10.39 *Cardiocondyla emeryi* FOREL, 1881

Cardiocondyla emeryi FOREL, 1881; St.Thomas / Virgin Islands [types investigated].
Cardiocondyla emeryi var. *rasalamae* FOREL, 1891; Madagascar [types investigated].

Cardiocondyla emeryi ssp. *mahdii* KARAVAJEV, 1911; Khartoum / Sudan [types investigated].
Cardiocondyla nuda ssp. *nereis* W.M. WHEELER ,1927; Norfolk Island [types investigated].
Cardiocondyla mauritia DONISTHORPE, 1946; Mauritius [type investigated].

Investigated type material: *Cardiocondyla emeryi*: 2 **syntype** workers labelled by Forel "Cardiocondyla Emeryi Forel ♂ Antilles St. Thomas (Forel)", MHN Genève.

C. emeryi var. *rasalamae*: 2 **syntype** workers labelled by Forel "C. emeryi ♂ Forel v. rasalamae Forel, Antananarivo Camboúe", MHN Genève. 1 **syntype** worker labelled by Forel "C. emeryi ♂ Forel v. rasalamae Forel, Antananarivo (Camboúe)" and by G. Mayr "Emeryi v. rasalamae Forel, Type", NHM Wien.

C. emeryi ssp. *mahdii*: 3 **syntype** workers labelled by Karavajev "Cardiocondyla mahdii sp.n. Karaw., Khartum 1900 W.K.", MHN Genève and NHM Basel.

C. nuda ssp. *nereis*: 4 **syntype** workers and 3 **syntype** gynes labelled "Norfolk I, A.M.Lea \ Wm.M.Wheeler \ M.C.Z. CoType 27887 \ subsp. nereis Wheeler", MCZ Cambridge.

C. mauritia: 1 **type** worker labelled "Mauritius 1941-45, 102, R.Mamel", "Pres.by Imp.Inst.Ent.B.M.1947-128", "Cardiocondyla mauritia H.Donisthorpe 1945 TYPE", BMNH London.

Morphometrically investigated material (81 samples): **Aldabra Islands:** Dune d'Messe, 9.22 S, 46.20 E, 1971.05.13, w; **Angola:** Luanda - 6.5 km S, 1949.08.23, w; **Botswana:** Shanobe, 1975.06.23, w; **Brazil:** Bahia: Itabuna, 1998, w; **Burundi:** Barage, 1977.10.23, w; **Cameroon:** Mbalmayo, 1993.11, w; Nkoemvon, 1980, w; **Cape Verde:** Cap Verde Island, 1989, g; Fogo: Cha des Chaldeiras, 1979.11.03, w; Sao Vicente: Rib.Juliao, 1953, w; **Caribbean:** Barbados: N of Bridgetown, 1995.01.01, w, g; Cuba: Cienfuegos, 1933.07.31, No.17, g; Cuba: Cienfuegos, 1933.08, w; Cuba: Cienfuegos, 1933.08.31, No.31c, w; Cuba: Cienfuegos, 1933.12, w; Cuba: Pinar del Rio: Majagua, 1930.01.03, w; Cuba: Pinar del Rio: Mariel, 1930.01.20, w; Cuba: Pinar del Rio: Mariel, 1931.02.06, w; Cuba: San Antonio de los Banos, Pazos, w; Grenada (Weber), w; Puerto Rico: Camp Tortuguero, 1950.10.27, w; Puerto Rico: Cayo Congo, 1983.05.20, w; Puerto Rico: Desecheo, 1981.05.10, w; Puerto Rico: Dorado, 1985.08.06 (samples No. 223, 225), w;: Puerto Rico: Humacao: Cayo Luis Pena, 1982.10.09, w; Puerto Rico: Humacao: San Lorenzo - 10 km SSW, 1989.07.26 (samples No.33, 38), w, g; Puerto Rico: Mayaquez, 1936.02/03, w; Puerto Rico: Mona Island, 1982.06.29, w; Puerto Rico: Ponce Agr. Exp.Stat., 1980.02.27, w; Puerto Rico: Punta Salinas, 1981.07, w; Puerto Rico: Salinas, 1950.07.01, w; Puerto Rico: Salinas, 1988.04.28 - 515, w; Puerto Rico: San Lorenzo, carr. 7740, km 1.2, 1979.04.03 (samples No. 0, 12), w; Puerto Rico: San Lorenzo, carr. 7740, km 1.3, 1979.05.22, g; St. Kitts (Weber), w; Virgin Islands, Dutch Cayo, 1982.11.10, w; Virgin Islands, Guana Isl.(18.29N, 64.34W), 1993.07, g; Virgin Islands: Guana Isl. (18.29 N, 64.34 W), 1993.10.27, w; Virgin Islands, St.Thomas (Forel), w; West Indies: Anguilla (18.13 N, 63.02 W), 1980.04.04, w; Tobago: Plymouth, 2000.08 (samples No. T14, T23, T33), w; **Chagos Islands:** Diego Garcia (7.18 S, 72.26 E), 1971.05.13, w; **Egypt:** Siwa Oasis (29.33 N, 25.11 E), 1935.06.30, w; **Israel:** Jaffa (leg. André), w; Michmoret, 1980.11.30, w; Tel Aviv, 1944.09.10, w; **Madagascar:** Antananarivo (Camboué), w; **Mauritius:** Mauritius 1941 - 1945, w; **Madeira:** Furado (Schmitz), w; Funchal (Schmitz), w; Funchal, 1960.11, w, g; Madeira, 1933.08.19, w; Paul do Mar, 2001.06.14, w; **Morocco:** Agadir: Hotel Hacienda, 1992.05, w; **Nepal:** Kathmandu, 1988.06, w; **Nigeria:** Gambari, 1969.06.10, w; Ibadan, 1987.10, w; **Polynesia:** Hawaii: Mokapun Oahu, 1938.06.22, w; Norfolk Island, 1915, w, g; **Rwanda:** Barage, 1977, w; **South Africa:** Durban, 1914.09.26, w; Transvaal: Nelspruit, 1980, w; **Spain:** Isla Gomera: Playa del Gran Rey, 1981.05.05, w; Isla Lanzarote, Costa Taguise, 1988.10 (A. Norris), w; **Sri Lanka:** Bandarawella, 198801.15, w; **Sudan:** Khartoum, 1900, w; Wadi Halfa, 1962.01.28, w; **Uganda:** Ruwenzori: Semliki Forest, 1952, w; **USA:** Florida: Miami, 1911.11.05, w; **Seychelles:** Little Sister Island, 1975, w; **St. Helena:** Ascension, 1958, w; **Tanzania:** Ibaya - 1 km N (3.58 S, 37.47 E), 1996, w; Lindi (9.59 S, 39.42 E), 1936.10.22, w; **Yemen:** Al Mahrah, S. Ba Angood, 1997.02.13 (samples No. 0, 3376) w; **Zimbabwe:** Bembesi, 1913.01.12, w.

