

**REPORT ON A SURVEY
OF THE PILL MILLIPEDE
TRACHYSPHAERA LOBATA (RIBAUT, 1954)
IN THE BEMBRIDGE AREA OF
THE ISLE OF WIGHT**

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The photographs of live *Trachysphaera lobata* were taken by Steve Hopkin who kindly gave permission for their use in this report.

Summary

1. Field work undertaken in January 2005 confirmed the continued existence of a population of the pill millipede, *Trachysphaera lobata*, at East Cliff in Bembridge on the Isle of Wight. The population appeared to be confined to an area of less than 10 000m² within a narrow belt of coastal, sycamore woodland.
2. Standardised soil samples appeared to show a significant decline in the estimated population density of the millipede over 21 years. Both the 1984 and 2005 estimates were based on samples from pockets of sandy soil that were considered most suitable for the species. As large areas of the site were considered unsuitable the actual population density will be significantly less than the estimates of 2377 to 3313 individuals per cubic metre of soil obtained in 2005 and the estimate of 5600 individuals per cubic metre made when the millipede was first discovered at East Cliff in 1984.
3. Analysis of a sample of 54 live millipedes revealed a male to female sex ratio of 1:3. The male *Trachysphaera lobata* collected in this sample are the first male specimens to be found in the UK. The species had previously been assumed to be parthenogenetic at East Cliff. The sample also included some immature animals in the oldest two or three stadia. This suggests that the population is still in a healthy state.
4. Wave action was found to be eroding the woodland at an estimated rate of 0.33m per annum. The population of *Trachysphaera lobata* is not in imminent danger of extinction from habitat loss but the long term survival of the species is unlikely when such a narrow strip of woodland is being removed at this rate.
5. Other threats to the habitat at East Cliff were identified. This included offshore gravel extraction, tree felling and other site management activities, dumping of garden waste, fire and cliff slumping.
6. Recommendations were made to address these threats and to promote the long term survival of *Trachysphaera lobata* as a UK species.

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1. Introduction

Trachysphaera lobata (Ribaut, 1954) is a small, white pill millipede approximately 4mm in length and less than 2mm in breadth (Figure 1). It is presumed to be calcicolous based on the evidence of French records from over a dozen locations in the western half of the country. Most of these records involve specimens collected from caves but the millipede has also been found in woodland litter and in a quarry (Kime, 2001). Outside of France the only records of *Trachysphaera lobata* are those from Bembridge on the Isle of Wight. Its occurrence here would seem to fit with its Atlantic distribution in Europe and there is no reason to suppose it is not native to Britain.

Specimens of *Trachysphaera lobata* were first collected from East Cliff at Bembridge (40/648888) in June 1984 by Dick Jones and Andy Keay. Whilst sieving sandy soil in a narrow, coastal belt of mainly sycamore woodland they found the millipede at a density of up to 28 per 0.005m³ (Jones & Keay, 1986). These high densities were only achieved when selectively sampling the most suitable pockets of sandy soil within the much more extensive clay underlying the site. They also reported finding a second site for *Trachysphaera lobata* at the Duver (40/637892) in September 1984. This record has since been recognised as an error but the millipede was found subsequently in an area of scrub close to Bembridge Harbour, a few hundred metres west of the East Cliff site. However, the scrub was later cleared and the site developed resulting in the loss of the millipede population.

The original description of *Trachysphaera lobata* relies heavily on male characters to separate it from *Trachysphaera pyrenaica* (Ribaut, 1907) but no male specimens were found at Bembridge. The identification had to be based on somatic characters as given in Demange (1981) and specimens were also examined by J-P. Mauriès of Paris Museum. Until male specimens are collected and examined there remains the possibility that the Bembridge population consists of another species from the genus *Trachysphaera* or at least a parthenogenetic form of *T. lobata*, something not known in the French populations.

