Capture necrophilous beetles in your garden: grow a *Dracunculus*

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Angiosperms, which comprise the largest group of vascular plants, are pollinated chiefly by insects. The majority of these attract insects by visual cues, emitting fragrances, producing protein-rich pollen and secreting sugary nectar, and have in some cases developed very specialised and mutualistic associations with their pollinators (Mauseth 1998). A smaller number of species exploit their pollinators. Perhaps the best-known of these are the insect orchids (genus *Ophrys* L.), which primarily mimic female Hymenoptera in morphology and smell. Other species have developed sapromyophilous adaptations, in which the flowers or inflorescences mimic oviposition and foraging sites for necrophilous and coprophilous insects in odour and, less often, in morphology. Such plants include members of the family Araceae Juss. Although sapromyophilous flowers chiefly attract calliphorid flies, they are also known to attract beetles (Yélamos, 2002; Jürgens *et al.,* 2006; Ollerton & Raguso, 2006).

Plants with sapromyophilous habits have the largest flowers and infloresences in the plant kingdom: the largest single flower is to be found on *Rafflesia arnoldii* R.Br. (Rafflesiaceae or Euphorbiaceae) whilst the largest inflorescence belongs to *Amorphophallus titanum* (Becc.) Becc. ex Arcang. (Araceae). Smaller but no less impressive species of aroids are those that belong to the genus *Dracunculus* Schott, of which there are three species: *Dracunculus muscivorum* (L.f.) Parlatore (from Corsica, Sardinia and the Balearics), *Dracunculus canariensis* Kunth (from the Canaries and Madeira) and *Dracunculus vulgaris* Schott (Walters *et al.,* 1984). This last species is native to the eastern Mediterranean but naturalised in Gibraltar, at the mouth of the Mediterranean (Linares 1993). *D. vulgaris* is a striking species, with a large and distinctly coloured spathe (of 60 & 65cm in length on the plant studied) and a long, black spadix (Fig. 1). In all three species, the lower part of the spathe has overlapping margins, which enclose the lower spadix and act as a trap for pollinators. All *Dracunculus* species are grown as garden plants in Europe (Walters *et al.,* 1984).

On the evening of the 8th May 2009, we were alerted to a plant of *Dracunculus vulgaris* with two flowers at the Gibraltar Botanic Gardens (N36°07.52' W005°21.05', 35m a.s.l.) by one of our colleagues, who remarked on the extremely unpleasant smell that it was producing. On arrival, we found numerous Calliphoridae (as well as smaller Diptera) around the flower, which was emitting a strong, far-carrying and foetid odour akin to that of a decomposing carcass. On inspecting the lower spathe of the inflorescence, we found a large number of Coleoptera trapped inside. Not wishing to damage the flower, we fetched a scalpel knife from our laboratory and made a small, square incision at the base of the flower (Fig. 1). We held a large jar directly beneath the incision, allowing beetles to fall in as they were freed from their trap. The beetles that remained inside the flower were extracted by inserting a pooter in the incision and pooting the specimens out. Examination of the flowers three days later confirmed that we had caused no structural damage. The odour had disappeared by the 11th May and the spathes were wilting by the 12th. Indeed, flowers with sapromyophilous habits are typically short-lived (Ollerton & Raguso, 2006).

Eight species of beetle were found within these flowers, belonging to four families (Table I). At least twenty beetles were trapped within each flower. In the case of *Creophilus maxillosus*, this included a pair *in copulo*. *Saprinus* s.str. species are primarily necrophilous (but also show a tendency towards coprophily) and had already been recorded in inflorescences of aroids. Yélamos (2002) mentions records for *Saprinus cruciatus* (Fabricius, 1792), *Saprinus lautus* Erichson, 1839 and *Saprinus aegialius* Reitter, 1884 specifically, but not for the three species recorded from Gibraltar. *Creophilous maxillosus* and the two *Dermestes* species are likewise common on carcasses. *Onthophagus similis*, which was recorded as new to Gibraltar (Gibraltar has no livestock and is poor in dung beetles) has strong coprophilous habits, although it has been recorded occasionally under rabbit (*Oryctolagus cuniculus*) carcasses and has been captured with traps baited with liver and beer (Martín-Piera & López-Colón, 2000).

