

**CONTRIBUTION TO THE KNOWLEDGE OF THE GEOGRAPHICAL
DISTRIBUTION OF NEW AND LITTLE KNOWN FORMS OF THE
SPECIES *PROCRUSTES CORIACEUS* L.
(COLEOPTERA, CARABIDAE).**

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On the basis of the determination of the material of the geographical species *Procrustes coriaceus* L. from the collections of the Entomological Division of the National Museum in Prague, represented here by about 3.000 specimens, I give in the present paper a description of some new geographical forms most of which were collected by members of the excursions of the Entomological Division to the Balkan Peninsula, further from the collections of Dr Št. Jureček - H. Jurečková and from the large carabidological collections of Dr Štěrba which he recently has given to the Entomological Division.

The new forms here described come mostly from areas in which representatives of the species *Procrustes coriaceus* L. had not yet been found. Thus they supplement not only our knowledge of the geographical distribution, but extend also our knowledge of the morphological and taxonomic properties of this large geographical species besides contributing to our knowledge of the historical evolution of the different geographical forms. These new forms also throw some light on the history of the migration and shifting of the fauna in the former Southern and Northern Aegean as summarised synoptically at the end of this paper. When I determined the Museum material I found that some forms of the species *Procrustes coriaceus* L. are not correctly identified in BREUNING'S „Monographie der Gattung Carabus“ 1932—1937. This applies chiefly to the forms of the group of the geographical race *cerisyi* DEJ., especially to the forms related to the natio *vicinus* WALTL.

In order to avoid complicating the already sufficiently intricate question of the synonyms of especially the Dinaric race described by DEJEAN in 1826 as *Procrustes rugosus* I use for this race the designation *Pr.*

coriaceus rugosus DEJ. in the same sense as it is used by GÄNGELBAUER (1892), REITTER (1895), APFELBECK (1904), MÜLLER (1926) a. o. in their systematic works. BREUNING 1937, who regarded the name *rugosus* DEJ. as a nomen praeoccupatum for *Carabus (Macrothorax) rugosus* FABR. (1792) used for the chief Dinaric race the designation *excavatus* CHARP. (1825), which SCHAUM considered a synonym of DEJAN's *rugosus*. But according to JEANNEL 1941 *excavatus* CHARP. is in reality the Pyrenean race of the species *C. coriaceus* L. CSIKI 1946 (p. 115) used for the main Dinaric race the designation *spretus* DEJ. (1826), but DEJEAN's *Pr. spretus* (described simultaneously with *Pr. rugosus*) is a morpha belonging to the sphere of the race *coriaceus* s. str. REITTER (1882) described from Bosnia and the Hercegovina *Pr. proximus* which is a transition form between the race *rugosus* DEJ. and forms close to the race *coriaceus* s. str. GEHN's (1885) *dalmatinus* is taxonomically a morpha formed by the mixing of the races *rugosus* DEJ. and *joniensis* BR., and thus also this designation cannot be used for the chief Dinaric race.

The types and paratypes of all newly described forms are deposited in the entomological collections of the National Museum in Prague.

***Procrustes coriaceus rugosus* m. *pindicola* m. n.**

Small mountain form from the northern part of the Pindus, from Malakassion, and from the Zygos. Length 27—29 mm. By its whole habitus it is very similar to the race *rugosus* DEJ. s. str., but it is smaller, slimmer, the shield is narrower and more attenuated posteriorly, the sculpture of the elytra is distinctly flatter than in *rugosus* s. str., quite analogous as in m. *nitidior* RTRR. from the Island of Lessina.

Holotype ♂ Malakassion, northern Pindus, VI. 1938 Mařan legit. *Allotype* ♀ Dutschimi on the ridges of the Zygos, about 2000 m. above sea level, VI. 1938 Mařan legit. In coll. mus. nat. Pragae.

***Procrustes coriaceus rugosus* m. *olympicola* m. n.**

Mountain form from the higher altitudes of Mt. Olympus in Thessalia, belonging to the race *rugosus* DEJ. By the shape of the body strongly reminiscent of m. *dalmatica* GEH., but flatter, with a much smoother sculpture of the elytra similar to m. *nitidior* RTRR. and the above mentioned m. *pindicola* m. It differs from the latter by its greater size, flatter shape of body, narrower and longer, at the sides more evenly rounded, towards the base less attenuated pronotum. By the shape of its body it is also reminiscent of the form *foudrasi* m. *coraxensis* BEHEIM et BREUN., but the type of the sculpture of the elytra is evidently linked to the race *rugosus* DEJ., which penetrated Mt. Olympus from the north, probably in the Ice Ages, and which is here today isolated at higher mountain altitudes.