Trachysphaera lobata was given the status RDBK: Insufficiently Known by Bratton (1991) on the basis that it may still be discovered at other locations in southern England. Although it has been searched for since in other locations, East Cliff remains the only known British site which supports a population of *Trachysphaera lobata*. Since its original discovery Andy Keay has visited the Bembridge site on further occasions, sometimes accompanied by other workers. Over this period he has noted the continued erosion of the woodland belt by wave action. In August 2004 he spent three days sampling approximately 1m³ of soil from the East Cliff site and found only two specimens of *Trachysphaera lobata*. A further four days, later in the year, produced nothing (Keay, 2004). Fears for the continued survival of *Trachysphaera lobata* in Britain led the British Myriapod and Isopod Group (BMIG) to contact both BUGLIFE and English Nature (EN). As an initial stage in any plan to conserve the millipede, EN agreed to contribute to the cost of four fieldworkers to assess the current status of the East Cliff site, to assess the size and range of the remaining population of *Trachysphaera lobata* and, time permitting, to survey other potential locations for the species.

2. Methods

A two stage approach was planned for the fieldwork at East Cliff. The initial aim was to try and find specimens of *Trachysphaera lobata* at its original site. If this was successful then the population density and the extent of the species' distribution within the site would be assessed.

Fieldwork took place at East Cliff on 6th and 7th January 2005. A total of 22 man hours were spent in sampling the site. Each sample comprised a standardised volume of 400 cm³ of soil and litter either dug out with a small trowel or removed as a core with a bulb planter. Where there was sufficient depth of soil, successive samples were taken from deeper within the same hole. The soil samples were passed through a sieve and the fine material passing through the mesh was examined in the field (Figure 2). The number of individuals of *Trachysphaera lobata* in each sample was recorded. The original location at OS grid reference 40/648888 had been totally eroded but sampling commenced on the woodland edge at 40/64858871, as close as possible to the original site. Once the presence of the species had been established further samples were taken across the woodland from the shore to the base of the marl cliff, a maximum distance of 50m, and along the length of the woodland, approximately 300m in each direction. There was no attempt to randomise the samples and the field workers soon came to recognise the sandy, humus rich soils that were most likely to support the millipede. In addition to the target species, all other species of myriapods and isopods in the samples were recorded.

Further locations were visited on 7th and 8th January 2005. The aim of these visits was to assess the potential of the sites as habitat for other populations of *Trachysphaera lobata*. Each site was assessed on the basis of visible soil characteristics and non-standardised hand searching for *Trachysphaera lobata* was carried out.

3. Results from East Cliff

3.1 Site description

The habitat at East Cliff consists of a narrow belt of semi-natural deciduous woodland (Figure 3) dominated by sycamore (*Acer pseudoplatanus*) with some ash (*Fraxinus excelsior*) and turkey oak (*Quercus cerris*). The ground flora is dominated by mats of ivy (*Hedera helix*), nettle (*Urtica dioica*) and various grass species with some bramble (*Rubus fruticosus* agg.), dog's mercury (*Mercurialis perennis*) and fern species (Figure 4). The woodland stretches for approximately 800m along the foot of an unconsolidated cliff approximately 7m high that faces roughly north north east. The woodland belt has a maximum depth of approximately 50m before ending in a wave eroded cliff between one and two metres high at the top of the beach (Figure 5). Especially towards either end of the woodland there are increasing amounts of human disturbance with gardens and buildings reaching down to the shore. A public footpath through the site has been closed for safety reasons as erosion has generated a significant hazard from falling trees. The path is blocked in places where such trees have not been cleared.

The whole site is underlain by Bembridge limestone which outcrops approximately 30m offshore as low rock ledges. This is overlain by Bembridge Marls which form the platform on which the woodland grows. The cliff behind the woodland is a raised beach formed during the Ipswichian period. Sands and gravels eroded from the cliff cover the marls to varying depths (Figure 6) and have created pockets of lighter soils within the heavy clay.

3.2 Findings

The number of samples taken and the number of specimens of *Trachysphaera lobata* they produced are shown in Table 1. The highest densities of the millipede were found close to the original site for the species and slightly to the east of it. The density declined east and west of this with no specimens found east of grid reference 40/64958866 or west of 40/64768871. On this evidence the *Trachysphaera lobata* population at East Cliff is confined to a 200m length of woodland with an area of less than 10 000m².

