Description of the Dominican amber biota

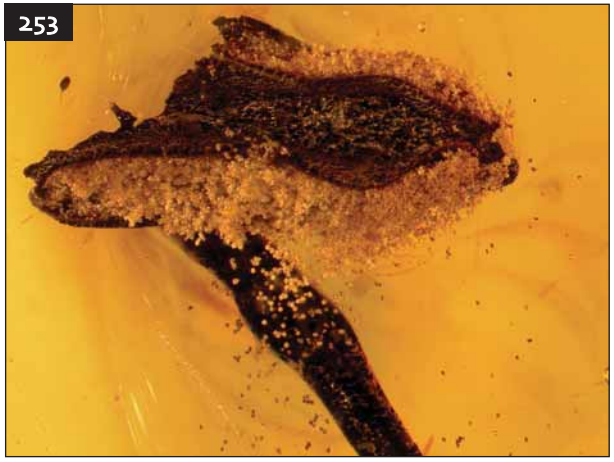
Plants

Amber is the fossilized resin of trees, but which species of tree produced the resin? For Dominican amber, the answer is straightforward because leaves (**252**), seeds, flowers, and pollen (**253**) of the producer tree have been preserved in the amber. The tree was named *Hymenaea protera* by Poinar (1991). Living *Hymenaea* in Hispaniola are called algarrobo, which grow to over 37 m (120 ft) in height. *Hymenaea* occurs not only in the Caribbean, tropical South America, and the western part of Central America, but also in East Africa and the Indian Ocean region. Oddly, the extinct Hispaniolan *Hymenaea protera* seems to be more closely related to the African *Hymenaea verrucosa* (which is also the source of East African copal) than it is to the New World *Hymenaea* species! The disjunct distribution of the genus needs explanation. It was a very long time ago (Cretaceous) that there was a landmass which connected Africa and Central America through the tropics; however, viable *Hymenaea* pods could have been carried long distances by ocean currents. *Hymenaea* belongs to the Fabaceae (Leguminosae), the pea family. Its flowers were winged, like those of a pea, and its seeds were borne in pods. There were other leguminous trees in the amber forest: *Prioria* (the cativo) and *Peltogyne* (the nazareno). These trees also reached more than 37 m (120 ft) in height, and together with *Hymenaea* would have formed the major canopy trees of the amber forest.

Flowers belonging to the families Fabaceae, Meliaceae, Myristicaceae (**254**), Thymelaceae, Bombacaceae, and Hippocrateaceae have all been found in Dominican amber (Poinar, 1992). These trees would have formed mostly understorey trees in the forest, although Hippocrateaceae are lianas. Tall bamboos and palms were also present. It is not always the actual fossils of plants which give evidence to their presence. Fossils of fig-wasps (Hymenoptera: Agaonidae) show that fig trees (*Ficus*) must have been present because these wasps need figs for their life cycle just as fig species need their specific species of wasp for pollination. The palm bug *Paleodoris lattini* (Hemiptera: Thaumastocoridae) provides evidence for the presence of palms on which it lives (Poinar and Santiago-Blay, 1997).

As in all tropical forests today, epiphytes – plants which live on the trunks and branches of other plants – were abundant in the amber forest. Bromeliads and orchids are likely to have been common, as well as ferns, bryophytes (mosses and liverworts), lichens, algae, and fungi. Being bark

252 Leaf of algarrobo (*Hymenaea protera*) (PC). Length about 25 mm (1 in).



253 Pollen of *Hymenaea* emerging from the anther (PC). Anther is 2.2 mm (0.09 in) long.

254 Male flower of the ucuúba (*Virola*: Myristicaceae) (PC). Length about 2 mm (0.08 in).

255 Leaves of a moss (PC). Picture about 15 mm (0.6 in) wide.

dwellers, mosses (**255**) and liverworts are quite common as fossils and, rarely, a fossil mushroom has been preserved (Poinar and Singer, 1990).

