On two species of Curculionidae (Col.) new to the Canary Islands. — Up to now only three species of *Mecinus* (*M. circulatus* (Marsham), *M. longiusculus* Boheman and *M. pascuorum* (Gyllenhal)) and five species of *Tychius* (*T. antoinei* Hustache, *T. colonnellii* Caldara, *T. depauperatus* Wollaston, *T. stephensi* Schönherr and *T. striatulus* Gyllenhal) have been recorded in the Canary Islands (Machado & Oromí, 2000, *Elenco de los Coleópteros de las Islas Canarias*, La Luguna).

Recently I have examined one specimen of *Mecinus variabilis* (Rosenhauer, 1856) from Tenerife: La Esperanza, 23.iii.1994, leg. Schön, coll. Borovec (Smidary, Czech Republic), and two specimens of *Tychius elongatulus* Desbrochers, 1897, also from Tenerife: Médano and Arenales de Guimar (Museum de Ciencias Naturales, Madrid). These two species of weevil are thus new to the Canary Islands.

Mecinus variabilis has a circummediterranean distribution and is usually found on *Plantago lagopus* L. (Sprick, 2001, *Weevil News* No. 10), a plant which is also recorded from all the Canary Islands, including Tenerife (Hansen & Sunding, 1993, *Sommerfeltia* **17**).

Tychius elongatulus has been reported from North Africa (except Morocco) and Iran, but nothing is known about its biology, although it is almost certain that the host is a species of Fabaceae, as in all other species of the genus (Caldara, 1990, *Memorie della Società Italiana di Scienze Naturali e del Museo Civico di Storia Naturale di Milano* **25**: 51–218). — R. CALDARA, Via Lorenteggio 37, 20146 Milano, Italy: *June 23rd*, 2007.

The response of Pterostichus melanarius (Illiger) (Col., Carabidae) to a summer riparian flood — On 21.vii.2007 I was able to observe an autochthonous assemblage of 585 mesophilous insects on improved grassland, rafted by flood water at the front of the first terrace above alluvium of the River Avon at Wick, Worcestershire (VC37, SO94 19m O.D.). They comprised Coleoptera (Carabidae, Staphylinidae, Cholevidae, Aphodiidae, Erirhinidae, Curculionidae), Hemiptera (Pentatomidae, Cydnidae, Lygaeidae, Miridae) and Hymenoptera (Formicidae). The carabid beetles *Amara aenea* (De Geer) and *Amara similata* (Gyllenhal) were the dominant species, together amounting to 305 individuals.

The insects were massed in an area where the flood water was some 33cms deep, through which the foliage of grasses of *Lolium perenne* L. and *Dactylis glomerata* L. penetrated. Many carabid beetles clung on to this foliage where it extended above water level, including 22 adult *Pterostichus melanarius* (Illiger). The behaviour of this species was of some interest, all of the individuals adopting a downward position on the grass foliage some two to three cms below the water surface. Periodically, every minute or so, they would reverse upwards, and largely expose the abdomen to the air before resubmerging, presumable to minimise the effect of hydration and to respire.

Both the *Pterostichus* and many of the *Amara* specimens preferred temporary submersion in this way, rather than dispersion to dry land only one metre or so distant, where they could have made easy pickings for predatory animals. It may also have been a seasonal response strategy, for in winter floods the grass foliage would have been unavailable. – P.F. WHITEHEAD, Moor Leys, Little Comberton, Pershore, Worcestershire WR10 3EH: U.K.: *August 23rd*, 2007.

OBSERVATIONS ON THE LARVAL ECOLOGY OF THE STAG BEETLE *LUCANUS CERVUS* (L., 1758) (COL., LUCANIDAE) IN ENGLAND

BY PAUL F. WHITEHEAD

In recent years the Stag Beetle *Lucanus cervus* (L.) has been the subject of concerted interest in Britain. A survey organised by the People's Trust for Endangered Species in 1998 produced over 10,000 records (Hawes, 1998; Robb, 2001). Pratt (2003) produced a detailed overview, and found that the larval stage may endure from three to seven years, in accord with the wide range of variation in larval longevity of many xylophilous scarabaeoid beetles. Harvey & Gange (2003) provided an instructive paper on the larval ecology of *L. cervus*.