Description: Worker (Figs. 6, 58, 59; Tab. 13): Small size, CS 411. Head elongated, CL/CW 1.229. Scape short, SL/CS 0.758. Postocular index large, PoOc/CL 0.467. Eyes medium-sized, EYE 0.246. Frons very narrow, FRS/CS 0.215, frontal carinae immediately behind FRS level slightly converging and then diverging. Occipital margin more or less straight, with a suggested concavity. Whole head and mesosoma without longi-

tudinal rugosity, except for small patches with weak carinulae mentioned below. Anterior clypeal margin with weak median concavity; central surface of clypeus in type specimens of *C. emeryi* with suggestions of flat foveolae, in type specimens of *C. emeryi* var. *rasalamae* with fine, interrupted fragments of carinulae and without any foveolae. Vertex in types of *C. emeryi* with deeply impressed, flat-bottomed foveolae of 17 - 19 µm diameter in densely-packed honey-comb arrangement; foveolae showing an inner corona (tubercle) of 8 - 9 µm diameter (Fig. 58); median vertex with weak, interrupted longitudinal carinulae. Vertex in types of *C. e.* var. *rasalamae* in overall impression rather shining, structure and strength of sculpture radically different from that in types of *C. emeryi* (Fig. 59), showing shallow, but well-demarcated foveolae of 14 - 17 µm diameter, which occasionally possess an inner corona (tubercle); interspaces about as wide as foveolar diameter, much shining, with very fine cross-branched microcarinulae that may completely surround foveolae (= perifoveolar reticulum). Whole surface of mesosoma in types of *C. emeryi* with well-pronounced and dense microreticulum with meshes of 9 - 12 µm diameter; dorsal mesosoma additionally with scattered foveolae. Dorsal area of mesosoma in the types of *C. emeryi* var. *rasalamae* much less deeply sculptured than in *C. emeryi* types, moderately shining, with shallow foveolae similar to those on vertex; lateral area of mesosoma entirely reticulate but more delicately than in *C. emeryi* types. Petiole, except for the more smooth dorsal surface with well-pronounced and dense microreticulum that is weaker the *C. emeryi* var. *rasalamae* types. Postpetiole more smooth, with finer reticulum. Promesonotal dorsum showing in profile a continuous shallow convexity, not abruptly sloping into the moderately deep metanotal groove. In *C. emeryi* types, anterodorsal profile of propodeum convex, caudodorsal profile linear and slightly sloping downwards, spines deviating from longitudinal mesosomal axis by 40°. In *C. e.* var. *rasalamae* types, whole dorsal profile of propodeum very shallowly convex, not sloping downwards, spines less erect. Petiole node in dorsal view distinctly longer than wide; petiolar peduncle moderately long. Postpetiole in dorsal view wider than long, with shallowly concave anterior margin and evenly convex sides; postpetiolar sternite showing a conspicuous anteroventral prominence or bulge, without dents or carinae (Fig. 6). Different colour variants known: in most frequent variant whole body yellowish except for blackish gaster and terminal segment of antennal club; sometimes whole body dark or dirty brown. For morphometric data of 115 workers see Tab. 13.