Table 1: Numbers of *Trachysphaera lobata* collected from sampling locations at East Cliff

Grid reference	40/647887	40/648887	40/649886	40/651885
No. of samples	19	40	14	8
No. of specimens	2	53	22	0

Within this area of woodland the population is not evenly distributed. The number of animals found within a 400cm³ sample of soil varied from 0 in most of the samples to 11 in one. This patchiness of distribution appeared to be related to the nature of the substrate. *Trachysphaera lobata* was only found in pockets of humus rich, sandy soil with or without coarser pebbles. It was absent from any samples of clay soil and from samples taken from slumps at the base of the unconsolidated cliff where the soil was often sandy but lacked any organic material. No specimens were found in the litter

layer and Jones and Keay (1986) have already noted that the millipede appeared to be most abundant at a depth of about 15cm. Even where the substrate appeared suitable many samples failed to produce any specimens.

Full species lists of the other myriapods and isopods found at East Cliff are given in Appendix 1. However it is worth noting here that the isopod *Haplophthalmus danicus* was often found in association with *Trachysphaera lobata*. Where numbers of *Trachysphaera lobata* declined towards the edge of its range the centipedes *Henia vesuviana* and *Cryptops anomalans* appeared more abundant. No attempt was made to confirm these relationships and it may be worth following up these observations with quantitative studies in the future.

4. Results from other sites

4.1 Bembridge Harbour

The “lost” *Trachysphaera lobata* site at Bembridge Harbour (Grid reference 40/643887) was visited on 7th January 2005. A modern holiday home development now occupies the site (Figure 7) and where bare soil still exists it has been improved in beds in the ornamental gardens. Six standardised soil samples (400cm³ each) were taken but no specimens of *Trachysphaera lobata* were found. It must be assumed that the population of *Trachysphaera lobata* that previously existed on this site is now extinct.

4.2 Priory Woods

Priory Woods, crossing the boundary of the parish of Nettlestone and Seaview and the parish of St Helens (Grid references 40/634902 to 40/635900), was visited on 7th January 2005. A total of 8 man hours were spent searching the site but no populations of *Trachysphaera lobata* were located. This is an area of semi-natural deciduous woodland on a cliff top facing the sea to the east. The whole woodland is underlain by heavy clay with very few, very small pockets of other soils. The woodland has a deep litter layer which helps to create some areas of more friable soil but generally the soil is not humus rich. As *Trachysphaera lobata* is apparently absent from the litter layer at East Cliff it is unlikely the species is present, even in the more friable pockets of soil, at Priory Woods.

4.3 Hillway Woods

A cursory visit was made to Hillway Woods along Sandown Road, Bembridge (Grid reference 40/637870) on 7th January 2005. This is an area of semi-natural deciduous woodland on heavy clay soils. No specimens of *Trachysphaera lobata* were found and due to the nature of the soil the site was deemed unsuitable for further survey.

4.4 Centurion’s Copse

Centurion’s Copse, west of Bembridge Airport, (Grid reference 40/621868) was visited on 8th January 2005. A total of 1man hour was spent assessing the site but no specimens of *Trachysphaera lobata* were found. This is a relatively large woodland complex consisting mostly of semi-natural deciduous woodlands in valley bottoms. Tree species present are mainly hazel (*Corylus avellana*) and ash (*Fraxinus excelsior*) with some oak (*Quercus robur*). The ground flora is dominated by ivy (*Hedera helix*) but also with ferns as in the East Cliff area. The nature of the substrate varies and includes some clay but there are also deep alluvial soils in places. Generally the soils appear to be loamy and friable rather than claggy clays. There is a deep humus layer in places but also a couple of chalky outcrops and several areas with flints. Although the soils do not have such a high sand content as at East Cliff, the humus content is high. This site is probably worthy of a more intensive survey, especially bearing in

mind the patchiness of *Trachysphaera lobata* in its East Cliff site and the varied nature of the soils at Centurion's Copse.

4.5 Bembridge Down

Bembridge Down was visited on 8th January 2005. A total of 4.5 man hours were spent assessing an area of scrubby deciduous woodland around disused chalk pits below Bembridge Fort (Grid reference 40/624863) and an area of scrubby deciduous woodland near Glover's Farm (Grid reference 40/630860). These semi natural woodlands are on the steep, north-facing slopes of Bembridge Down. Although well drained and friable the soils are thin and lacking in humus. No specimens of *Trachysphaera lobata* were found and due to the nature of the soil the site does not merit further survey effort.

