratory, mapped the distribution of the scale (Fox Wilson, 1944). This is significant as it appears to be the earliest distribution map published for any scale insect species in Britain, and also provides baseline data to monitor subsequent changes in distribution.

The purpose of this communication is to report changes in the distribution and pest status of *P. pomericum* between 1944 and 2010 (66 years later) and to discuss possible causes.

PARTHENOLECANIUM POMERANICUM (KAWECKI) IN BRITAIN

Lecanium pomeranicum was originally described by Kaweckı (1954) from specimens collected on yew in Poland. It was subsequently described as *Eulecanium taxi* by Habib (1955) from specimens collected from yew at Imperial College Field Station, Silwood Park, Sunninghill, Berkshire, during 1951–53; and reassigned to the genus *Parthenolecanium* by Borchsenius (1957).

It was first detected in Britain by Fox Wilson at a commercial nursery garden in Crawley, West Sussex, 14 June 1928 (Green, 1930, misidentified as *Lecanium corni crudum* Green). The stems and undersides of the foliage of a yew tree were heavily encrusted in scales. Adult males of the scale were observed to emerge in May (Gimingham, 1934, misidentified as *L. corni* Bouché) and described in detail by Green (1934, as *L. corni-crudum*). Green stated that the scale was causing serious damage to yew plants in Britain. It was misidentified as *P. corni* in Britain for many years until it was recognised as distinct by Habib (1955).

GEOGRAPHICAL RANGE

The present distribution of *P. pomeranicum* in Britain, based on RHS records, private collectors, and a small number of unpublished records held by The Food and Environment Research Agency (Fera), is shown in Figure 1. The records have been divided into four periods: 1928–1943 (Fox Wilson’s 1944 map); 1944–1966; 1967–1988; 1989–2010).

The distribution data are not based on a systematic survey and need to be interpreted with caution. The vast majority of records were obtained from the RHS membership which is concentrated in south east England, inevitably giving a bias to the data (at least in frequency of reports). However, the Royal Horticultural Society has members throughout Britain who would notice the conspicuous damage that yew scale can cause, so any observed changes in distribution cannot be explained entirely by the distribution of RHS members (or by changes in the distribution of the host). Members of the Royal Horticultural Society are gardeners rather than entomologists and therefore only likely to detect and report the scale once populations have built up to damaging levels. Therefore the map is likely to show where the pest is abundant, rather than its true distribution. Despite these caveats there is a clear expansion in geographical range of the scale, both northwards and westwards.

Between 1928 and 1943 *P. pomeranicum* was restricted to southern England and recorded from 13 counties, most frequently in East and West Sussex and Surrey, but as far north as Huntingdon in Cambridgeshire. Between 1944 and 1966 it was reported widely in southern and central England, and had also become common in Buckinghamshire, Hampshire, Kent and Wiltshire. It was by then found as far north as Ffynnongroyw, Flintshire, Wales. There were relatively few reports during the period 1967 and 1988, but it was found as far west as Dartington, Devon. Between 1989 and 2010 it reached as far north as Kettleshulme, Cheshire and Nunnington, North Yorkshire.

ABUNDANCE

The highest total number of reports of *P. pomeranicum* is from Surrey (59 reports) followed by Hampshire (22), North Yorkshire (21), West Sussex (20) and Kent (19). Five or more reports have also been received from Berkshire, Buckinghamshire, Dorset, East Sussex, Hertfordshire, Middlesex, Oxfordshire, Suffolk and Wiltshire.