NEW EVIDENCE FROM WORCESTERSHIRE

The entomofauna of Bredon Hill in Worcestershire is moderately well-known. Its Coleoptera have been studied by Whitehead (e.g. 1992, 1996) and during the 1990s Dr P. Skidmore worked on Diptera collected from Malaise Traps set by English Nature. Rumoured larval Stag Beetles *L. cervus* from this site, have, up to now, all proved to be large larvae of the Lesser Stag Beetle *Dorcus parallelipipedus* (L.). It was therefore a surprise to learn, in November 2003, of a beetle "the colour of a Horse Chestnut seed, with huge antlers, like a lobster," observed after showers during April of that year on the low north-easterly footslope of Bredon Hill. Traditionally, this is a relatively early date in the spring for Stag Beetles to be seen in England. I have a record of a ♂ on 1.v.2000 from the Serra do Gerês in Portugal. Although the Bredon Hill site was what would conventionally be regarded as a garden, it formed part of the extended topography and landscape of hedged and tree-lined fields of the area in general. I visited the site on 1.v.2004 and observed wooded copses nearby, with many large sawn dead butts of English Elm *Ulmus procera* Salisbury (syn. *Ulmus minor* Miller var. *vulgaris* (Aiton) Richens). Smaller sawn stumps of *U. procera*, some 20-25 cms in diameter, occurred along the boundary of the garden. The soil at this point is essentially developed on a lobe of colluvium that has come to rest on the low footslope of Bredon Hill, associated with ancient collapse and outwash from the scarp. With the permission of the landowner one of the elm stumps was lifted and a larva of *L. cervus* was found immediately. The larva was situated eight centimetres deep in the soil at the periphery of the stump, and had been consuming the wood from the outside.

During my early residence in Little Comberton (VC37 SO94) in the 1970s, I engaged in dialogue with many of its longer-established residents to try to determine what they regarded as characteristic of the biology of the place. *Lucanus cervus* was never mentioned in recollections extending

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as far back as the year 1900. Having maintained some interest in the invertebrates of Little Comberton, it proved somewhat chastening to discover a larva of *L. cervus* within the boundaries of my own property, at the roots of a sawn elm stump, *U. procera*, on 23.xii.2006. The sediments are fluvially resorted colluvium. Stumps of *U. procera* first became available in numbers in the area about 1973 following the last major episode of Elm Disease caused by the introduced fungus *Ophiostoma novo-ulmi* Brasier, 1991. This evidently provided opportunities for *L. cervus* to proliferate but remain undetected up to now; in this context see also Hawes (1999), Lewis (1998) and Pratt (2000, p.76). The beetle found in the garden by Bredon Hill in April 2003 was attempting to hide in a narrow rock crevice, and such limited evidence of populations is likely to escape notice.

The behaviour of the adult generation in these apparently small, localised populations, is evidently different to that of those in large focussed populations where there is scope for large-scale simultaneous interaction of beetles. In parts of Central Slovakia, *L. cervus* is associated with extensive oak pasture-woodlands where moribund roots and subterranean wood decays slowly and sequentially, sometimes following lightning strikes or deliberate firing. Numbers of beetles there are large and they appear more or less synchronously (cf. Bizely, 1984; Frith, 1999) in May, when adult mortality may be high (PFW, pers. obs.). There was some evidence that male mortality at times of mass emergence was higher than that of females, the males having little useful functionality after copulation, when they provide a valuable recyclable energy resource.

THE FOOD RESOURCE AND LARVAL NICHE OF *LUCANUS CERVUS*

The larvae of *L. cervus* have straighter mandibles than those of larval *Dorcus parallelipipedus* (L., 1758) which distinguishes the two species on sight. The mandibles are beset with secondary teeth. Using their chisel-tipped dentition the larvae effectively mill wood and the differential development of the mandibular structure permits the two genera to exploit two very different niches. The bodies of *L. cervus* larvae tend to be cream rather than white, and what makes them special is their ability to eat moderately indurate lignified wood which is dead or dying, but not necessarily fungoid. Their preference for firm wood is satisfied in particular by the proliferation of *Ophiostoma*-infected elm stumps. This is a disease of the tree's vascular system and does not degrade wood. Additionally, dead elm wood degrades from slowly to not at all in the presence of soil moisture, so that the larval pabulum of *L. cervus* is secured for decades, and in the case of high volume veteran elms, for more than half a century (PFW pers. obs., *contra* Pratt, 2000, p. 81). Describing the food source of *L. cervus* simply as rotting wood understates the exactness and precision with which it and all scarabaeoid beetles select their breeding niches. Pratt (2003) collated information on larvae at *Ulmus* in southern England and showed that a single stump of this tree may support from 40 to 100 larvae. What makes *L. cervus* special amongst European scarabaeoid beetles is its ability to subsist on dead wood in the rhizosphere; it is completely dependent on wood or trees but is not arboreal. The larvae of *D. parallelipipedus* have, in general terms, a marked affinity for the soft dead heartwood of trees delignified by basidiomycotine fungi. They are frequently arboreal, ascending well up inside the boles of fungoid trees, often for some time prior to their fall. They occur at ground level but are not, in my experience of many thousands, truly subterranean in this sense of *L. cervus*, in agreement with the findings of Harvey & Gange (2003).