4.6 Bembridge Lodge

The woodland complex on the western fringe of Bembridge and north of Bembridge Lodge (Grid reference 40/638879 to 40/641883) was visited on 8th January 2005. A total of 4 man hours were spent on the site but no specimens of *Trachysphaera lobata* were found. These semi-natural deciduous woodlands sit on the eastern edge of the River Yar flood plain and on the base of the slopes above it. The alluvial soils of the floodplain are humus rich but probably too wet to support a population of *Trachysphaera lobata*. The woodlands on the slopes have drier but mainly clay soils. It is possible that pockets of sandy soil exist in a similar mosaic to those at nearby East Cliff but they were not located during this fieldwork. It is probably not worth spending future resources in a more intensive survey of this site.

5. The population of *Trachysphaera lobata* in the UK

Based on the figures given in Table 1, 77 specimens of *Trachysphaera lobata* were collected from 81 soil samples at East Cliff. This gives an estimated population density for the East Cliff woodland of 2377 individuals per cubic metre of soil. However this figure significantly over estimates the population size as it is based on samples selected from pockets of sandy soil considered the most likely to support the species. Most of the woodland soils were clays unlikely to provide suitable conditions for the millipede. Using similarly selective techniques, Jones and Keay (1986) quoted a figure equivalent to 5600 individuals per cubic metre for the population density in 1984. This higher figure referred to a restricted area of the woodland, towards the centre of the range of the millipede as determined by this study. The population density might be expected to be higher here than on the fringes of the distribution and hence would also be expected to be higher than for the site as a whole. If only the samples taken from the area around the original site are used, i.e. those for grid reference 40/648887, the estimated population density in 2005 is 3313 individuals per cubic metre. This is still significantly lower than the 1984 estimate and in any case exaggerates the overall density as most samples were taken from potentially suitable pockets of sandy soils rather than the ubiquitous clay at the site. Although these estimates have value in determining relative changes in the population, a set of truly random samples would be necessary to produce an estimate of absolute population density and population size at East Cliff.

A sample of 54 specimens of *Trachysphaera lobata* was removed from East Cliff for further study of the population structure. In view of the estimates of population density obtained in the field work, the removal of this sample was not considered detrimental to the survival of the millipede at East Cliff. The results of analysis of the sample are shown in Table 2. Only 14 of these specimens were not adult and all of these were from the two oldest immature stadia. The presence of immature stadia indicates there is a healthy breeding population maintaining recruitment. The relatively small proportion of the sample represented by these stadia and the apparent absence of younger stadia are likely to be artefacts resulting from the small size of younger animals. The smallest specimens collected were just 0.8mm in diameter when enrolled. Such small individuals are very difficult to see in the field and a true picture of population structure could only be obtained by collecting soil samples for extraction of animals under laboratory conditions.

The sample contained 40 animals that were either fully mature or were mature enough to be sexed. Surprisingly, eleven of these specimens were male. Although it had been assumed that *Trachysphaera lobata* must be parthenogenetic in the UK, the 3:1 sex ratio of females to males in this sample suggests otherwise. Analysis of the sample also suggests that, in line with many other species of millipede, the males are on average smaller than the females. However, this difference does not appear to be so significant as to result in an under representation of the male sex in the sample.

Table 2: Analysis of *Trachysphaera lobata* population sample removed from East Cliff

