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The identity of *Leptothorax albipennis* (Curtis) (Hymenoptera: Formicidae) and its presence in Great Britain

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Abstract. The karyotype and external morphology of *Leptothorax* (*Myrafant*) ants, taken from nests at nine '*Leptothorax tuberum*' localities in England and Wales, identifies them all as *L. tuberointerruptus*. Their karyotype differs in chromosome number and chromosome morphology from the karyotypes of morphologically similar European *Leptothorax* (*Myrafant*) species including *L. tuberum*, but matches the karyotype shared by *L. tuberointerruptus* and *L. rougeti*. Worker propodeal spine length, and worker propodeal spine shape coupled with worker gaster banding characteristics, distinguish the nest samples from *L. rougeti*. The presence of *L. tuberointerruptus* in Britain is therefore confirmed, and the data demonstrate this ant's occurrence throughout the British range attributed to *L. tuberum*. In the absence of equivalent data identifying *L. tuberum* as a British species, it may reasonably be assumed that *L. tuberointerruptus* has been misrecorded as *L. tuberum* in Britain and that all British mainland records of *L. tuberum* refer to *L. tuberointerruptus*. An examination of the syntypes of *Stenamma albipennis* shows that *S. albipennis* and *L. tuberointerruptus* are synonymous, and that *L. albipennis* is the senior name. It follows that *L. albipennis* is a scarce British ant of 'Notable B' conservation status. A taxonomic synopsis for *L. albipennis* is given.

Introduction

The large genus *Leptothorax* Mayr contains more than 300 species and is distributed through the Neotropical, Nearctic, Palaearctic, Afrotropical (Ethiopian), Malagasy, Oriental and Indo-Australian (Malesian) zoogeographical regions (Bolton, 1995a). There are at least forty European species (Collingwood, 1979; Casevitz-Weulersse, 1990). Within subgeneric groups, interspecific similarity and intraspecific variation in external morphology (taken, in this paper, to include both body shape and colour) can lead to confusion over identification. The study of karyotypes can sometimes help to clarify the situation (Imai *et al*., 1977; Casevitz-Weulersse, 1990; Loiselle *et al*., 1990).

Three members of the *Leptothorax* subgenus *Myrafant* Smith are currently recognized on mainland Britain: *L. tuberum* (Fabricius), *L. interruptus* (Schenck) and *L. nylanderi* (Foerster) (Bolton & Collingwood, 1975; Brian, 1977; Barrett, 1979; Collingwood, 1979). *Leptothorax tuberum* is a species of central and northern Europe. It is widely distributed in the mountains of central Europe from Spain to the Caucasus, and from northern Italy to Scandinavia, where it is found in southern Norway, Sweden and Finland, north to about latitude 62°, and in Denmark (Baroni Urbani & Collingwood, 1977; Kutter, 1977; Collingwood, 1979). The British ant recorded as *L. tuberum* is restricted mainly to warm, open coastal habitats in south and south-west England and in Wales (Fig. 3), where it typically nests in rock cavities, fractures and crevices, or under small stones. It nests less frequently in dead plant material (Orledge, unpublished thesis, University of Bath, 1995). Colonies are small, seldom exceeding 500 workers, and have a single queen (Pearson *et al*., 1995; Partridge *et al*., 1997). In recent years the identity of this ant has been called into question by electrophoretic data collected by Per Douwes (University of Lund) from populations in south-west England (Franks *et al*., 1992; Orledge, unpublished thesis, 1995), and the external morphology of specimens from the south coast of England examined by Bernhard Seifert (Staatliches Museum für Naturkunde, Görlitz) (N.R. Franks, personal communication). These unpublished data indicate that some English populations recorded as *L. tuberum* are populations of a morphologically similar species presently named as *L. tuberointerruptus* Bondroit (see Franks *et al*., 1992; Orledge, unpublished thesis 1995, Partridge *et al*., 1997). Luc Plateaux (personal communication) lists several morphological distinctions

