

10.21 *Cardiocondyla mauritanica* FOREL, 1890

Cardiocondyla nuda var. *mauritanica* FOREL, 1890; Kairouan/ Tunisia [types investigated].

Cardiocondyla ectopia SNELLING, 1974; Orange Co. / California [types investigated], **syn.n.**

Investigated type material: *Cardiocondyla mauritanica*: 5 **syntype** workers and 4 **syntype** gynes labelled "C. nuda r. mauritanica Forel, Kairouan 18 IX Santschi", MHN Genève.

C. ectopia: 3 **paratype** workers and 2 **paratype** gynes labelled "CALIF., Orange Co.: Seal Beach, 0-25' 17-VII-1972 R.R. Snelling No 72-9" and "PARATYPE *Cardiocondyla ectopia* R.R. Snelling", LACM Los Angeles and SMN Görlitz.

Morphometrically investigated material (84 samples): **Abu Dhabi:** Park, 1995.03, w; **Afghanistan:** Kandahar, 1953.01.12, g; Kandahar - Kunar, 1953.01.18 w, g; Kandahar - Kunar, 1953.01.22 w, g; **Caribbean:** Puerto Rico: Aguada, 1987.04.06 (samples No. 455,462), w; Puerto Rico: Isla Culebra: Humacao, 1982.08.26, w; Puerto Rico: Isla Culebrita, 1991.10.02, w; Puerto Rico: Lobos, 1983.10.12, g; Puerto Rico: Mayaguez, Isla Maria Langa, 1983.03.08, w, g; Puerto Rico: Mona Island, 1982.07.03, w; Puerto Rico: San Juan: Carolina, 1983.02.23, w; Puerto Rico: San Juan: Carolina, 1985.04.02, w; Puerto Rico: San Juan: Carolina, 1986.06.15, w, g; **Egypt:** Assuan (leg. Karavajev), w; Gizeh, 1994.04.27 g; Hurghada Gifthun, 1992.09.12, w; Cairo, 1957.10.30, w; **Greece:** Crete: Iraklion district, 1990.04, w; Crete: Zaros, 1992.05, w; Crete: Rhethimnon, Georgioupoli, Kavros, 1994.08.27, g; Cyclades: Paros, 1994.05, g; **India:** Him. Pradesh: Kullu - 10 km N, 1996.10, w; Him. Pradesh: Kullu - 20 km E, 1996.10,