Holotype ♂ Mt. Olympus in Thessalia, 6. VI. 1937, found by me at an altitude of about 2600 m., in the saddle below the summit of Mt. Olympus. In coll. nat. mus. Pragae.

Remark: *Procrustes coriaceus* is obviously rare in the area of Mt. Olympus; the above-mentioned type m. *olympicola* m. is the only speci-

men I found during my fortnight's stay on Mt. Olympus. In the literature there is only one report, by GANGLBAUER, of 1888 on a flat specimen from the Thessalian Olympus, which according to GANGLBAUER corresponds to MOTSCHULSKY's description of *Procrustes deplanatus*, and which GANGLBAUER placed still to the race *foudrasi* DEJ. just like the specimens from Korax recently described by BEHEIM and BREUNING as *m. coraxensis*. It is difficult to decide whether the Olympian form is really identical with MOTSCHULSKY's description of *Procrustes deplanatus* (Étud. ent. 1859, pp. 125—126), though in many respects MOTSCHULSKY's diagnosis really corresponds also to my specimen from Mt. Olympus. „L'insecte est un mâle et ressemble au *Pr. graecus*, mais son corselet est plus carré, moins rétréci vers les extrémités, les angles postérieurs plus relevés; les antennes plus longues; les élytres plus courtes, moins rétrécies antérieurement, les angles huméraux plus distincts, l'extrémité plus acuminée, la ponctuation plus rugueuse, plus opaque. Peut-être aussi une des variétés du *vicinus* FRIV., à élytres beaucoup plus fortement rugueuses et plus déprimées, mais dans tous les cas fort remarquable.“ To this GANGLBAUER remarks that MOTSCHULSKY probably took the typical *foudrasi* for *graecus* as may be gathered from his remark on the shape of the shield. In any case the name *deplanatus* is a nomen praecoccupatum for *Carabus deplanatus* FISCH. (FISCHER von WALDHEIM Ent. Ross. 1823, p. 57); and this Olympian mountain form which obviously belongs to the ssp. *rugosus* cannot be placed to the race *foudrasi* DEJ., as GANGLBAUER did, so that its designation is necessary in any case.

***Procrustes coriaceus rugosus n. ioniensis m. albanicus* BREUN.**

BREUNING described this form in the Mitt. Münch. Ent. Ges. XXXIII 1943, p. 20: „Kleine Gebirgsform des *ioniensis* BREUN. von 27—30 mm Länge aus den Bergen des südlichen Albanien. Typ ♂ Alb. Maj. Tartarit, ♀♀ Sinanai.“

The specimens from Janina (Dr. Purkyně legit) and 1 ♂ from Argirokastron differ from the specimens of the race *ionensis* BREUN. from the Island of Corfu by the flatter sculpture of the elytra and the broader, towards the base less attenuated shield, with mostly less projecting posterior corners. Length 30—34 mm. The small specimen of this form (♂ Janina 30 mm.) corresponds to the description of *m. albanicus* BREUN. I believe it to be best to place to this form described as *m. albanicus* also the larger specimens from Southern Albania, so that this form is a vicariating subforma of the insular *ioniensis* just as it is a subrace of the South Italian form *mediterraneus* BORN. documenting the late connection of continental Southern Italy with the neighbouring part of the Balkan Peninsula across the area of the Island of Corfu.

***Procrustes coriaceus cerisyi n. foudrasi m. coraxensis* BEHEIM et BREUN.**

BEHEIM et BREUNING l. c. pp. 19—20 described this form: „Kleine Gebirgsform des *foudrasi* DEJ. Halsschild schmaler, die Seiten zur Basis stärker verengt. Flügeldecken schmaler und gewölbter, Skulptur deutlicher. Länge 26—30, Breite 9 mm, Typus Koraxgebirge.“

To this form belong also the specimens from Veluchi (Tymphrestos) VI. 1938 Mařan legit in coll. mus. nat. Pragmae. Further it is closely approached by some specimens from the Chelmos Mts. in Northern Peloponnesus (documentary specimen ♂ Kalavryta IV. 1936 Mařan legit), whereas the larger specimens from lower altitudes at Kalavryta correspond to the race *foudrasi* DEJ. s. str.

***Procrustes coriaceus cerisyi* m. emgei m. oetensis m. n.**

Smaller and more vaulted than *foudrasi* s. str., with a more distinct, and coarser sculpture of the elytra; shield on the sides evenly rounded-slightly attenuated towards the base. Length 28—32 mm., width 10—11 mm. From m. *coraxensis* BEHEIM et BREUN. it differs by the broader shape and especially by the broader shield less attenuated towards the base and by the broader elytra more strongly rounded at the sides. By these features it approaches the race *emgei* GANGLB. But it strikingly differs from the typical specimens of this race from Attica by the much coarser sculpture of the elytra, its lesser size, etc. The characters of this form seem to be considerably constant and uniform.