Apparent no. of tergites	No. of leg pairs	Max. width of tergite 2 (shield) in mm	Max. diameter* of enrolled animal in mm	Sex / stage	Comments
9	8	0.6	0.8	0	
9	8	0.6	0.8	0	
10	11	0.6	1.0	0	
10	11	0.7	1.0	0	
10	11	0.7	1.0	0	
10	11	0.7	1.0	0	
10	11	0.7	na	0	Dead specimen - not possible to measure diameter
10	11	0.7	0.9	0	
10	11	0.8	1.1	0	
10	11	0.8	1.1	0	
10	11	0.8	1.1	0	
10	11	0.8	1.1	0	Ocelli in single row on each side
10	11	0.8	1.1	0	
10	11	1.0	na	0	Dead specimen - not possible to measure diameter
11	17	0.9	1.4	f	
11	17	0.9	1.4	f	
11	16	1.1	1.5	m	?subadult
11	16	1.1	1.7	m	?subadult
11	17	1.1	1.7	f	
11	16	1.2	1.7	m	
11	16	1.2	1.7	m	
11	16	1.2	1.7	m	
11	16	1.2	1.7	m	?subadult
11	17	1.2	1.9	f	
11	17	1.2	1.9	f	
11	16	1.2	1.9	m	
11	17	1.2	2.0	f	
11	17	1.3	2.1	f	
11	16	1.4	2.0	m	
11	17	1.4	2.1	f	
11	17	1.4	2.1	f	Dead specimen
11	16	1.4	2.1	m	
11	17	1.4	2.1	f	Ocelli in single row on each side
11	17	1.4	2.2	f	
11	17	1.4	2.2	f	
11	16	1.5	2.1	m	
11	16	1.5	2.2	m	
11	17	1.5	2.3	f	
11	17	1.5	2.3	f	
11	17	1.5	2.3	f	
11	17	1.5	2.4	f	
11	17	1.6	2.2	f	
11	17	1.6	2.3	f	
11	17	1.6	2.4	f	
11	17	1.6	2.4	f	
11	17	1.6	2.4	f	
11	17	1.6	2.4	f	
11	17	1.6	2.5	f	Ocelli only pigmented on right of head

Apparent no. of tergites	No. of leg pairs	Max. width of tergite 2 (shield) in mm	Max. diameter* of enrolled animal in mm	Sex / stage	Comments
11	17	1.6	2.5	f	
11	17	1.6	2.5	f	
11	17	1.7	2.3	f	
11	17	1.7	2.6	f	
11	17	1.7	2.6	f	
11	17	1.8	2.5	f	

Notes

All measurements were taken using a stage micrometer at x50 magnification.

*Maximum diameter was measured from the ridge on tergite 4 to the ridge on tergite 7, 8 or 9 (depending on total number of tergites) with the animal in lateral view.

Except where stated otherwise all specimens, even the smallest, had the ocelli arranged as a vertical row of 3 to 6 with a single ocellus posterior at the upper end of the row.

Twenty of the individuals from the sample were preserved in 70% IMS. Half of these will be deposited with the BMNH and the others will be kept in the BMIG collection currently being established in the BENHS rooms at Dinton Pastures, Reading. Ten of the remaining live specimens were sent to Dr Steve Hopkin at the University of Reading but these died in transit as a result of damage to the packaging by Post Office workers. These specimens have also been preserved. A further three live specimens were successfully despatched to Dr Hopkin. These have been photographed and are now being maintained as a potential breeding colony by Dr Hopkin. The remaining live specimens are being maintained as a separate captive colony by one of us (PL).

At this point in time it is still assumed that the species at East Cliff is *Trachysphaera lobata*. The collection of the first male specimens from the site will enable further taxonomic studies to confirm the species identity on the basis of the male characters described by Ribaut (1954).

6. Threats

Although there still appears to be a healthy population of *Trachysphaera lobata* at East Cliff, there is quantitative evidence of a decline in population density over a 20 year period. There is also some evidence, both qualitative and quantitative, of a number of factors affecting the site that are likely to be detrimental to the survival of the species. These factors are discussed in more detail below.

6.1 Coastal erosion

From knowledge one of the authors (ANK) has of the original *Trachysphaera lobata* site, it is clear that this site has been totally removed by coastal erosion. A large lump of concrete that remains isolated on the beach in 2005 (Figure 8) was still within the woodland boundary in 1984. From clues such as this it is estimated that the site has eroded approximately 5m in 15 years, equivalent to a rate of 0.33m per annum. Independent reports on the erosion of this section of the coast indicate that sediment is being moved from Foreland, approximately 1.5 km south east of East Cliff, to Bembridge Point, approximately 1km north west of East Cliff. These reports also estimate the rate of coastal recession between Foreland Fields and the Bembridge Lifeboat Station (the stretch of coastline immediately to the south east of East Cliff) to be between 0.25 and 0.33m per annum. These estimates are very similar to our own. Assuming the width of the site is 50m and that the rate of erosion remains constant, this suggests that the woodland at East Cliff will have completely disappeared in 150 years. *Trachysphaera lobata* is likely to disappear from the site long before this as much of the woodland belt is considerably narrower than 50m and the millipede population is not evenly distributed throughout the woodland. As the soils towards the base of the unconsolidated cliff lack the humus content that *Trachysphaera lobata* appears to need, its habitat will have disappeared well before the last few trees fall into the sea.