It is interesting to note that, in contrast, we have only recorded Diptera on *Stapelia gigantea* N.E.Br. (Apocynaceae), another sapromyophilous species that is cultivated outdoors at the Gibraltar Botanic Gardens (Fig. 2). This is surprising given that the pollination strategies of the species are similar; *S. gigantea* also emits a foetid odour that resembles a rotting carcass, and has flowers that are up to 40cm across (Bruyns, 2005). However, the lack of a tube-like spathe in these stapeliads may explain this, as all beetles found on *D. vulgaris* were trapped within this structure.

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References: BRUYNS, P.V. 2005. *Stapeliads of Southern Africa and Madagascar. 2 vols.* Hatfield, South Africa: Umdaus Press. ● JÜRGENS, A., S. DÖTTERL & U. MEVE 2006. The chemical nature of foetid floral odours in stapeliads (Apocynaceae-Asclepiadoideae-Ceropegieae). *New Phytologist*, **172**: 452-468. ● LINARES, L. 1993. Checklist of the Gibraltar Flora. *Alectoris*, **8**: 30-49. ● MARTÍN-PIERA, F. & J.I. LÓPEZ-COLÓN 2000. *Coleoptera, Scarabaeoidea* I. In: *Fauna Ibérica*, vol. 14. Ramos, M.A. *et al.* (eds.). museo Nacional de Ciencias Naturales. CSIC. Madrid. 526pp., 7 plates. ● MAUSETH, J.D. 1998. *Botany. An Introduction to Plant Biology*. London, UK: Jones & Bartlett Publishers. 794 pp. ● OLLERTON, J. & R.A. RAGUSO 2006. The sweet stench of decay. *New Phytologist*, **172**: 382-385. ● WALTERS, S.M., A. BRADY, C.D. BRICKELL, J. CULLEN, P.S. GREEN, J. LEWIS, V.A. MATTHEWS, D.A. WEBB, P.F. YEO & J.C.M. ALEXANDER 1984. *The European Garden Flora. Vol. II: Monocotyledons (Part II).* Cambridge, UK: Cambridge University Press. 318pp. ● YÉLAMOS, T. 2002. *Coleoptera, Histeridae*. In: *Fauna Ibérica*, vol. 17. Ramos, M.A. *et al.* (eds.). museo Nacional de Ciencias Naturales. CSIC. Madrid. 411pp.

Fig. 1. Inforescence of *Dracunculus vulgaris* at Gibraltar (left) and incision made at the base of the spathe (right).
Fig. 2. *Stapelia gigantea* growing at the Gibraltar Botanic Gardens, with its dipteran pollinators.

Table I. Species of Coleoptera captured within flower of *Dracunculus vulgaris*, by family. Circumstances of previous captures in Gibraltar are given, for comparison.

Family	Species	Previous Captures
Histeridae	*Saprinus (Saprinus) detersus* (Illiger, 1807)	On dead birds (*Larus michahellis*) & reptile (*Coluber hippocrepis*)
Histeridae	*Saprinus (Saprinus) politus* (Brahm, 1790)	On dead bird (*Turdus merula*)
Histeridae	*Saprinus (Saprinus) subnitescens* Bickhardt, 1909	On dead birds (*Larus michahellis*), reptile (*Coluber hippocrepis*) & mammal (*Capra hircus*)
Staphilinidae	*Creophilus maxillosus* (Linnaeus, 1758)	On dead birds (*Larus michahellis*) & reptile (*Coluber hippocrepis*)
Staphilinidae	*Philonthus* sp.	
Scarabaeidae	*Onthophagus (Palaeonthophagus) similis* (Scriba, 1790)	New to Gibraltar
Dermestidae	*Dermestes (Dermestinus) frischii* Kugelann, 1792	On dead birds (*Larus michahellis*), mammals (*Capra hircus* & *Macaca sylvanus*) and reptile (*Coluber hippocrepis*)
Dermestidae	*Dermestes (Dermestinus) undulatus* Brahm, 1790	On dead birds (*Larus michahellis*) & mammal (*Capra hircus*)