Holotype ♀ Oeta, Graecia IV. 1936, Mařan legit. Further specimens 6 ♀♀ Oeta IV. 1936, Mařan et Táborský legit. In coll. mus. nat. Pragmae.

***Procrustes coriaceus cerisyi* n. vicinus WALT.**

WALT. described this form as a separate species from the neighbourhood of Constantinople and from „the Balkans“. BREUNING (Monogr. p. 140) refers to this form as follows: „Flügeldecken ganz seicht und flach gerunzelt, ganz wie bei *subrugosus*; die Primärgrübchen deutlich. Halsschild breit, die Seiten gleichmässig gerundet (wie bei *kindermannii* WALT.) 28—35 mm.“ He places to it in addition to specimens from Eastern Bulgaria (Silistria, Svishtov, Tirnovo, Stara Zagora, Sliven) also specimens from the Dobruja (described by BORN as *dobrudjensis*) and 1 ♀ specimen from the Kalofer Balkan in the entomological collections of the National Museum in Prague, which I describe below as n. *pseudofurax* m. n.

This wide conception of the race *vicinus* WALT. is certainly not correct, and it appears that the true *vicinus* WALT. remained unknown to BREUNING, as BREUNING's description of the race *vicinus* applies obviously to m. *dobrudjensis* BORN. Thus it is necessary to return to WALT.'s original description in Isis 1838, p. 452, which runs: „*Procrustes vicinus* WALT. (FRIVALDSKY in lit.) niger, thorace rotundato, elytris glabris, punctis singulis ornatis. De même taille que le précédent (*kindermannii*). La tête est assez rude, mate, le thorax bien rond, relevé sur le côté vers l'arrière, avec une faible ligne au milieu, n'arrivant pas tout à fait à la base, à rides fines transversales; les élytres ayant un luisant de cuir on comme si elles étaient grasses, lisses et non verruqueuses, avec très peu de points profonds, entremêlés de fovéoles un peu plus grandes, mais pas aussi régulières que l'on peut les regarder comme placés en lignes longitudinales. Cette espèce ressemble le plus au *Procr. foudrasi* qui pourtant est plus étroit et a les points des élytres plus distincts et rangés en lignes.“

With this description of WALTZ's agrees perfectly 1 specimen ♂ of the Museum collections from the locality of Silivri Marmara, therefore from the area at Constantinople, which can be regarded with certainty as *m. vicinus* WALTZ. It is a form which differs from *m. dobrudjensis* BORN by the completely non-rugulose elytra with a distinct granulation in the posterior part and a still more evenly rounded shield with rounded posterior corners. Length 27 mm. This race is connected geographically with a number of races which have their origin in the southern Aegeis and inhabit present Northern Greece. They are *n. štorkáni* *m. n.* from Alexandroupolis, *n. xanthiensis* *m. n.* from Xanthi, whose descriptions I give below and which farther west are connected with the race *emgei* GANGLB.

In the vicinity of Constantinople, where the race *kindermanni* WALTZ predominates, *Procrustes coriaceus cerisyi* *n. vicinus* is very rare and has remained unknown to most authors. To the SE, at Gallipoli, this race penetrating from the European continent mixes with *n. cerisyi* s. str. penetrating from the SW of Asia Minor. This race of Asia Minor is characterised by a narrower shield and more elongated, laterally more moderately rounded elytra. A transition specimen between *n. vicinus* and *n. cerisyi* from Gallipoli is in the museum collections.

Procrustes coriaceus cerisyi* *n. štorkáni* *m. nov.

This race is very close to *n. vicinus* WALTZ to which it attaches itself also geographically. The shield is on the sides more strongly rounded, but its posterior corners are less rounded, more pointed, and the elytra are somewhat more closely punctate than in *n. vicinus* and distinctly finely granular, especially in the posterior part. The primary pits are indistinct. From the race *hopfgarteni* KR., whose occurrence lies farther to the NW, it differs by the shorter and broader shape of the body, the broader, on the sides more evenly rounded shield, the more vaulted, more evenly rounded elytra, which are widest in about the middle, flat, with a still smoother sculpture than in *hopfgarteni*, with indistinct primary pits. By its whole habitus it is reminiscent of *n. emgei* GANGLB. from which it differs by the somewhat slimmer shape of the body, the closer punctation, and the finely granular elytra without distinct primary pits. Length 32 mm. I collected this new natio on 2. V. 1937 in the vicinity of Alexandroupolis in SE Greece.