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between *L. tuberum* and *L. tuberointerruptus*, including the darker colouration and larger size of *L. tuberum* queens, and the less sculptured, and often smooth, scutellum and shoulders of the mesonotum of *L. tuberum* males. The wings of *L. tuberointerruptus* sexuals are coloured to some extent, whereas those of *L. tuberum* are clear. The worker petiole of *L. tuberum* is generally less angular, and with a blunter anterodorsal ridge than that of *L. tuberointerruptus*. Also, the dark banding on the first gastral tergite of workers is generally more extensive, and there is a tendency for the top of the worker head to be more uniformly coloured in *L. tuberum*. However, sculpturing and melanisation are variable. Collingwood (1979) notes the variation in the colour of *L. tuberum* workers, and the data of Douwes & Stille (1991) demonstrate the variability in worker melanisation within some *Leptothorax* (*Myrafant*) taxa including *L. tuberum* and *L. tuberointerruptus*. *Leptothorax tuberointerruptus* has been recorded below 1520 m altitude from northern Spain, southern France, south and central Germany, central Italy and the Netherlands (Collingwood, 1971; du Merle, 1978; as *L. tuberum* [L. Plateaux, personal communication]; Fischer, unpublished thesis [Technische Hochschule, Darmstadt], 1987; Douwes & Stille, 1991; Seifert, 1993; P. Douwes, personal communication; L. Plateaux, personal communication).

Although most recently regarded as a variety of *L. interruptus* by Novak & Sadil (1941) (Bolton, 1995b), *L. tuberointerruptus* is informally treated as a separate species by a number of authors including Plateaux (e.g. 1984), Fischer (unpublished thesis, 1987) and Douwes & Stille (1987, 1991). Seifert (1993) re-established its specific status, support for which comes from its karyotype (see Fischer, unpublished thesis, 1987) and allozyme phenotype (Douwes & Stille, 1987, 1991). *Leptothorax tuberointerruptus* has a haploid chromosome number ($n = 8$) which is the smallest number of chromosomes known from the genus *Leptothorax*, and comprises one large and five smaller metacentric, and two medium-sized acrocentric, chromosomes. For *L. tuberum*, $n = 9$, comprising one large and seven small metacentric chromosomes with one small submetacentric chromosome (Fischer, unpublished thesis, 1987). Chromosome nomenclature is described in 'Materials and methods' below. For the morphologically distinct *L. nylanderi* and *L. interruptus*, $n = 11$ and $n = 12$, respectively. Another European *Leptothorax* (*Myrafant*), *L. rougeti* Bondroit (*sensu* Plateaux, 1978, 1984), has a similar karyotype to *L. tuberointerruptus* (Fischer, unpublished thesis, 1987), but differs from *L. tuberointerruptus* in external morphology. *Leptothorax rougeti* workers have longer propodeal spines than *L. tuberointerruptus* workers, and a dark band of more or less uniform width on the first gastral tergite. In *L. tuberointerruptus* workers this band narrows towards the middle and can be broken in light-coloured individuals (L. Plateaux, personal communication).

In this paper karyotype and external morphology (i.e. body shape and colour) are used to examine the identity of *Leptothorax* (*Myrafant*) nest samples taken from English and Welsh populations recorded as *L. tuberum*. The extent to which British records of *L. tuberum* may be misidentifications is considered. Then follows an examination of the nomenclatural implications of this study, and a description of the British distribution and conservation status of *L. albipennis* (= *tuberointerruptus*). A taxonomic synopsis for *L. albipennis* is given.

Materials and methods

During 1995 and 1996 *Leptothorax* (*Myrafant*) workers and brood were collected from eight '*L. tuberum*' sites in England and Wales, and from a new *Leptothorax* (*Myrafant*) locality at Tremadog, Gwynedd, discovered by the author and P. A. Smith in 1996. Twelve separate nests (coded BC) were sampled from these nine sites, which are spread throughout the known '*L. tuberum*' range in Britain (Table 1, Fig. 3). Eleven preserved workers of *L. rougeti* were kindly donated by Luc Plateaux. They were taken from a colony (D195) collected in 1975, by G. Délye, from the Forest of Lubéron, Provence, France, and subsequently cultured by Plateaux.

Karyotype

The BC nest samples were cultured in the laboratory. All produced, or included at collection, male pupae, the testes of which were used to make chromosome preparations. The time between sample collection and the removal of male pupae was ten months for overwintered nest samples BC3, BC4 and BC5, and between 4 h and 17 days for the samples collected in 1996. Imai *et al*. (1977) found karyotype to be unaffected by several months of laboratory culture. Testes were taken from fresh white pupae with varying degrees of eye pigmentation. They were prepared using the technique of Imai *et al*. (1977), without colchicine pretreatment, and with the following modifications. Removed testicular follicles were transferred immediately to a drop of colchicine-hypotonic solution on a clean plain slide. After incubation of 20–40 min the hypotonic solution was drawn off as completely as possible with absorbent paper. Preparation was continued on the same slide, eliminating the transfer of delicate incubated material from one slide to another (Loiselle *et al*., 1990). Cover slips were mounted using DPX mountant (BDH Ltd, Poole, England). Although separate preparations were made for each nest sample, most included follicles from more than one pupa. Fourteen slides were used for karyotype analysis: two from each of nest samples BC17 and BC19, and one from each of the remaining nest samples. They were prepared from the testes of sixty-five pupae.