w; Punjab: Chandigarh, 1978.08.21, w; **Indonesia**: Lombok: Senaru, 1999.12.21-17, w, g; **Irak**: Mesopotamia, 1918.10.18 (W.E.Evans), w; **Iran**: Basht (30.20N, 51.15E), 1974.05.25, w, g; Shiraz - 10 km SSW, 1997.09.14, w; Shiraz - 16 km ESE, 1997.09.16, w; Shiraz - 7 km NE, 1997.09.18, No.17, w; **Israel**: Ein Yahav, 1985.11.10, w; Tal Yeroham, 1966.03.27 w, g; Tel Aviv, 1984.04, g; **Jordan**: Hammamat Main, 1996.11.01, w; Rum (29.34N, 35.25E), 1996.11.07, w; Wadi Mujib, 1998.11.02, w; **Libya**: Tripolis, Dernah, 1906.08, w; **Malta**: without locality, 1984, w; **Morocco**: Agdz. Qued Draa 20 - 28 km E, 1991.05.09, w; Ait Ourir - 8 km E, 1995.05.09 w, g; Zagora - 11S, 1998.05.29, w; **Nepal**: Thak, Jomosom, 1974.03.01, g; **Oman**: Kayma Desert, 1993.05.03, w; Wahiba Sands, 1989.12.15, w; **Papua New Guinea**: Bismarck - Archipel, g; **Pakistan**: Swat: Madyan, 1974.06.22, w; **Philippines**: Luzon: S of Baguio, Bridall Falls, 1999.02.16, g; **Portugal**: Montemor, 1991.07, w; **Spain**: Canaries: Isla Fuerteventura, 1989.12, w; **Spain**: Canaries: Isla Hierro, 1989.03.03, w, g; Canaries: Isla Lanzarote, Costa Taguise, 1988.10, w; Canaries: Isla La Palma, Barranco de los Angustias, 1990.04.05, w; Canaries: Isla Tenerife: Puerto de la Cruz, 1999.04, w, g; Ceuta, 1979.04.14, g; Almeria: La Hoya, 1988.06.28, g; Granada: Motril, 1993.09, w, g; Granada: Motril, 2000.04 (samples 1, 4a, 6, 10, 14), w, g; Granada: Sierra Elvira, 2000.04, g; Granada: Guadix, 2000.04, g; **Tunisia**: Gabes (Oasis), Forel, w; Hammamet - 80 km S, 1993.03.02 w, g; Kairouan - 18.09.18, w, g; Tabarka, 1995.10.08, g; **Turkey**: Inkumia, 1984.06 (Collingwood), w; Kayseri - 30 km SW, 1997.05.10, g; Kayseri - 30 km SW: Incesu - 2N, 1997.05.10, w; Mersin: Silifke - 15 km SE, 1993.05.29, w; **Ukraine**: Crimea: Bachcysarai - SW, 1995.08.12, w; **United Arab Emirates**: Alain, Zoo, 1995.02, w; Dubai, Municipality, 1998 (K.Valsan), w; **USA**: Arizona: Pinal /Gila River, 1995.05.25, w; California: Los Angeles Co.: Downey, 1968.06.06, w; California: Los Angeles Co.: Long Beach, 1967.09.19, w; California: Orange Co.: Seal Beach, 1972.07.17, w, g; California: Orange Co.: Tustin, 1970.06.06, w; California: San Joaquin Co.: Stockton, 1992.01.27, g; California: Ventura Co.: Port Hueneme, 1985.03.21, w, g; Florida: Bahia Honda, 1981.12.10, w, g; **Zimbabwe**: Zambesi, 1995.07, g.

Description: Worker (Fig. 33, Tab. 9): Head elongated, CL/CW 1.183. Postocular index large, PoOc/CL 0.447. Eyes relatively small, EYE 0.232. Frontal carinae immediately caudal of the FRS level parallel or only very slightly converging. Foveolae on vertex not separated by interspaces, deeply impressed, with 17 - 22 μ m diameter and on parame-dian vertex usually without inner corona. Longitudinal sculpture on vertex relatively well developed but obscured by their merging with strong foveolar margins. Median vertex and frontal laminae finely longitudinally carinulate; clypeus with few longitudinal rugae. Whole mesosoma usually with well-developed microreticulum, but less strong than in *C. nuda*; samples with weak mesosomal microsculpture, meaning mildly shining overall surface appearance, may occur locally throughout the range. Metapleuron laterally longitudinally rugulose. Surface of 1st gaster tergite completely glabrous, a delicate microreticulum, as present in *C. nuda* and *C. paranuda*, is absent, but fragmentary reticulate structures may occur. Metanotal groove more or less shallow. Spines short and blunt. Petiole narrow, PEW/CS 0.265, node slightly longer than wide. Postpetiole relatively narrow, roughly hexagonal in dorsal aspect, with completely flat sternite, and distinctly lower than petiole, PEH/PPH 1.146 ± 0.034 [1.057 - 1.256]. Colour variable. Typically, dorsal head dark brown, mesosoma and waist orange brown, gaster dark to blackish brown. Lighter brown or, on the other hand, concolorous blackish brown samples may locally occur throughout the range.