Holotype ♂, Alexandroupolis Graec. or. 2. V. 1937. *Allotype* ♀, from the same locality. In coll. mus. nat. Pragae.

Remark: Farther north this race mixes with *n. hopfgarteni*. I found a transition specimen on 3. V. 1937 at Ferré near Marica (♂ in coll. mus. nat. Pragae).

Procrustes coriaceus cerisyi* *n. xanthiensis* *m. n.

In stature strikingly resembling large specimens of the race *foudrasi* DEJ. from the Peloponnesus. Shield towards the base strongly attenuated, elytra longitudinally oval, with a similar smooth structure as in *n. štorkáni*, and the primary pits indistinct just as in this form. This new natio from the vicinity of Xanthi in Northern Greece combines obvi-

ously features of the race *hopfgarteni* with features of *n. emgei* GANGLB., whose limit of distribution lies farther west in Thessalia. It is so striking by its size, by its towards the base strongly attenuated shield, and by the smooth and mat sculpture of the elytra that it deserves its separate designation. Length 36,5 mm.

Holotype; ♀ Xanthi, Graecia sept. IV. 1931, Dr Štěpán Jureček legit. In coll. mus. nat. Praeae.

Procrustes coriaceus cerisyi m. bodemeyerianus m. n.

The specimens described by LAPOUGE 1924 from Akşehir and Konya as var. *bodemeyeri* approach by their general habitus considerably the race *cerisyi* s. str. and differ very strikingly from the strongly vaulted and broad specimens of *n. mopsucrenae* PEYR. to which it was placed by BREUNING. As, however, the name of *bodemeyeri* is a nomen praecoccupatum for *Pr. (Lamprostus) torosus bodemeyeri* LAP. (1914), I change the designation of this morpho to *bodemeyerianus m.*

Remark: *Procrustes coriaceus cerisyi n. mopsucrenae* was described by PEYRON, 1858, from the vicinity of Tarsus under the southern slopes of the Taurus. It is a nation characterised by the very strikingly strongly vaulted body and the flat sculpture. Four specimens of this geographical race are in the collections of the Entomological Division of the National Museum from the vicinity of Mersin, i. e. from a locality lying unfar Tarsus under the southern slopes of the Taurus. At Tarsus itself, e. g. at Külek, and on the northern slopes of the Taurus occur less typical, narrower and less vaulted specimens of the same race.

Procrustes coriaceus kindermanni n. pseudofurax m. n.

Very interesting race from the Kalofer Balkan at Karlovo. Its morphological features evidently link it with the race *furax* CSIKI, which it resembles in its general habitus, shape of the shield, and sculpture of the elytra. But the shield is still flatter than in this race, the lateral border is posteriorly strikingly thickened, and the sides of the shield are posteriorly, almost not raised. The basal pits are flat, wrinkly punctate, in the centre the shield is almost smooth, without punctation, the posterior corners of the shield project posteriorly a little more than in the race *furax*. The sculpture of the elytra is flatter, punctation anteriorly sparser and finer, in the middle of the elytra and on the sides the sculpture is, however, distinctly wrinkly, quite similar to that of the race *furax*. The primary pits are less distinct. BREUNING placed this form from the Kalofer Balkan (proof material from the Kalofer Balkan VI. 1933 Mařan legit) to the race *vicinus*. But the true *vicinus* WALT from the vicinity of Constantinople is an entirely different form with entirely smooth, unwrinkled elytra and evenly rounded sides of the shield. *Pr. coriaceus vicinus* sensu BREUNING is identical with the race *dobrudjensis* BORN. The race *pseudofurax m.* differs from it by its greater size, much more wrinkly elytra, posteriorly more attenuated shield, thicker shield border, and almost unraised margin of the shield anterior to the posterior corners; the much more coarsely punctate sides of the sternum (this punctation is still more distinct and coarser than in the race *furax* and in most specimens of the typical *Pr. coriaceus* from Bohemia).

It appears that this form from the Kalofer Balkan is close to the original form, from which the race *kindermanni* WALTZ developed in the vicinity of Constantinople and in the adjoining part of Asia Minor, and which our new natio resembles considerably. It differs, however from it by the much broader shape of the body, the broader shield border, the deeper punctation of the elytra, and the much coarser punctation of the sternum. It is evidently an independent geographical form standing with its morphological features between n. *furax* CSIKI and ssp. *kindermanni* WALTZ.

Holotype; ♀ VI. 1933 Kalofer Balkan, Mařan legit. In coll. mus. nat. Pragae.