A variety of terms have been used to describe the morphology of ant chromosomes in relation to the location of the centromere (e.g., Imai *et al*., 1977; Hauschteck-Jungen & Jungen, 1983). Given that the chromosome arm ratio, r, can be expressed as the ratio of the length of the long arm to the length of the short arm (Levan *et al*., 1964), the three terms used here are defined thus: for metacentric, $r = 1$, for submetacentric, $1 < r < 3$, and for acrocentric, $r > 3$.

Table 1. BC nest samples collected during 1995 and 1996. Localities are shown in Fig. 3. VC: Vice-county; ABSF: A.B. Sendova-Franks; GMO: G.M. Orledge; NRF: N.R. Franks.

Nest sample	Locality	Collection date	Collector/s
BC3	Isle of Portland, Dorset (VC 9)	10.5.95	ABSF NRF
BC4	Isle of Portland, Dorset (VC 9)	10.5.95	ABSF NRF
BC5	Isle of Portland, Dorset (VC 9)	10.5.95	ABSF NRF
BC16	Great Ormes Head, Gwynedd (VC 49)	26.5.96	GMO
BC17	Marle Hall, Gwynedd (VC 49)	26.5.96	GMO
BC18	Tremadog, Gwynedd (VC 49)	24.5.96	GMO
BC19	Barmouth, Gwynedd (VC 48)	27.5.96	GMO
BC21	Dungeness, Kent (VC 15)	25.5.96	ABSF NRF
BC22	Dungeness, Kent (VC 15)	25.5.96	ABSF NRF
BC25	Kynance Cliff, Cornwall (VC 1)	7.6.96	GMO
BC26	Goblin Combe, Somerset (VC 6)	15.6.96	GMO
BC29	Brean Down, Somerset (VC 6)	18.6.96	GMO

External morphology

Six workers from each BC nest sample, and the eleven *L. rougeti* workers from colony D195 (henceforth referred to as nest sample D195), were examined. For each worker, the lengths of both propodeal spines were measured to the nearest 0.01 mm and a mean value calculated. Measurements were made using a binocular dissecting microscope fitted with an eyepiece graticule. The degree of spine curvature was assessed, also the shape of the dark band on the first gastral tergite. Spine length was taken as the distance from the spine tip to an imaginary line joining the dorsal and ventral angles where the spine meets the propodeum, when the internal face of the spine is viewed. Spine curvature was scored 1 (straight), 2 (tendency to curve inwards) or 3 (pronounced inwards curve). The dark gaster band was scored 1 (narrowing sharply towards the middle, sometimes broken in the middle) or 2 (continuous, of more or less uniform width or narrowing slightly towards the middle). In both cases the lower scores correspond to typical *L. tuberointerruptus* morphology and the higher scores correspond to typical *L. rougeti* morphology (from Bondroit, 1918; L. Plateaux, personal communication and inspection of nest samples D195 [*L. rougeti*] and BC3 and BC4 [identified as *L. tuberointerruptus* by Plateaux, see below]).