Morphometric data of 103 Palaearctic, W Oriental, and Ethiopic workers:

CS 516 ± 21 [460, 568], CL/CW 1.181 ± 0.021 [1.126, 1.224], SL/CS 0.813 ± 0.012 [0.787, 0.841], PoOc/CL 0.446 ± 0.009 [0.426, 0.467], EYE 0.233 ± 0.005 [0.222, 0.246], dFOV 18.2 ± 1.0 [15, 20], FRS/CS 0.265 ± 0.008 [0.248, 0.286], SPBA/CS 0.269 ± 0.010 [0.239, 0.296], SP/CS 0.090 ± 0.014 [0.047, 0.119], PEW/CS 0.268 ± 0.011 [0.239, 0.298], PPW/CS 0.487 ± 0.014 [0.458, 0.533], PEH/CS 0.331 ± 0.008 [0.309, 0.350], PPH/CS 0.288 ± 0.009 [0.271, 0.318], PEW/PPW 0.553 ± 0.021 [0.486, 0.616], sqrtPDG 3.73 ± 0.29 [3.15, 4.64], PLG/CS 6.44 ± 0.43 [5.43, 7.73] %, MGr/CS 2.20 ± 0.50 [1.1, 3.4] %.

Morphometric data of 36 American workers:

CS 508 ± 18 [474, 538], CL/CW 1.188 ± 0.016 [1.159, 1.224], SL/CS 0.812 ± 0.010 [0.792, 0.849], PoOc/CL 0.450 ± 0.006 [0.436, 0.461], EYE 0.231 ± 0.005 [0.223, 0.241], dFOV 16.6 ± 0.8 [15, 18], FRS/CS 0.268 ± 0.006 [0.255, 0.277], SPBA/CS 0.266 ± 0.008 [0.251, 0.281], SP/CS 0.089 ± 0.011 [0.054, 0.108], PEW/CS 0.254 ± 0.011 [0.233, 0.287], PPW/CS 0.483 ± 0.009 [0.465, 0.508], PEH/CS 0.325 ± 0.008 [0.313, 0.341], PPH/CS 0.285 ± 0.006 [0.271, 0.296], PEW/PPW 0.525 ± 0.017 [0.494, 0.565], sqrtPDG 3.72 ± 0.23 [3.35, 4.32], PLG/CS 6.23 ± 0.21 [5.73, 6.78] %, MGr/CS 1.88 ± 0.47 [1.1, 3.0] %.

Gyne (Fig. 38, Tab. 17): Head of medium length, CL/CW 1.171. Postocular index large, PoOc/CL 0.434. Occipital margin straight or weakly concave. Frontal carinae diverging caudad. Head sculpture comparable to worker. Whole dorsal area of mesosoma densely and deeply foveolate; lateral area of mesosoma with longitudinal rugosity superimposing the microreticulum. Spines short and blunt. Shape of waist similar to worker but segments slightly wider and higher. Postpetiole significantly lower than petiole, PEH/PPH 1.154 ± 0.036 [1.089, 1.230]. Dorsal area of head, dorsal area of mesosoma, and gaster in typical case dark to blackish brown, lateral area of mesosoma and petiole lighter brown. Concolorous dark brown or lighter brown specimens may occur. For morphometric data of 46 gyness see Tab. 17.

Comments: The cosmopolitan *C. mauritanica* is one of the most abundant and most widely distributed *Cardiocondyla* species of the world and comprises about 12 % of all investigated samples. It is mainly a species of semi-deserts and other xerothermous habitats. Throughout the cosmopolitan range of *C. mauritanica* only minor variation in morphometry is detectable. *C. mauritanica* specimens from India (Punjab, Himachal Pradesh) have a slightly narrower postpetiole and slightly shorter spines. Furthermore, there is a certain trend from NW Africa east to India to have the petiole node lower and more rounded in profile (not quadrate as in the Tunisian type population).

The Old World population and the American population (the latter has been named *C. ectopia*) are almost identical in body shape, surface structures, and morphometry. In both workers and gyness the American specimens are fully within the range and very close to the mean values of Old World *C. mauritanica* though weak statistic differences are detectable in worker petiole width and strength of sculpture (see above). Conspecificity is further indicated by the high similarity of the characteristic ergatoid males from typical *C. mauritanica* and *C. ectopia* populations and by mDNA data (Trindl and Heinze, pers. comm., October 2002).