6.2 Offshore dredging

Whilst undertaking the field work there was dredging work being carried out on Bembridge Point (Figure 9). The material was being extracted for commercial use in the aggregates industry and was not being returned to the beach. This work has begun since the original discovery of *Trachysphaera lobata* at East Cliff and it is possible that continued extraction of material at Bembridge Point will increase erosion rates at East Cliff and further east along the coast.

6.3 Deforestation

Clearly trees are being lost at East Cliff through coastal erosion (Figure 10) but even before an individual tree finally topples there is a significant risk it will be felled on health and safety grounds by the site owner. There is evidence of trees on site that have already been felled. Notices closing the public footpath for safety reasons suggest that further felling is likely to be undertaken, possibly relatively soon in time for the 2005 tourist season. Loss of trees may affect *Trachysphaera lobata* in two ways. Firstly the reduction in canopy may lead to drying of the soil. Based on

observations of captive animals, this millipede seems to be less able to cope with drier conditions than the other species of pill millipede found in the UK. Secondly the loss of living trees will reduce the seasonal input of organic matter into the soil from leaf fall. Again, field observations suggest that high humus content is an essential characteristic of those soils that support *Trachysphaera lobata* populations.

6.4 Other management activities

Other forms of site management may be a threat to *Trachysphaera lobata* populations. Although there was little evidence of any specific threats at the time of the visit, it was noted that some coppicing had been undertaken in one area of the site and no specimens of the millipede were collected from sampling here. This area was towards the edge of the range of the species and management may not have been a significant factor affecting it here. However it could be presumed that coppicing would have a similar, though less marked, effect on soil humidity and humus levels to tree felling and therefore if carried out in areas where the population density was high could pose a significant threat.

6.5 Human disturbance

In addition to management activities already discussed there was evidence of other human activities on the site that could pose a threat to the *Trachysphaera lobata* population. The remains of fires, presumably from barbecues and beach parties, were seen both on the beach and at the woodland edge. Although fires set within the woodland may pose a direct threat to animals in the underlying soil, probably the most significant risk to the millipede is from the loss of habitat that would result if any fire spread to the trees and other vegetation. As with deforestation this would be likely to result in a reduction in soil humidity and organic matter that would make the site unsuitable habitat for *Trachysphaera lobata*.

There was also evidence that some dumping of garden waste, especially from properties built on the cliff slope, occurs. Such material has the potential to increase the humus content of the soils but it may also have detrimental effects through leaching of garden chemicals and the unknown response of *Trachysphaera lobata* to different litter types. The presence of relatively large mounds of dry waste may also increase any risk of fire spreading within the woodland.

6.6 Cliff slumping

There is clear evidence that slumping of the unconsolidated cliff behind the woodland at East Cliff occurs on a regular basis. A number of debris slopes are present and show different stages of colonisation by vegetation. Much of this material may become a suitable substrate to support *Trachysphaera lobata* once organic matter has been incorporated. However the development of a suitable soil from the freshly eroded cliff material is a long term process and in the short term cliff slumps bury any potentially suitable soils that have already developed at the base of the cliff. As the area of woodland remaining continues to be reduced by coastal erosion any loss of habitat due to cliff slumping becomes an increasingly significant risk to the remaining millipede population.

7. Recommendations

A concern that the extinction of *Trachysphaera lobata* within the UK was imminent was the stimulus for the field work that generated this report. This field work has shown that *Trachysphaera lobata* remains at risk of extinction as its only known habitat within the UK is threatened by a number of factors. However, it has also shown that loss of the population is not imminent and there is still time in which to take action to conserve the species.