Results

Karyotype

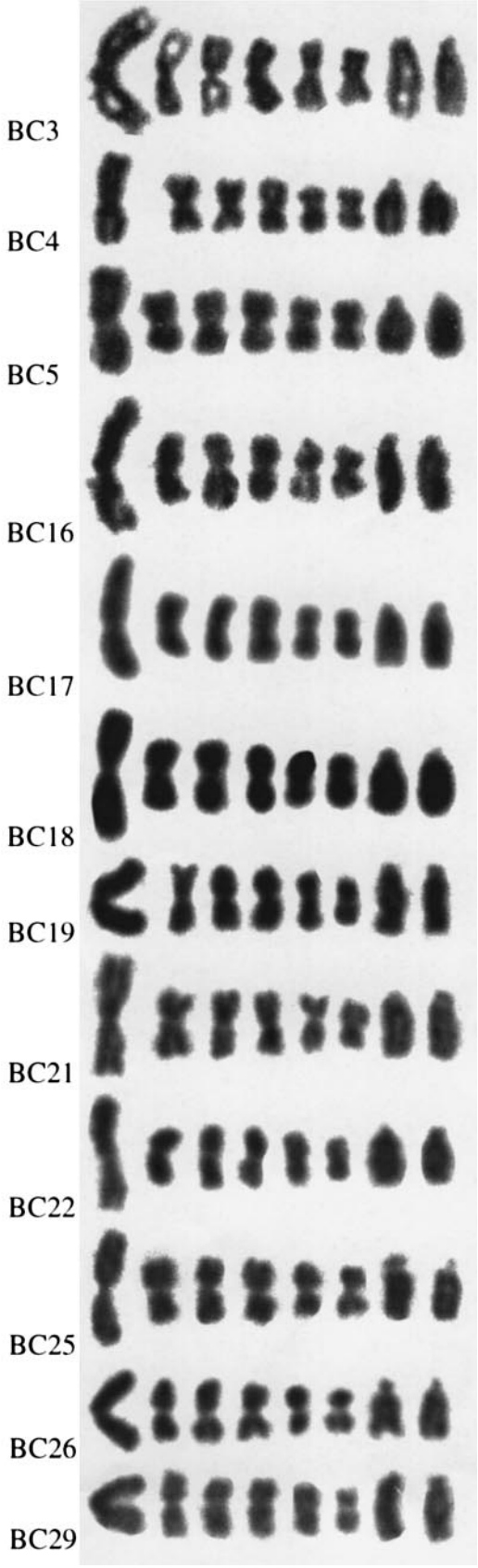
Each testes preparation from the BC nest samples yielded between ten and 104 metaphase spreads, each with eight chromosomes. With the exception of diploid and tetraploid cells, no evaluable cells were found with a greater number of chromosomes. Therefore, since males are typically haploid, for all BC nest samples, $n = 8$. The haploid chromosome set of all BC nest samples is composed of one large metacentric, five smaller metacentric (of which the first three are larger than the other two), and two medium-sized acrocentric chromosomes (Fig. 1). This is the karyotype shared by *L. tuberointerruptus* and *L. rougeti*. It is not the karyotype of *L. tuberum*, *L. interruptus* or *L. nylanderi*.

Diploid cells ($2n = 16$, Fig. 2) were found in the preparations from nest samples BC4 (Isle of Portland, 2 cells), BC5 (Isle of Portland, 1 cell), BC19 (Barmouth, 1 cell) and BC22 (Dungeness, 6 cells). It was not possible to determine if they were from completely or partially diploid males. Tetraploid cells ($4n = 32$) were found in the preparations from nest samples BC3 (Isle of Portland, 1 cell) and BC22 (Dungeness, 1 cell). Diploid males occur in a number of ant genera including *Leptothorax* (Loiselle *et al*., 1990), and Fischer (unpublished thesis, 1987) has reported the frequent occurrence of diploid cells, and the presence of tetraploid cells, in male prepupae of *L. tuberointerruptus*.

External morphology

Worker propodeal spine length data is summarized in Table 2, and spine curvature and gaster banding scores are given in Table 3.

From Table 2, mean spine length is greatest for nest sample D195 (0.103 mm), followed by nest sample BC16 (0.089 mm) and nest samples BC4 and BC5 (0.083 mm). Nest samples BC17 and BC25 have the shortest spines (mean values of 0.058 mm and 0.057 mm, respectively). There are significant differences between some of the nest samples for mean spine length (from a one-way analysis of variance, $F_{12,70} = 12.51$, $P < 0.0000$). Subsequent pairwise comparisons (Spjotvall & Stoline Test) show that the mean spine length of nest sample D195 differs significantly from that of all BC nest samples except BC16, and that the mean spine length of nest sample BC16 differs significantly only from the two nest samples with the shortest spines, BC17 and BC25 (Table 2). Of note is the opinion of Luc Plateaux (personal communication) that the external morphology of workers from nest samples BC3 and BC4 identifies them as *L. tuberointerruptus*. Applying Dixon's test (Rohlf & Sokal, 1969; Sokal & Rohlf, 1969) to the scores for spine curvature and gaster banding in Table 3 identifies the



D195 mean score (4.2) as an outlier ($r_{21} = 0.75$, $P < 0.01$). This indicates that nest sample D195 and the BC nest samples belong to different populations for these two characters when they are combined.