The closest competitor of *L. cervus* is the scarabaeid Rhinoceros Beetle *Oryctes nasicornis* (L., 1758), the evident absence of which from Britain, both now and in the past, seems to be remarkable, given for example its occurrence on small Mediterranean sea-islands. Like *L. cervus* this widespread species is frequently synanthropic and its larvae readily utilise 'loggeries,' although in general they occur in decaying wood and in the secondary fill of hollow trees on which they are no less polyphagous than *L. cervus*. Microscopic examination of faecal pellets would undoubtedly throw further light on the larval autecology of *L. cervus*, which, like some larval scarabaeids (Whitehead, 2003), are likely to benefit from the presence of hydrolysable tannins in the wood. It would be no surprise to find that they are also facultative predators.

Lucanus cervus is rarely cited in the fossil record, being known mostly from low-lying sites in England in the Prehistoric to early Historic Periods (Girling, 1984; Robinson, 1979). Although characterising prime habitat in many parts of Europe it is not regarded as a strict *Urwaldtier*. Within the often humid, closed canopy of Bialowieza Forest in north-east Poland, where the mycobiota is exceptionally rich, *L. cervus* remains elusive, legally protected and little-known (Szwałko, Tsinkevich & Aleksandrovich, 2001), possibly for climatic reasons. That *L. cervus* is so frequently a synanthropic species in England may be a consequence of the reduction on amenity trees of the woodland mycobiota that would compete with it. This may also partly explain why *L. cervus* prefers somewhat more open situations where the larvae are exposed to ambient climate and insolation (see also Harvey & Gange, 2003). If larval longevity was repeatedly extended to its maximum by competition with lignin-degrading fungi, the larvae could become more vulnerable to other external influences. A number of dominantly oak-associated wood-degrading fungi only consume cellulose.

The excavations in wood of larval *D. parallelipipedus* and *L. cervus* are usually distinctive. Because *L. cervus* frequently works indurate wood, its mandibles create relatively smooth-sided chambers bearing mandibular tooling and surface impressions. These chambers may be irregular, forming large cavities which protect the larvae, and in which they remain somewhat immobile surrounded by a mass of food in constant readiness. When threatened, they may secrete from the mouthparts a noxious fluid smelling of iodides, observed in other scarabaeoid beetle larvae (Whitehead, 2004). The larvae of *D. parallelipipedus* are somewhat more mobile, since they consume wood which is already itself being consumed by fungi, and a large number may reduce the heartwood of a standing fungoid tree to a vesicular mass over a period of several years, sometimes maintaining their populations after tree fall. The large, elliptical or subcircular larval cavities of *L. cervus* are often so distinctive (Pratt, 2000) that they will diagnose the past occurrence of the species even when larvae are no longer present.

LUCANUS CERVUS AND SYNANTHROPY

There has been some discussion in recent years on the relative merits of conservation strategies such as the establishment of 'loggeries' (e.g. Rose, 2005). Although Pratt (2003) reasoned that "numerical levels only have the opportunity to expand if and when they have been previously directly impeded" this statement needs to be reconstrued in the knowledge that *L. cervus* is one of group of related species which frequently and habitually demonstrate cyclic change in their population levels. Its British populations result largely from the interactions of humans and trees over time. The Worcestershire experience with field elms discussed here confirms this; dead elms left *in situ* always ultimately wind blow. It is human intervention that planted a vegetatively reproductive tree in fields and human intervention that, for the benefit of Stag Beetles, left only sawn stumps. The establishment of 'loggeries' should therefore be received a little more positively than has sometimes been intimated, as the 50 to 100 larvae at, presumably green, Blackthorn fence posts (Hawes, 1998) confirm.

On 21.viii.2004 I was invited to inspect a garden developed from ancient woodland near Purley-on-Thames, above the river in Berkshire (VC22 SU67, 65m O.D.). A large coppiced ash tree (*Fraxinus excelsior* L.) had been clear-felled in 1996 and the coppice stems, some 20cms in diameter, cut into metre lengths. During 1998 these had been placed horizontally on the ground surface to define the edges of ornamental plant beds. I found 11 larvae of *L. cervus* under them, including eight under one log. Of these, one was a first instar larva, and another was a last instar larva 72mm long, which had cut a puparium into the wood and had entered the pre-pupal phase. The pupal cocoon was not composed of soil particles but of chips of ash wood chiselled out by the powerful mandibles of the larva; the size of the removals was comparable with those chiselled out of wood by Wood Mice. Like the elm wood in Worcestershire (*op. cit.*), the ash wood was not colonised by invasive arboreal basidiomycotine fungi. In this instance the situation of the puparium cut into wood at the contact between the wood and the ground was completely unlike that described by Sprecher (2003) as being "in the soil half a metre or more from a stump" or by Harvey & Gange (2003) as being "in the soil." The *terminus post quem* for the last instar larva near Purley-on-Thames is 1999, indicating that its full development could have spanned five years.

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January 20th, 2007.