Gyne (Tab. 19): Very small size. Head elongated, CL/CW 1.180. Scape very short, SL/CS 0.731. Postocular index large, PoOc/CL 0.448. Occipital margin more or less straight. Anteromedian clypeal margin between level of frontal carinae straight to slightly concave. Frons very narrow, FRS/CS 0.216, frontal carinae in posterior part almost parallel. Vertex in the *emeryi* morph with deeply impressed, flat-bottomed foveolae of 16 - 17 µm diameter in densely-packed arrangement, foveolae showing an inner tubercle of 8 - 9 µm diameter; vertex sculpture in the *rasalamae* morph similar, but foveolar diameter a little smaller and arrangement less dense. Clypeus and narrow median stripe of anterior vertex frequently with short fragments of weak carinulae. Whole mesosoma without elements of longitudinal sculpture, except for 4 - 6 weak longitudinal carinae on lateral area of metapleuron. Whole dorsal area of mesosoma with deep, densely-packed foveolae; in the *rasalamae* morph foveolae less deep. Lateral area of mesosoma and petiolar peduncle reticulate. Petiole node foveolate, in dorsal view longer than wide, axis of petiolar

peduncle deviating in lateral view from petiolar node axis by 45°. Spines well-developed, their axis deviating in lateral view by 18 - 30° from longitudinal mesosomal axis. Postpetiole with a strong anteroventral bulge, in dorsal view wider than long, with strongly convex sides, slightly concave anterior margin, and foveolate. Gaster tergites shining, but with very fine microreticulum. Colour bimorphism. Light form: lateral area of mesosoma, waist, and appendages yellowish; scutellum, gaster, and antennal club dark brown; remaining body parts yellowish brown. Dark form: whole body dark brown; coxae, femora, tibiae, scape, base of funiculus, and ventrolateral area of pronotum yellowish. For morphometric data of 12 gynes see Tab. 19.

Comments: The type specimens of *C. emeryi* and *C. emeryi* var. *rasalamae* show the external morphology of separate species. However, a consistency of these differences was not demonstrable on a larger scale and both taxa are assumed to represent different genotypes of the same polymorphic species. The cosmopolitan population of *C. emeryi* shows extreme polymorphism in microsculpture clearly exceeding the usual intraspecific variability known for *Cardiocondyla.* 55 % of the specimens show deeply impressed and densely packed vertex foveolae (named here sculpture score 3 or SC3, as found in the type specimens of *C. emeryi*, Fig. 58). 26 % of the specimens show shallow, well-distant vertex foveolae, which are surrounded by a perifoveolar reticulum (named here sculpture score 1 or SC1, as found in the type specimens of *C. e.* var. *rasalamae, C. e.* ssp. *mahdii*, and *C. nuda* ssp. *nereis*, Fig. 59). 19 % of the specimens show an intermediate sculpture type (sculpture score 2 or SC2, as found in the type specimen of *C. mauritia*). SC1 and SC3 were so far not observed within the same sample but were twice observed at the same site. The linear correlation coefficient between sculpture score and the following morphometric characters is highly significant ($p < 0.0001$) for 115 investigated specimens: -0.611 (SL/CS), 0.484 (PEH/CS), 0.435 (PEW/CS), 0.401 (PPW/CS), 0.353 (PPH/CS), and 0.349 (dFOV). The arithmetic means of these characters in specimens of the 3 sculpture types are as follows:

	SL/CS	PEW/CS	PPW/CS	PEH/CS	PPH/CS	dFov
SC1 (n = 30)	0.771	0.254	0.469	0.320	0.330	15.43
SC2 (n = 22)	0.764	0.261	0.474	0.327	0.334	15.86
SC3 (n = 63)	0.752	0.269	0.483	0.334	0.339	16.21

SC3 specimens predominate in the Caribbean and adjacent regions. They have significantly shorter scapes and wider and higher waist segments than SC1 specimens, which predominate in E and N Africa and the Near East. Intermediate SC2 specimens are most abundant on the Atlantic islands and in Central Africa and show also intermediate morphometric characters. The distribution pattern of SC3 suggests American SC3 specimens to have been anthropogenically introduced from W Africa via the intensive shipping connections that were established as early as 400 years ago in connection with the transport of plant material and slaves. Some of the Atlantic islands were used as stopovers in this routes. N and E African SC1 populations developed notable morphological divergence from the W African SC3 populations in the precultural period and their anthropogenic transport to America began much later and was less strong. The spreading by human commerce all over the world should have lead to repeated local encounters and hybridising of SC3 (*C. emeryi*) and SC1 (*C. emeryi* var. *rasalamae*) populations and stopped their beginning divergence.