Discussion

The karyotype shared by all the BC nest samples is that of *L. tuberointerruptus* and *L. rougeti*. No other *Leptothorax* (*Myrafant*) is known to share this karyotype (Fischer, unpublished thesis, 1987), which differs in chromosome number and in chromosome morphology from the karyotype of *L. tuberum*. This separates all BC nest samples from *L. tuberum* and identifies each of them as either *L. tuberointerruptus* or *L. rougeti*.

The considerable variation in worker propodeal spine length among the nest samples is sufficient for some of these samples to differ significantly from each other (Table 2). As the propodeal spines of *L. rougeti* workers are longer than those of *L. tuberointerruptus* workers (L. Plateaux, personal communication), the range of mean propodeal spine length for all thirteen nest samples (0.04–0.130 mm) suggests that they may represent both of these taxa. But the identification of each nest sample is uncertain from the nest sample spine data alone. It is known, however, that nest sample D195 is *L. rougeti*, and that nest samples BC3 and BC4 are *L. tuberointerruptus* (L. Plateaux, personal communication). Therefore, since nest sample D195 has significantly longer spines than all BC nest samples except BC16, and the spines of nest sample BC4 (with nest sample BC5) appear to be longer than those of any other BC nest sample except BC16 (Table 2), the significant difference in mean spine length between nest sample D195 (*L. rougeti*) and all BC nest samples with a mean spine length equal to, or smaller than, that of nest sample BC4 (*L. tuberointerruptus*), suggests that all BC nest samples, except BC16, are *L. tuberointerruptus*. Although the mean spine length of nest sample BC16 appears closer to that of nest sample BC4 (*L. tuberointerruptus*) than to that of nest sample D195 (*L. rougeti*) (Table 2), the taxon to which nest sample BC16 belongs remains uncertain from these data alone.

The spine curvature and gaster banding data validate the suggestion that eleven of the BC nest samples are *L. tuberointerruptus* and remove the uncertainty over the identification of the twelfth, BC16. They demonstrate that nest sample D195 and the BC nest samples (including BC16) belong to different populations for these combined characters. Since these characters can be used to distinguish between *L. tuberointerruptus* and *L. rougeti*, and since nest sample D195 is *L. rougeti*, it follows that all BC nest samples belong to the same taxon, and that this must be *L. tuberointerruptus*.

Although the external morphology data presented here enable a satisfactory separation of *L. tuberointerruptus* and *L. rougeti*,

Fig. 1. Haploid karyotypes of the BC nest samples, obtained from the testes of male pupae. For each nest sample $n = 8$. Nest sample localities are given in Table 1.

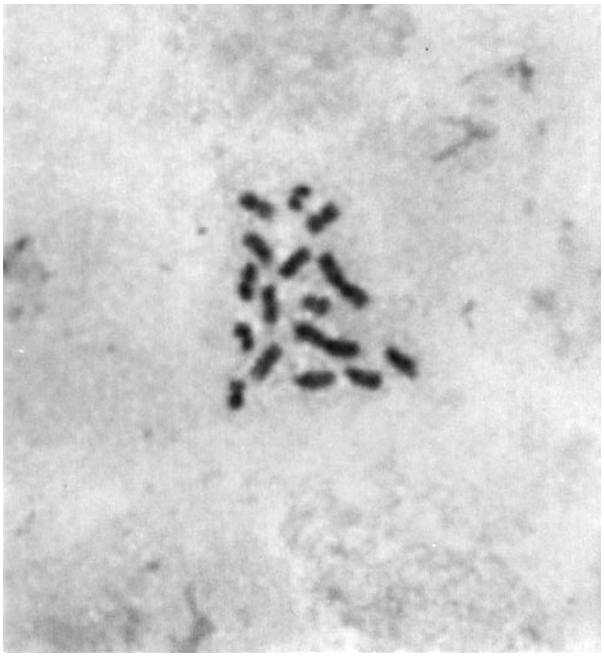


Fig. 2. Diploid cell at metaphase. Testes of male pupa from nest sample BC22 (Dungeness).

they serve to illustrate how intraspecific variation in external morphology can cause the different frequency distributions of a taxonomic character to overlap between taxa. As a consequence, the distinction between a minority of individuals belonging to morphologically similar *Leptothorax* (*Myrafant*) taxa can become blurred, and it may be necessary to examine several specimens from a nest, and several taxonomic characters, in order to obtain a secure identification. For example, twenty-three (28%) of the *L. rougeti* and *L. tuberointerruptus* workers examined here have a mean spine length between the *L. rougeti* (nest sample D195) minimum of 0.085 mm and the *L. tuberointerruptus* (BC nest samples) maximum of 0.105 mm, and twenty-four (29%) have a gaster banding score of 2 combined with a spine curvature score of either 1 or 2 (Tables 2 and 3). However, only ten (12%) of the examined workers belong to both of these overlapping groups.