Nematodes and mollusks

Microscopic roundworms (Nematoda) are common just about everywhere, so it is not surprising that they have been reported in Dominican amber (Poinar and Poinar, 1999). Both free-living and parasitic nematodes have been found as fossils in the amber. Other microscopic free-living animals which lived among the damp moss and algae of the epiphytes include rotifers (Poinar and Ricci, 1992). Numerous shells of land snails (**256**) have been reported in Dominican amber (Poinar and Roth, 1991), all of which occur in the tropical and subtropical regions of the Caribbean today.

Crustaceans

Crustaceans need damp places to live on land, so tropical forests provide ideal habitats for them. Amphipods (hoppers) (Bousfield and Poinar, 1995) and isopods (woodlice) (Schmalfuss, 1980, 1984) occur in Dominican amber.

Myriapods

Myriapods include the predatory centipedes (Chilopoda) and mainly detritivorous millipedes (Diplopoda), both of which are common in terrestrial habitats, especially where it is damp, such as beneath decaying logs and in leaf litter. The centipede *Cryptops* has been reported from Dominican amber (Shear, 1987) as well as the house centipede *Scutigera* (Poinar, 1992). Among millipedes, a whole range of genera which occur today in the region have been recorded from the amber (Shear, 1981; Santiago-Blay and Poinar, 1992). These include the small, bristly polyxenids (**257**), siphonophorids, and the flat-backed polyxenids. One very rare fossil from Dominican amber is a velvet worm (Onychophora; Poinar, 1996a). We met this group back in the Cambrian, when they were marine (Chapter 3: The Burgess Shale). They became terrestrial and now occur in rotting logs in the southern hemisphere.

Insects and their relatives

Primitive hexapods (insects and related groups) are represented in Dominican amber by diplurans and several species of Collembola (springtails) (Mari Mutt, 1983). Members of the latter group are quite likely to get preserved in fossil resin

256 Land snail shell (PC). Length about 1.4 mm (0.05 in).

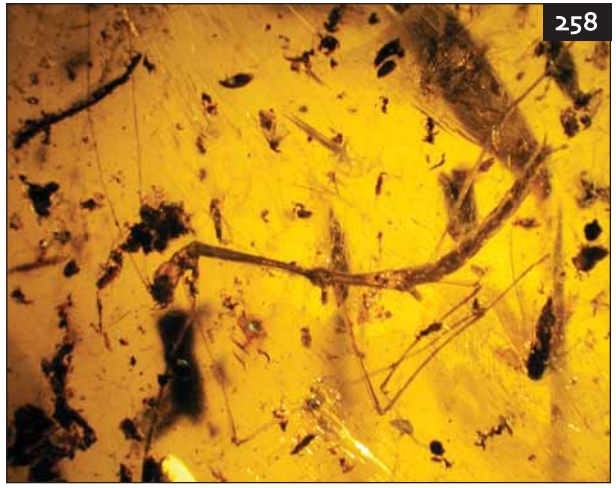
because of their jumping method of locomotion. Silverfish (Thysanura), common today under bark and stones are represented by a few records in the Dominican amber.

More advanced, winged insects are the commonest inclusions in amber. The last chapter gave details of the modes of life and relationships of the many insect groups. Two families of mayflies (Ephemeroptera) present in Dominican amber are evidence that ponds and/or rivers must have been present in the forest because their aquatic larvae do not occur in the small bodies of water which collect in holes in trees or bromeliads (urn-plants), known as phytotelmata. Stoneflies (Plecoptera) also have aquatic larvae, and representatives of these occur in Dominican amber but not in Hispaniola today. Dragonflies and damselflies (Odonata) are stronger fliers, and much less likely to be blown onto sticky resin, so are rather rare in amber. However, a specimen of a stalk-winged damselfly from Dominican amber, whose descendants today lay their eggs in phytotelmata, provides evidence for this habitat in the amber forest (Poinar, 1996b).