- Previous attempts to establish ownership of the East Cliff site have been unsuccessful. Ownership does need to be established before any practical conservation measures can be implemented there. Recent notices at the site seemed to imply that the district council or some other local authority had some interest in the land but this needs to be researched and contact made with the land owner or their representative.
- At the very least the owner should be made aware of the importance of the site and should be encouraged to refrain from any management activities which may further threaten the survival of the species until a management plan for the site can be agreed.
- A site meeting should be arranged with the owner and relevant specialists (e.g. soft cliffs expert, coastal protection engineer, local EN staff, BMIG representative etc) to identify the issues affecting the site and how they can feasibly be dealt with. The aim should be to agree a management plan for the site that at least extends as long as possible the existence of the *Trachysphaera lobata* habitat.
- Any steps taken by the landowner will be voluntary until *Trachysphaera lobata* is assigned a protected status. The species is being proposed by BMIG for BAP Priority Species status in the current review and this process should be supported by EN and BUGLIFE. The species action plan will need to take account of any site management plan that is agreed but will also need to take a wider view of conserving the species once the East Cliff site is finally lost.
- As a priority, survey work for *Trachysphaera lobata* should be undertaken in other potential habitats. Centurion's Copse has been identified as one site worthy of further study and knowledge of the local geology is likely to produce other potential sites under less threat than East Cliff. It may also be worth considering looking at other places where the same rock type outcrops, for example on the west side of the Isle of Wight and in Dorset. If the species is found to exist elsewhere it would be sensible to devote resources to its conservation at a less vulnerable location.
- Conservation of *Trachysphaera lobata* at East Cliff and the identification of any other site where it may occur would be assisted by better knowledge of the precise habitat requirements of the species. In particular it seems likely that soil properties are a significant aspect of its ecology. Therefore, analysis of the soils at East Cliff combined with a survey of soils in the wider area should be

undertaken. Reference to the soils of the woodland sites in France where the species occurs may also be useful.

- As the East Cliff site continues to be eroded there is likely to be an increasing area of beach sand that is above high tide except under storm conditions. Such sand can develop a substantial humus component and supports a number of other species of myriapod and isopod. It would be useful to discover if such a habitat could also support a population of *Trachysphaera lobata*.

8. References

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Appendix 1: Species lists

Taxa	East Cliff 40/646887	East Cliff 40/647887	East Cliff 40/648887	East Cliff 40/649886	East Cliff 40/651885
Opiliones					
<i>Nemastoma bimaculatum</i>			•		
Pseudoscorpiones					
<i>Roncus lubricus</i>			•		
Isopoda					
<i>Androniscus dentiger</i>			•		
<i>Armadillidium vulgare</i>		•			
<i>Haplophthalmus danicus</i>			•		
<i>Oniscus asellus</i>	•		•	•	•
<i>O. asellus occidentalis</i>		•	•		
<i>Philoscia muscorum</i>	•	•	•		
<i>Porcellio scaber</i>	•	•	•		
<i>Porcellionides cingendus</i>		•	•		
<i>Trichoniscus pusillus</i>	•	•	•		
<i>Trichoniscus pygmaeus</i>			•		
Chilopoda					
<i>Brachygeophilus truncorum</i>	•				
<i>Cryptops anomalans</i>	•	•		•	
<i>Cryptops hortensis</i>	•	•	•		
<i>Geophilus osquidatum</i>	•	•	•	•	
<i>Haplophilus subteranneus</i>		•	•	•	
<i>Henia vesuviana</i>	•	•			
<i>Lithobius forficatus</i>		•			
<i>Lithobius melanops</i>		•			
<i>Lithobius microps</i>		•	•	•	
<i>Necrophloeophagus flavus</i>		•	•		
<i>Schendyla nemorensis</i>	•	•	•		
Diplopoda					
<i>Blanuilus guttulatus</i>			•		
<i>Brachychaeteuma melanops</i>	•		•	•	
<i>Brachydesmus superus</i>	•		•		
<i>Cylindroiulus latestriatus</i>	•				
<i>Cylindroiulus punctatus</i>	•	•	•		
<i>Glomeris marginata</i>		•	•	•	
<i>Nanogona polydesmoides</i>			•		
<i>Ophiodesmus albonanus</i>		•			
<i>Polydesmus angustus</i>	•		•		
<i>Proteroiulus fuscus</i>	•		•		
<i>Tachypodoiulus niger</i>			•		
<i>Trachysphaera lobata</i>		•	•	•	
Coleoptera					
<i>Bembidion litorale</i>			•		
<i>Nebria salina</i>		•			