These observations, and the lack of a significant difference between the mean spine lengths of nest sample D195 (*L. rougeti*) and BC16 (*L. tuberointerruptus*), demonstrate that a single morphological character considered in isolation can be unreliable for distinguishing between *L. tuberointerruptus* and *L. rougeti*. They also emphasize the need to use a combination of characters to identify some *Leptothorax* (*Myrafant*) taxa (see also Douwes & Stille, 1991).

The conclusion that all BC nest samples are *L. tuberointerruptus* confirms the presence of this ant in Britain. In addition, the BC nest sample data show not only that *L. tuberointerruptus* is present at British localities from which *L. tuberum* has been recorded, but also that *L. tuberointerruptus* is found throughout the British range attributed to *L. tuberum*. In the absence of data confirming *L. tuberum* as a British species, it is reasonable to assume that *L. tuberointerruptus* has been recorded in error as *L. tuberum* in Britain, and that all British *L. tuberum* records are in fact records of *L. tuberointerruptus*.

Table 2. Worker mean propodeal spine length for nest sample D195 (*L. rougeti*) and the BC nest samples, listed in order of decreasing mean value. Mean values bearing different letters are significantly different (Spjotvall & Stoline Test; $P < 0.05$)

Nest sample	*n*	Min (mm)	Max (mm)	Mean (mm)
D195	11	0.085	0.130	0.103 a
BC16	6	0.080	0.105	0.089 ab
BC4	6	0.070	0.095	0.083 b
BC5	6	0.080	0.095	0.083 b
BC29	6	0.080	0.085	0.081 b
BC21	6	0.070	0.095	0.079 b
BC18	6	0.070	0.085	0.079 b
BC26	6	0.065	0.090	0.078 b
BC22	6	0.070	0.080	0.075 bc
BC19	6	0.060	0.090	0.072 bc
BC3	6	0.055	0.080	0.072 bc
BC17	6	0.050	0.065	0.058 c
BC25	6	0.040	0.070	0.057 c

The recognition of Leptothorax albipennis *as a senior name for* Leptothorax tuberointerruptus

Leptothorax tuberointerruptus and *L. tuberum* are discrete species. *Leptothorax tuberointerruptus* is present in Britain (where it has been misrecorded as *L. tuberum*), but *L. tuberum* is probably absent. Consequently, the specific name *albipennis*, which is currently recognized as a junior synonym of *tuberum*, may be a senior synonym of *tuberointerruptus*. From Bolton (1995b) current synonymy of *tuberum* includes three names which predate *tuberointerruptus* (i.e. are pre-1918):

tuberosa Latreille, 1802: 259. FRANCE. Incorrect subsequent spelling of *tuberum*.
albipennis Curtis, 1854: 218. GREAT BRITAIN.
melanocephalus Emery, 1870: 197. FRANCE: Corsica.

The *albipennis* types (two workers, two males) were beaten from a privet hedge behind Shakespeare Cliff, Dover, Kent, by John Curtis in July 1852 (Curtis, 1854 and unpublished diaries). Curtis named and described them as *Stenamma albipennis*, despite his doubts about their being *Stenamma* (Curtis, 1854 and pencilled note in his diaries). They were subsequently recognized as belonging to the genus *Leptothorax* Mayr, with Donisthorpe (1915: 154, 162) and Emery (1922: 256) treating *Stenamma albipennis* as a junior synonym of *L. tuberum*.

With all British records of *L. tuberum* assumed to be records of *L. tuberointerruptus*, and as the *albipennis* type-locality is Great Britain, it follows that *albipennis* may be the first available specific name for *L. tuberointerruptus* (B. Bolton, personal communication). To allow investigation of this situation the *albipennis* types were kindly loaned by the

Table 3. Propodeal spine curvature and gaster banding scores for workers from nest sample D195 (*L. rougeti*) and the BC nest samples. Mean scores are the sum of each sample's scores divided by the number of assessed workers in that sample.