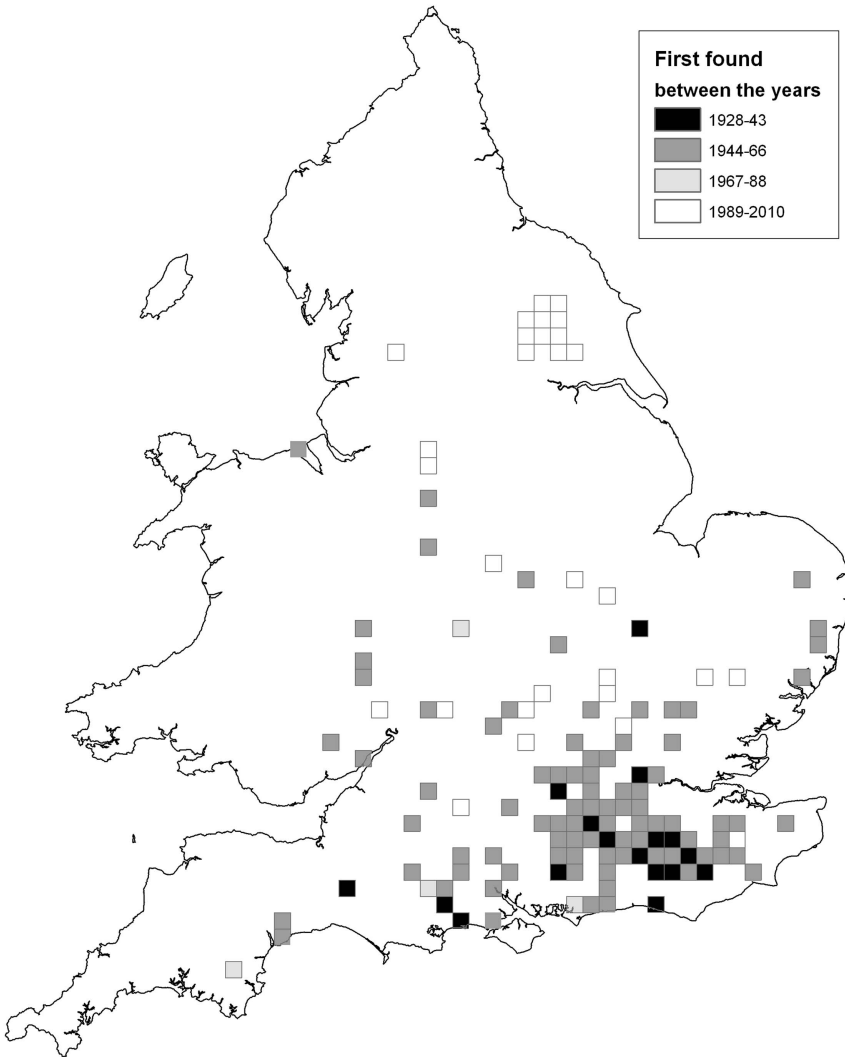


Fig. 1. The distribution of *Parthenolecanium pomericum* in Britain between 1928 and 2010. Each square represents 10km.

All of these counties are located in southern England, with the exception of North Yorkshire, but the latter's inclusion is due to more intensive recent collecting by the first author.

During November and December 2010, the first author searched for *P. pomericum* on yew at twenty-two locations (mostly churchyards) in or near York, North Yorkshire. The scale was found at 19 (86%) of the sites examined. They were found on both young plants and mature trees. The scales were most often detected on trimmed hedges, but this may be due to the fact that these plants were

more easily examined. Yew scale often occurred together with cottony camellia scale, *Pulvinaria floccifera* (Westwood) (Coccidae), but the two species are easily separated in the field. Each adult female cottony camellia scale produces a conspicuous elongate white ovisac on the undersides of the foliage. The adult drops off the plant after oviposition but remnants of the ovisac remain throughout the autumn and most of the winter (particularly on sheltered parts of the host). Adult female yew scales (Plate 9, Fig. 3) do not produce an ovisac and usually remain attached to the host throughout the winter. The overwintering nymphs of cottony camellia scale are usually pale yellow, whereas those of yew scale are orange or reddish-brown. In most cases the overwintering second instar stage of yew scale was observed before the adults. This is because they are far more numerous (each adult female can produce up to 3000 eggs (Kosztarab & Kozár, 1988)) and occur on the foliage where their reddish-brown body colour contrasts strongly with the green substrate. The adults were far less numerous and often occurred on the bark where they were camouflaged and more difficult to detect. All historical and recent records of yew scale recorded here were confirmed by the presence of adult females.

PEST STATUS

Two hundred and sixty-three records of *P. pomeranicum* in Britain have been collated and divided into periods of five years (Fig. 2). This shows a rapid increase in the number of reports of *P. pomeranicum* in the 1940s, reaching a peak during the period 1946–1950. It then declined sharply to the 1960s and continued at a low level until it again increased during 2006–2010. Fox Wilson's interest in the yew scale is likely to have influenced the increase in the number of reports during the 1930s and 1940s (Fox Wilson, 1944). However, this interest alone does not explain the large increase in the number of reports during 1946–1950 (which came from many different locations in central and southern England). The peak in 2006–2010 has already been explained as being due to recent intensive collecting by the first author.

The number of reports by RHS members is highly likely to be related to the damage/symptoms caused by the scale. Therefore the yew scale appears to have become less important as a pest in recent decades than it was during the 1940s, 50s and early 60s. However, it still has the potential to cause damage in Britain. The first author has observed an enormous population of yew scale damaging part of a mature yew tree in a churchyard in Huntingdon, York, June 2009; and Fera received a sample of yew heavily infested with scales from a commercial plant nursery in Surrey, November 2010.

