

**GYNES:** Based on measurements of 25 Panamanian *C. longiscapus* gynes from 20 nests and of 23 *C. muelleri* gynes from 20 nests (Table 2), Panamanian *C. muelleri* gynes have longer and slightly wider heads than do *C. muelleri* gynes, but there is no difference in body length (two-tailed t test on average values: HL:  $t=2.562$ ,  $df=45$ ,  $P=0.014$ ; HW:  $t=2.041$ ,  $df=35$ ,  $P=0.049$ ; WL:  $t=0.070$ ,  $df=45$ ,  $P=0.944$ ). As with worker measurements, these marginal size differences are obviously of little practical value for identifying specimens. Based on measurements taken from two gynes from the same nest (Table 2), Colombian *C. longiscapus* gynes from Colombia are larger than *C. longiscapus* gynes from Panama, a pattern paralleling that in the workers.

**MALES.** Based on measurements of 25 Panamanian *C. longiscapus* males from 23 nests and of 29 *C. muelleri* males from 28 nests (Table 2), *C. muelleri* males have on average longer heads than Panamanian *C. longiscapus* males, but do not differ in other dimensions (two-tailed t test on average values: HL:  $t=3.762$ ,  $df=52$ ,  $P<0.001$ ; HW:  $t=0.244$ ,  $df=52$ ,  $P=0.808$ ; WL:  $t=1.023$ ,  $df=51$ ,  $P=0.311$ .) In parallel with workers and gynes, the only known non-Panamanian male of *C. longiscapus*, from the paratype series, is slightly larger than the largest *C. longiscapus* and *C. muelleri* males from Panama.

**NEST ARCHITECTURE:** Based on measurements of 55 *C. longiscapus* and 24 *C. muelleri* nest entrances from Panama (Table 3), *C. longiscapus* entrance auricles are on average higher than wide (i.e., vertically elongate), whereas *C. muelleri* auricles are wider than high (i.e., horizontally elongate) ( $t=-3.862$ ,  $df=37$ ,  $P<0.001$ ) (Figs. 8b and 8c). Because there is some overlap in the ratio of auricle height to width across the two species (Table 3), this difference obviously needs to be used with caution as a field character for distinguishing nests of the two species. However, of 54 additional nests of *C. longiscapus* and *C. muelleri* examined in spring of 2001 at Pipeline Road in Panama, 50 were classified in the field as either *C. longiscapus* (22 nests assigned) or *C. muelleri* (28 nests assigned); the auricles of the remaining four of the 54 nests were judged to be “intermediate” in shape and thus did not allow clear assignment to either species. Using only auricle architecture as a criterion, all of the 22 *C. longiscapus* nests were correctly identified to species, whereas 27 of the 28 *C. muelleri* nests were correctly identified. In practice, therefore, auricle shape (summarized as the ratio of vertical to horizontal diameter; Table 3 and Figs. 8a and 8b) is quite reliable for species identification, especially when combined with the other differences discussed above.

### Ecology and behavior

What little knowledge we have of the ecology of *C. longiscapus* in Colombia is consistent with the ecology of the far better studied Panamanian *C. longiscapus* and *C. muelleri* (Mueller and Wcislo 1998; UGM, unpublished). Although no ecological data are reported in Weber's original (1940) description of *C. longiscapus*, a subset of the paratype

labels indicates that the colony was taken at 1020 m elevation (another label indicates 3200 ft); one paratype label specifies “nesting in rain forest”; and Weber's notes indicate a collection location of 6°40'N, 75°10'W. Weber (1972) supplies a verbal description and a photograph of the Colombian *C. longiscapus* type series nest, and provides the additional information that the nest was collected in “a deep, moist ravine in the Andes of Colombia” (p. 57), consistent with Mueller and Wcislo (1998), who surveyed 203 nests of *C. longiscapus* s.l. in Panama and documented a nesting preference for steep embankments along permanent streams. Label data accompanying Brown's 1971 Colombian collection of *C. longiscapus* indicate that the nest was encountered at 2000 m elevation in rain forest. The only known Costa Rican specimen, a lone worker, was found inside a dead stick on the ground of an old alluvial terrace close to a river (J. Longino, pers. comm.). Colombian *C. longiscapus* specimens have been identified from the stomach contents of two poison-dart frogs, *Phyllobates aurotaenia* and *Dendrobates histrioticus* (Snelling and Longino, 1992). The only known non-Panamanian *C. muelleri* specimen was taken in wet forest at sardine bait in Ecuador (C.R.F. Brandão, pers. comm.).

Both species are monogynous and perennial (Mueller and Wcislo, 1998; Villesen et al., unpubl.), queens are singly mated (Villesen et al., 1999; Adams et al., unpubl.; Villesen, unpubl.), and both cultivate mycelium gardens (Mueller and Wcislo, 1998; Mueller et al., 1998). Nests consist of a single garden chamber and are usually constructed in steep embankments under the shelter of overhangs or set back underneath the shelter of a rock or root. Nest entrance architecture is complex and characteristic (Fig. 8). In Panama, *C. longiscapus* constructs nests of two distinct, but intergraded, morphologies: (1) the hanging, baglike “swallow's nest” type (Fig. 8a), sometimes suspended from rock faces; and (2) the “auricle” type (Fig. 8b). Both of these nest types have pronounced, vertically elongate auricle-shaped entrances, but, whereas the “swallow's nest” type is suspended and the garden chamber is surrounded at the sides by thin (approximately 2 to 5 mm thick) walls constructed by the ants from clay, the simpler “auricle” type nest is set into the soil, the lateral walls of the excavated garden chamber are natural, and only the front walls surrounding the auricle are constructed by the ants. The single described non-Panamanian *C. longiscapus* nest, from Colombia, was of the swallow's-nest type (Weber, 1972; Mueller and Wcislo, 1998). *C. muelleri* constructs nests of the auricle type only, but significant differences separate the auricle-type nests of the two species: Only *C. longiscapus* constructs large, flaring nest auricles that are generally longer in the vertical than in the horizontal dimension (Fig. 8b; see also Fig. 1 in Mueller and Wcislo, 1998). *C. muelleri*, in contrast, constructs “mouthlike” auricles that possess swollen or thickened rather than flared rims and that are generally longer in the horizontal rather than vertical dimension (Fig. 8c). Neighboring nests of the two species almost invariably maintain these species-specific features, indicating that differences in auricle architecture are not microhabitat-dependent and confirming that the two species have diverged with respect to nest construction behavior.