10.22 *Cardiocondyla mauritanica* FOREL, 1890, morph B

Investigated material: Egypt: Sinai: Ein Chadjiah, 1968.04.23, 1 worker; Spain: Granada: Motril, 2000.04 (leg. Heinze), 11 workers out of four nests of typical *Cardiocondyla mauritanica*.

Description: Worker (Fig. 34, Tab. 9): Differing from typical *C. mauritanica* by following characters: Head shorter, CL/CW 1.148. Occipital margin as a rule more excavated. Anteromedian clypeal margin between lateral major setae slightly concave. Median and paramedian areas of vertex densely longitudinally carinulate, interspaces of carinulae with foveolae of 17 - 20 μm diameter. Mesosomal sculpture more reduced.

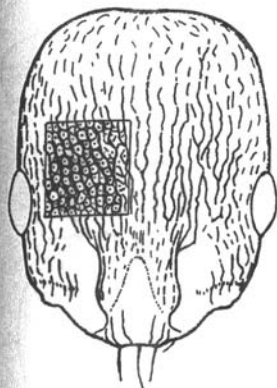
Propodeal spines reduced to rectangular or obtusely angled corners. Dorsal propodeal profile sloping down in posterior half. Waist segments more shining. Petiole much wider and higher, in lateral view with only slightly concave anterior profile and more narrowly rounded dorsal profile, petiolar spiracle frequently situated on high conical tubercle. Postpetiole wider and higher, with more rounded sides in dorsal view (not roughly hexagonal as in typical *C. mauritanica*), spiracle frequently situated on small conical tubercle. Head and postpetiole dark brown, mesosoma and waist light-orange brown, gaster blackish. For morphometric data of 12 workers see Tab. 9.

Tab. 2: Morphometric data of the cosmopolitan population of *Cardiocondyla mauritanica* and of normal and aberrant specimens in a local population from Motril, S Spain. Means are significantly different for: * $p < 0.01$, ** $p < 0.002$, *** $p < 0.001$, **** $p < 0.0001$.