DISCUSSION

Parthenolecanium pomeranicum is native to Europe and its principal host *T. baccata* is native to western, central and southern Europe, northwest Africa, northern Iran and southwest Asia. It would therefore appear reasonable to conclude that *P. pomeranicum* could be native to Britain. However, it was not recorded in Newstead's comprehensive monograph of the Coccidae of the British Isles (Newstead, 1903) and was only first detected in Britain in 1928, when it was found at a commercial plant nursery in southern England. It can be transported by international plant trade and by private individuals. For example, it has been detected at commercial nurseries in England on yew plants imported from the Netherlands and the most northerly record is on a small yew plant in a private garden in Nunnington, North Yorkshire that originally came from Bedfordshire and

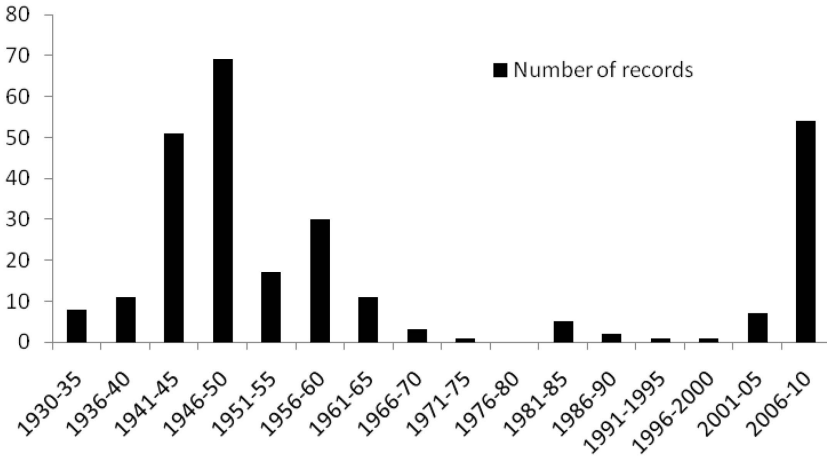


Fig. 2. Number of reports of *Parthenolecanium pomericum* in Britain between 1930 and 2010 divided into five yearly intervals.

was moved by the owner (Roger Hammon, pers comm., 2009). It has also been found on newly planted yew plants at the Food and Environmental Research Agency's laboratory in Sand Hutton.

It was reported to be a serious pest in southern England between the 1930s and early 1960s (Green, 1930; Fox Wilson, 1944; RHS, unpublished records), after which it has rarely been reported as a pest. The evidence available supports the hypothesis that *P. pomericum* is not native to Britain, but was introduced from continental Europe, probably with plant trade, in the 1920s. It is likely to have spread naturally locally from introduction sites (the first instars are active and may be dispersed by wind in a similar way to that demonstrated in other coccids (Washburn & Frankie, 1985; Barras, Jerie & Ward, 1994) and over longer distances by anthropogenic activities. The apparent decline in importance as a pest may be due, at least in part, to it being controlled by a complex of natural enemies, either introduced or already present in Britain. For example, there are at least four species of chalcidoid present in Britain that have been recorded attacking *P. pomericum* (Aphelinidae: *Coccophagus lycimnia* Walker, Encyrtidae: *Blastothrix longipennis* Howard, *Metaphycus insidiosus* Mercet and *Metaphycus zebratus* Mercet) (Universal Chalcidoidea Database, <http://www.nhm.ac.uk/research-curation/research/projects/chalcidoids/>).

Parthenolecanium pomericum is likely to continue its geographical expansion northwards in Britain, as it has been found as far north as Lithuania (Malumphy, Ostrauskas & Pye, 2008) and Sweden (Gertsson, 2000; Ossiannilsson, 1951). It is only occasionally an economic important pest of yew on the continent and is likely to be no more significant in Britain.

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 SHORT COMMUNICATION

Findings of mole crickets *Gryllotalpa* spp. (Orthoptera: Gryllotalpidae) in England in association with imports. – Each year thousands of arthropod specimens consisting of hundreds of species are found by the Plant Health and Seeds Inspectorate (PHSI) in association with plant material imported into England and Wales, and submitted to The Food and Environment Research Agency (Fera) laboratory at Sand Hutton for identification. One of the most impressive and instantly recognizable insects collected by the Plant Health and Seeds Inspectorate during 2011, on two separate occasions, were live adult European mole crickets *Gryllotalpa gryllotalpa* (L.) *sensu lato*. The mole cricket is a large burrowing insect with characteristic huge spade-like forelegs, similar to those of a mole (Fig. 1; Plate 9, Figs. 5 & 6), a brown body covered in velvety hair, and about 45mm in length. Recent findings of European mole crickets in gardens and garden centres have been summarised by Pinchen (2005, 2006, 2009 and *in press*). Mole crickets are rarely detected by the PHSI, and the purpose of this communication is to publish collection details, for the first time, of mole crickets found in association with imports, recorded by The Food and Environmental Research Agency. Two taxa have been intercepted by the PHSI, the *G. gryllotalpa*



Fig. 1. European mole cricket, *Gryllotalpa* spp. (Orthoptera: Gryllotalpidae).

group and the African mole cricket *Gryllotalpa africana* (Palisot de Beauvois). The *G. gryllotalpa* group contains several sibling species occurring in Europe and the Mediterranean region that have been separated primarily on chromosome number, in addition to morphology, acoustic behaviour and cuticular hydrocarbon pattern (Broza, Blondheim & Nevo, 1998). Nickle and Castner (1984) suggested that *G. africana* may also consist of a complex of several sibling species.