Crickets, grasshoppers and katydids (Orthoptera) all occur in Dominican amber, perhaps partly because of their habit of jumping, they are likely to have jumped onto the resin (Vickery

257 Bristly millipede (Polyxenida) (PC). Length about 2 mm (0.08 in).

258 Walking stick (Phasmatodea: Diapheromeridae) (PC). Body about 12 mm (0.5 in) long.



and Poinar, 1994). The walking sticks (Phasmatodea, **258**) also have representatives in Dominican amber. Turn over any piece of bark and one insect which is almost certain to be encountered is an earwig (Dermaptera), and it is not surprising, therefore, to find that they are known from Dominican amber too (**259**). Fossils of roaches (Blattaria) and their egg-cases are known from Dominican amber but not formally described. Termites (Isoptera) are common in Dominican amber, where not only winged adults have been found but also the worker and soldier castes which are rare in lake deposits such as Florissant (Chapter 12). The termites in Dominican amber include *Mastotermes*; now restricted to a single species in tropical Australia and New Guinea, these giant (50 mm [2 in] wingspan) creatures were once much more widespread over the globe (Krishna and Grimaldi, 1991).

The web-spinners (Embioptera) form a small group of insects with a thin cuticle and poor powers of flight which live communally in silken tubes beneath bark and under stones. Members of at least two extant families have been recognized in Dominican amber. Among other small orders of insects, the Zoraptera have their only known fossil representative in Dominican amber (Poinar, 1988a), while Psocoptera (bark-lice) and thrips (Thysanura) are very well represented.

A great many plant-sucking bugs (Hemiptera) would have plagued the amber forest trees, including aphids, leafhoppers (**260**), and scale insects. Cicada nymphs are common too, trapped in resin while climbing trees prior to the winged adults emerging. True bugs (Heteroptera) are also common in Dominican amber (**261**). These include water striders, indicating the presence of water bodies nearby. Strangest of all is the presence of the family Veliidae, the broad-shouldered water striders (Andersen and Poinar, 1998). These bugs are associated today only with the marine environment and, equally odd, occur today on the opposite side of the world from Hispaniola today. The Neuroptera are represented in Dominican amber by their large, winged adults (ant-lions and owl-flies) and their larvae with their formidable jaws. A few lacewings have been found, but they are rare.

Beetles (Coleoptera), being the most diverse of all insect orders are, of course, well represented in Dominican amber. Ground beetles (Carabidae) would have been common in the amber forest but few have been formally described. Water beetles (Dytiscidae, Gyrinidae) have been found in Dominican amber; they possibly lived in phytotelmata.

259 Earwig (Dermaptera) (PC). Length about 4 mm (0.2 in).

260 Leafhopper (Hemiptera: Membracidae) (PC). Length about 10 mm (0.4 in).

261 Heteropteran bug showing long, piercing mouthparts (PC). Length about 7 mm (0.3 in).

The rove beetles (Staphylinidae) are common but few have been formally described from Dominican amber. A species of staphylinid associated with termite nests is shown in (**262**), and a carabid found only in ant nests has also been described (see Poinar and Poinar, 1996). Soldier beetles (**263**) are often brightly colored and found on flowers where they prey on other insects. Many wood-boring beetles occur in the amber forest, including members of the beautiful, jewel-like Buprestidae, long-horn beetles of the family Cerambycidae, the death-watch beetle family Anobiidae (**264**), and predators of wood-borers: the Cucujidae (**265**). The large family of often brightly colored leaf beetles (Chrysomelidae) are extremely common in Dominican amber, as are the members of another large group of plant-eating beetles: the weevils (Curculionoidea).

Hymenoptera (ants, bees, and wasps) can be subdivided into two suborders: Symphyta (sawflies and horntails) and Apocrita (ants, bees, and wasps). A number of sawflies have been recorded from Dominican amber (Smith and Poinar, 1992). There are many different groups of Apocrita: parasitic, solitary, colonial, social, winged, and wingless. A great many Apocrita are parasitoids: they

262 Larva of rove beetle associated with termite nests (Staphylinidae, Trichopseniinae) (PC). Length about 3 mm (0.1 in).

263 Soldier beetle with elytra open exposing membranous wings (Cantharidae) (PC). Length about 15 mm (0.6 in).

264 Wood-boring beetle of the family Anobiidae (PC). Length about 4 mm (0.2 in).

265 A beetle of the family Cucujidae: predators on wood-boring insects (PC). Length about 3.5 mm (0.1 in).