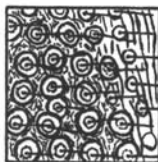
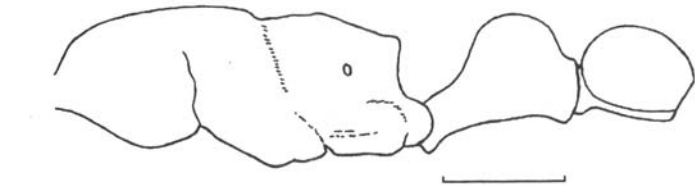
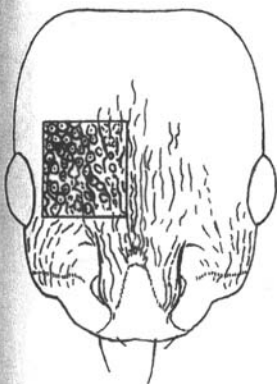
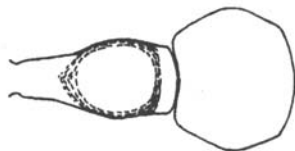
	morph B Motril (n = 11)	p	normal morph Motril (n = 12)	normal morph cos- mopolitan (n = 132)
CL	539 ± 13 [514, 565]	***	563 ± 16 [536, 581]	556 ± 22 [499, 612]
CL/CW	1.148 ± 0.020 [1.115, 1.182]	***	1.187 ± 0.023 [1.132, 1.216]	1.183 ± 0.020 [1.126, 1.224]
SL/CS	0.807 ± 0.015 [0.787, 0.833]		0.809 ± 0.013 [0.788, 0.827]	0.813 ± 0.011 [0.787, 0.849]
PoOc/CL	0.424 ± 0.007 [0.417, 0.441]	****	0.446 ± 0.007 [0.430, 0.454]	0.447 ± 0.008 [0.426, 0.467]
EYE	0.230 ± 0.005 [0.220, 0.237]		0.230 ± 0.004 [0.225, 0.239]	0.232 ± .005 [0.222, 0.246]
dFOV	17.9 ± 1.1 [16, 20]		17.6 ± 0.9 [17, 19]	17.8 ± 1.2 [15, 20]
FRS/CS	0.261 ± 0.006 [0.254, 0.272]		0.261 ± 0.010 [0.248, 0.283]	0.265 ± 0.007 [0.248, 0.286]
SPBA/CS	0.276 ± 0.011 [0.263, 0.301]	*	0.264 ± 0.010 [0.252, 0.293]	0.268 ± 0.010 [0.239, 0.296]
SP/CS	0.064 ± 0.006 [0.055, 0.079]	****	0.083 ± 0.010 [0.067, 0.105]	0.091 ± 0.013 [0.047, 0.119]
PEW/CS	0.309 ± 0.017 [0.279, 0.338]	****	0.268 ± 0.010 [0.251, 0.290]	0.265 ± 0.013 [0.233, 0.298]
PPW/CS	0.519 ± 0.016 [0.493, 0.545]	***	0.494 ± 0.012 [0.476, 0.516]	0.485 ± 0.012 [0.458, 0.533]
PEH/CS	0.353 ± 0.011 [0.339, 0.378]	****	0.333 ± 0.007 [0.325, 0.345]	0.329 ± 0.008 [0.309, 0.350]
PPH/CS	0.303 ± 0.009 [0.291, 0.317]	**	0.291 ± 0.009 [0.282, 0.313]	0.287 ± 0.008 [0.271, 0.318]
PEW/PPW	0.594 ± 0.022 [0.567, 0.627]	****	0.543 ± 0.017 [0.519, 0.569]	0.546 ± 0.024 [0.485, 0.615]
sqrtPDG	4.07 ± 0.26 [3.69, 4.50]		3.76 ± 0.35 [3.30, 4.44]	3.73 ± 0.27 [3.15, 4.64]
PLG/CS [%]	7.17 ± 0.27 [6.58, 7.62]	***	6.47 ± 0.43 [5.81, 7.51]	6.37 ± 0.39 [5.43, 7.73]
MGr/CS [%]	2.26 ± 0.59 [1.3, 3.2]		2.36 ± 0.49 [1.7, 3.2]	2.10 ± 0.51 [1.1, 3.4]

Comments: Except for one isolated worker specimen from the Sinai Peninsula, the *Cardiocondyla mauritanica* morph B specimens were found together with normal *C. mauritanica* workers in (at least) 4 out of 17 laboratory colonies collected near Motril/Spain in April 2000 by Juergen Heinze. Tab. 2 shows the local population of *C. mauritanica* from Motril to be almost identical with the cosmopolitan population in any character while morph B significantly differs in a number of characters.

It is not clear if this intranidal associations of two well-different worker morphs represent a normal situation, or if they could represent different species. Morph B specimens show peculiarities suggesting developmental irregularities leading to the expression of abnormal characters and of intercaste characters. Including the sample from Sinai, the mesosoma shows in 9 out of 13 specimens a promesonotal suture and in 5 out of 13 specimens rudimentary or less reduced metanotal structures and the orifice of the waist spiracles is situated on abnormally exposed, conic tubercles. These traits suggest morph B more likely to represent a mutant or epigenetic modification rather than being a different species. It may be a rare mutant that is abundant in the population of Motril or a modification induced by environmental factors during transport and rearing of the laboratory nests. However, it is difficult to call form B as ordinary intercaste. Intercastes are not rare in many *Cardiocondyla* species, but in contrast to the morph B example, no obvious deviations in surface structures, or head and waist shape were seen in all these cases. The case remains mysterious.



33 mauritanica



34 mauritanica morph B