Single adults of the *G. gryllotalpa* group have been found on six separate occasions: ENGLAND, Greater Manchester, Manchester, with kibbled onions (*Allium cepa* L.) imported from Egypt, 1966 (leg. B. V. H. Turner) (Ref. 94/1966), determined by D. R. Ragge of the Natural History Museum; Manchester, with tomato (*Solanum lycopersicum* L.) paste imported from Turkey, 5.xi.1973 (leg. M. E. Deardon) (Ref. 150/1973), det. R. G. Adams of the Ministry of Agriculture, Food and Fisheries; Manchester Airport, with cargo imported from France, Paris, 27.iii.2011 (leg. C. Varey of the PHSI) (Ref. 21105701), det. C. Malumphy of Fera; Kent, Paddock Wood, with melon (*Cucumis melo* L.) fruit imported from Spain, viii.1980 (leg. PHSI) (Seymour & Kilby, 1981); Lincolnshire, Boston, with cabbage (*Brassica oleracea* L.) imported from the USA, 10.iv.1996 (leg. J. Beaver, PHSI) (Ref. 962618), det. C. Malumphy; Spalding, with mature plants imported from Italy and Spain, 8.vii.2011 (leg. J. Snowden, PHSI) (Ref. 21112760), det. C. Malumphy.

Single adult *G. africana* have been found on two occasions: ENGLAND, Cambridgeshire, Doddington, with *Ficus* sp. imported from Africa, 14.vii.1976 (Ref. 76-166), det. B.C. Townsend of the Commonwealth Institute of Entomology; West Sussex, Littlehampton, with poinsettia (*Euphorbia pulcherrima* Willd. ex Klotzsch) cuttings imported from Kenya, 8.vii.2002 (leg. A. Gaunt of the PHSI) (Ref. 202475), det. C. Malumphy of Fera.

The *G. gryllotalpa* group is widespread in Europe and the Mediterranean region and has been introduced to eastern parts of the USA. Adults and nymphs live

underground throughout the year in extensive tunnel systems a few centimetres beneath the surface, but which may reach a depth of over a metre in the winter. They are omnivorous, feeding on roots, tubers and rhizomes and a range of soil invertebrates. In the UK this species is protected (GB Red List, Schedule 5 of Wildlife Countryside Act 1981) and it is a Natural England UK Biodiversity Action Plan (BAP) priority species, as there were only four confirmed sightings between 1970 and 2001 (see Pinchen *in press* for subsequent findings). It was previously recorded in at least 33 vice-counties, mainly across southern England but also in South Wales, western Scotland and Northern Ireland. Its geographical range, however, has contracted significantly and it appears to be on the verge of extinction in the UK, which has been attributed to long term climate changes (Burton, 1989). What appears to be the last remaining population has been reported from the New Forest, Hampshire (Pinchen, 2009).

Gryllotalpa africana has been reported to occur widely in Africa, Asia, Australia and Hawaii, but according to Townsend (1983) it only occurs in Africa. It is univoltine and has a similar biology to species of the *G. gryllotalpa* group (Graaf, Schoeman & Brandenburg, 2004).

The *G. gryllotalpa* group has been accidentally introduced to eastern USA, presumably with trade (Nickle & Castner, 1984). The accidental import of individuals of the *G. gryllotalpa* group into England and Wales are such infrequent events, and in such small numbers, that they are unlikely to significantly influence the decline of the mole cricket in the UK, although transient populations may occur.

Gryllotalpa gryllotalpa is protected by law in Britain and if found in the wild should not be handled without a licence issued by Natural England. Any suspected findings in Britain should be reported to Bryan Pinchen, co-ordinator of UK BAP Mole Cricket project (bryanpinchen@hotmail.co.uk) – CHRIS MALUMPHY, The Food and Environment Research Agency, Sand Hutton, York, YO41 1LZ, UK.

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PLATE 9. Figs 1–4. Yew scale *Parthenolecanium pomernicum*. 1: Scale infested yew covered in honeydew, sooty mould and dirt. 2: General adult females. 3: Close-up of an adult female. 4: Close up of an overwintering second instar female. Figs 5–6. European mole cricket, *Gryllotalpa* sp. 5: Head, frontal view. 6: Head and thorax, lateral view showing modified fore-legs. © Fera.