Taxa	Bembridge Harbour 40/643887	Priory Woods 40/6390	The Duver 40/6389	Hillway Woods 40/637870	Centurion's Copse 40/621868
Isopoda					
<i>Androniscus dentiger</i>	•				
<i>Armadillidium vulgare</i>	•				
<i>Haplophthalmus danicus</i>	•	•			
<i>Ligia oceanica</i>		•			
<i>Oniscus asellus</i>	•		•	•	•
<i>O. asellus occidentalis</i>		•			
<i>Philoscia muscorum</i>	•	•	•	•	•
<i>Platyarthrus hoffmannseggi</i>	•				
<i>Porcellio scaber</i>	•	•	•	•	•
<i>Porcellionides cingendus</i>		•			
<i>Trichoniscus pusillus</i>	•	•	•	•	
<i>Trichoniscus pygmaeus</i>		•			
Chilopoda					
<i>Brachygeophilus truncorum</i>		•			
<i>Cryptops hortensis</i>	•				
<i>Haplophilus subteranneus</i>		•			
<i>Lithobius forficatus</i>		•			
<i>Lithobius melanops</i>				•	
<i>Lithobius microps</i>	•	•		•	
<i>Lithobius variegatus</i>		•		•	
<i>Schendyla nemorensis</i>	•	•			
Diplopoda					
<i>Brachychaeteuma melanops</i>		•			
<i>Brachydesmus superus</i>	•	•			
<i>Cylindroiulus latestriatus</i>	•				
<i>Cylindroiulus punctatus</i>		•		•	•
<i>Glomeris marginata</i>		•		•	•
<i>Nanogona polydesmoides</i>		•			
<i>Polydesmus angustus</i>			•		
<i>Proteroiulus fuscus</i>		•			

Taxa	Bembridge Down 40/624863	Glovers Farm 40/630860	Bembridge Lodge 40/638879	Bembridge Lodge 40/641883
Opiliones				
<i>Nemastoma bimaculatum</i>			•	
Isopoda				
<i>Androniscus dentiger</i>			•	
<i>Armadillidium vulgare</i>	•		•	
<i>Haplophthalmus danicus</i>			•	
<i>Oniscus asellus</i>	•			•
<i>O. asellus occidentalis</i>			•	
<i>Philoscia muscorum</i>	•	•	•	•
<i>Platyarthrus hoffmannseggi</i>	•			
<i>Porcellio scaber</i>	•		•	
<i>Porcellionides cingendus</i>			•	
<i>Trichoniscus pusillus</i>	•		•	
<i>Trichoniscus pygmaeus</i>	•			
Chilopoda				
<i>Brachygeophilus truncorum</i>			•	
<i>Cryptops hortensis</i>			•	
<i>Geophilus easoni</i>			•	
<i>Geophilus electricus</i>			•	
<i>Geophilus osquidatum</i>			•	
<i>Haplophilus subteranneus</i>			•	
<i>Lithobius forficatus</i>	•			
<i>Lithobius melanops</i>			•	
<i>Lithobius microps</i>	•		•	
<i>Lithobius variegatus</i>	•		•	
<i>Necrophloeophagus flavus</i>			•	
<i>Schendyla nemorensis</i>	•		•	
<i>Strigamia acuminata</i>			•	•
Diplopoda				
<i>Brachydesmus superus</i>	•		•	•
<i>Chordeuma proximum</i>			•	
<i>Cylindroiulus punctatus</i>				•
<i>Glomeris marginata</i>	•		•	
<i>Nanogona polydesmoides</i>	•			
<i>Polydesmus coriaceus</i>			•	•
<i>Proteroiulus fuscus</i>			•	
<i>Tachypodoiulus niger</i>	•			