Nest sample	Specimen	Curvature score	Banding score	Mean worker score	Nest sample	Specimen	Curvature score	Banding score	Mean worker score
D195	1	3	2	4.2	BC18	1	1	1	2.2
	2	3	2			2	1	1	
	3	2	2			3	1	2	
	4	2	2			4	1	1	
	5	1	2			5	1	1	
	6	2	2			6	1	1	
	7	1	2						
	8	3	2		BC19	1	1	1	2.5
	9	2	2			2	1	1	
	10	2	2			3	2	1	
	11	3	2			4	1	2	
						5	1	1	
BC3	1	1	2	2.3		6	1	2	
	2	1	1						
	3	1	1		BC21	1	1	1	2.2
	4	1	1			2	1	1	
	5	1	2			3	1	1	
	6	1	1			4	1	1	
						5	1	2	
BC4	1	2	1	2.7		6	1	1	
	2	1	1						
	3	1	1		BC22	1	1	1	2.3
	4	2	1			2	2	1	
	5	1	2			3	1	1	
	6	1	2			4	1	1	
						5	2	1	
BC5	1	1	1	2.2		6	1	1	
	2	1	1						
	3	1	1		BC25	1	1	1	2.5
	4	1	1			2	1	2	
	5	1	2			3	1	2	
	6	1	1			4	1	1	
						5	1	1	
BC16	1	1	1	2.2		6	1	2	
	2	1	1						
	3	1	1		BC26	1	1	1	2.3
	4	1	1			2	1	1	
	5	2	1			3	1	1	
	6	1	1			4	2	1	
						5	1	1	
BC17	1	1	2	2.7		6	2	1	
	2	1	1						
	3	1	1		BC29	1	1	1	2.7
	4	1	2			2	2	1	
	5	1	2			3	2	1	
	6	1	2			4	1	1	
						5	1	1	
						6	2	2	

Museum of Victoria, Australia, for examination by the author. They were examined for morphological characters which could identify them as, or distinguish them from, *L. tuberointerruptus*, *L. tuberum*, *L. nylanderi*, or *L. interruptus*, and were compared with *L. tuberointerruptus* material from the BC nest samples discussed above.

Workers. Both *albipennis* workers have straight, diverging propodeal spines of medium length (0.07 mm, 0.07 mm, 0.09 mm, the fourth is broken), and lack a metanotal groove. The front of the dorsal surface of the tops of their heads is darker in colour than the back, and their antennal clubs are darker in colour than the remainder of the funiculus. The dark

banding on their first gastral tergites widens laterally. It is more diffuse, and narrows more noticeably towards the middle on the specimen with the broken spine. The spine characteristics, lack of a metanotal groove, darkened antennal clubs, and the particular head and gaster colouration seen in the *albipennis* workers, are also seen in BC nest sample specimens.

Males. The *albipennis* males lack propodeal spines. Despite stout, and somewhat bulbous, second antennal segments, their antennal segments two to five are longer than they are broad. Their wings have a covering of hairs and a 'smoky' appearance. These characters match those of BC nest sample males.

Assuming that the *albipennis* types all belong to the same species, their characters described here show that they are best determined as the same species as the BC nest samples, for not only do these characters match those of the BC nest samples, but they also separate the *albipennis* types from the three currently recognized British *Leptothorax* (*Myrafant*) species, *L. tuberum*, *L. nylanderi* and *L. interruptus*. This follows because the top of the head of *L. tuberum* workers is generally uniformly coloured, also the wings of *L. tuberum* males appear clear (L. Plateaux, personal communication): *L. nylanderi* workers have a metanotal groove and their antennal clubs are similar in colour to the rest of the funiculus (Bolton & Collingwood, 1975: 5, Fig. 33; Kutter, 1977: 104, Fig. 249; Collingwood, 1979: 69, Fig. 96): *L. interruptus* workers have curved pronotal spines (Kutter, 1977: Fig. 233; Collingwood, 1979: 69) which are longer than those of the *albipennis* types (for mean propodeal spine length of *L. interruptus* workers, max. = 0.17 mm, min = 0.105 mm, $n = 21$, representing at least five nests from four localities, Orledge, unpublished data), also *L. interruptus* males have distinct propodeal spines (Collingwood, 1979: 70) and segments two to five of their antennae are not longer than broad (Kutter, 1977: Fig. 216; Collingwood, 1979: 70).

It is clear, then, that *albipennis* and *tuberointerruptus* are taxonomic synonyms and that *albipennis* is the senior. Moreover, *albipennis* appears to be the first available specific name for *L. tuberointerruptus*. Consequently, the valid name for the species hitherto referred to as *L. tuberointerruptus* is *L. albipennis*, and the previous listing of *albipennis* as a junior synonym of *tuberum* is seen to be erroneous. In addition, *L. albipennis* should replace *L. tuberum* as a British species.

It follows that *L. albipennis* is a scarce British ant, provisionally designated by Falk (1991) as of 'Notable A' conservation status (i.e. estimated as occurring in sixteen to thirty post-1970 10 km squares of the British National Grid, Falk, 1991). During recent years it has been recorded from several new localities in England and Wales (Orledge, unpublished thesis, 1995) and is currently known from thirty-eight post-1970 10 km squares on mainland Britain (Fig. 3). Consequently it is now better categorized as 'Notable B' (i.e. estimated as occurring in thirty-one to 100 post-1970 10 km squares of the British National Grid, Falk, 1991). It can be abundant and, although the size and extent of its smaller populations, including the most northerly, are unknown, its continued presence in Britain does not appear to be threatened.

Leptothorax albipennis reaches the northern limit of its current distribution on mainland Britain, where it is geographically isolated from the *Leptothorax* (*Myrafant*) species, *L. nigriceps* and *L. unifasciatus*, with which it hybridizes on the continent (Fischer, unpublished thesis, 1987; Douwes & Stille, 1991; see also Plateaux, 1984). Except at Dungeness, Kent, where *L. interruptus* is also found, *L. albipennis* is not known to occur on mainland Britain in association with other *Leptothorax* (*Myrafant*) species.

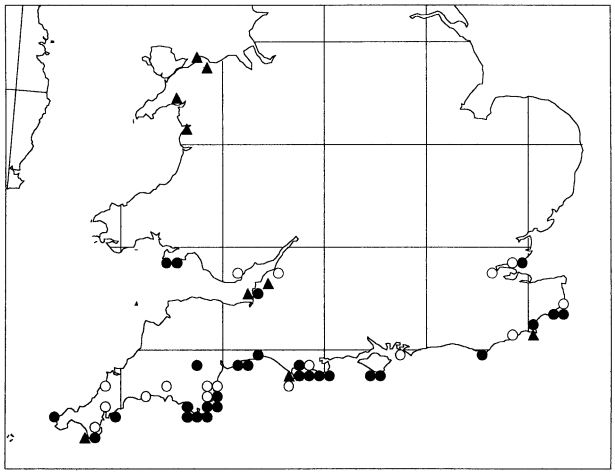


Fig. 3. The known distribution of *Leptothorax albipennis* (= *tubero-interruptus*) on the British mainland, 31 March 1997. This map has been compiled from all 19th and 20th century records for which the locality is known. Each symbol covers a 10 km square of the British National Grid from which *L. albipennis* has been recorded. Most records are from coastal sites. Open circles cover squares which hold only pre-1970 records. Filled circles and triangles cover squares which hold post-1970 records. Filled triangles cover the squares from which the BC nest samples were collected.

Worker and male specimens from each BC nest sample discussed in this paper, also female specimens from some of these samples, have been deposited in the Natural History Museum, London.

Leptothorax albipennis (Curtis), **sp.rev.**

Stenamma albipennis Curtis, 1854: 218. Syntype workers (2) males (2), GREAT BRITAIN: Kent, Dover, Shakespeare Cliff (*J. Curtis*) (Museum of Victoria, Australia) (examined). Previously synonymised with various *Leptothorax* species; see Bolton, 1995b: 235 for details. **sp.rev.**

Myrmica unifasciata Latreille, 1802: 257 *sensu* Nylander 1856:92 (misidentification).

Myrmica nylanderi Foerster, 1850: 53 *sensu* Smith, 1858:120 (misidentification).

Leptothorax tuberointerruptus Bondroit, 1918: 126. Worker type (1), SWITZERLAND: Savoie (depository unknown). First available use of *tuberointerruptus* Forel, 1874: 86, *nomen nudum*, and Forel, 1915: 24, unavailable name. **syn.n.**

Leptothorax tuberum Fabricius, 1775: 393 *sensu* Donisthorpe, 1915: 162 (misidentification).

Leptothorax interruptus var. *tuberointerruptus* Bondroit: Novak & Sadil, 1941: 93 (change of status).

Leptothorax tuberointerruptus Bondroit: Seifert, 1993: 22.

Revived status as species; previously implied by Plateaux, 1984, Fischer, unpublished thesis, 1987, Douwes & Stille, 1991.

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