***Procrustes coriaceus kindermanni* WALTZ.**

This geographical race was described by WALTZ from the vicinity of Constantinople in the journal *Isis* already in 1838. The specimens from the vicinity of Constantinople really agree with WALTZ's original description. In the museum collections are 12 specimens from the vicinity of Istanbul, 3 specimens from the vicinity of Silivri, 1 specimen from the Island of Prinkipo, and a number of specimens labelled Turcia or Asia Minor without stating the locality. On the coast of European Turkey n. *kindermanni* reaches in typical specimens as far as Silivri and from there along the southern slopes of the Strandža Planina to Edirne (proof specimen in the collections of the Entom. Dept. of the Nat. Museum, (Cf. Mařan, Sbor. ent. odděl. Nár. musea XXVI, 1950). From the area of Western Anatolia the Museum collections contain specimens from the Alem Dağ (Bodemeyer & Dr Št. Jureček lgt.) These specimens have mostly a slimmer shape of the body. Further 4 specimens from the Zonguldak (coll. Štěrba and coll. Duchoň), which is so far the easternmost locality on the north coast of Asia Minor where this form lives together with *Procrustes chevrolati thirki* CHD.

In the vicinity of Brussa and at the foot of Mt. Olympus in Asia Minor (Ulu Dağ) n. *kindermanni* (12 proof specimens in coll. Jureček) occurs in a transition form to m. *olympica* GEH. (= *brussensis* GANGLB.), which partly forms a transition to the race *cerisyi* and arose probably from the mutual interbreeding of these two geographical races.

Morpha *olympica* GEH. occurs mostly in the higher altitudes of the Ulu Dağ (10 proof specimens in the collections of the Ent. Dept. of the Nat. Museum 1928 and 1931 Dr Štěpán Jureček and H. Jurečková lgt.), and it is connected by a complete series of transitions with the larger specimens of the lower altitudes in the vicinity of Brussa, which differ only little from the specimens from the more northern localities of the typical *kindermanni*. Thus it is better to place m. *olympica* GEH. to the race *kindermanni* and not to the race *cerisyi* as BREUNING did.

***Procrustes coriaceus kindermanni* m. *caraboides* WALTZ.**

In the area of the Strandža Planina proper and on its northern slopes via Zeitinburun to Burgas and Varna the race *kindermanni* occurs in specimens with much more shiny elytra with a coarser sculpture, and more strongly rounded at the sides. BREUNING, who inclu-

ded *P. caraboides* WALTZ as a synonym in the race *kindermanni*, placed these specimens after the sculpture of the elytra partly to the race *kindermanni* s. str. and partly to n. *vicinus* WALTZ, which, however, he identified wrongly, as I have already pointed out above. I believe that it is more correct to retain for this form, which occurs especially abundantly in the oak forests at Zeitinburun in populations with very constant characters, the designation of *caraboides* WALTZ, as also GANGLBAUER (1896) and APFELBECK (1904) did, even though the identification of this form after the short inaccurate description of WALTZ is considerably problematic.

Materialia examinata: 36 ex. Zeitinburun Bulg. orientalis VI. 1933 and VII. 1934 Dr Mařan, Dr Táborský and Dr Purkyně lgt. 4 ex. Burgas: 1 ex. Varna VII. 1934 Dr Táborský lgt.

This form arose indubitably by the interbreeding of two geographical races, the original form, from which in the present European Turkey the race *kindermanni* developed, and a race of South Aegean origin corresponding to the original form of ssp. *cerisyi* whose relicts are on the European shore n. *vicinus* and n. *řtorkáni* and north of the distribution of n. *caraboides* in the Dobrudja n. *dobrudjensis* BORN. The specimens from řumen and Sliven collected by Rambousek VI. 1913 form the transition between n. *caraboides* and n. *dobrudjensis*.

Zoogeographical and Phylogenetic Conclusions.

On the basis of the morphological differences and on the basis of the geographical principle in taxonomy BREUNING made order out of that chaos that had reigned in the descriptions of the different geographical forms of the species *Procrustes coriaceus* L. (see his „Monographie der Gattung Carabus L.“, 1931—1937). On the basis of the principle introduced by SEMENOV TIANSHANSKY (1910) for lower taxonomic units than the species, BREUNING distinguished in this species 4 principal geographical races (subspecies), to which he joined the corresponding subraces and (nativa) local morpha.

When we evaluate the 4 principal subspecies of the species *Procrustes coriaceus* L. as they were established by BREUNING from the point of view of the historical development of these forms, we see that they really correspond to certain centres of evolution of Tertiary Europe and Anterior Asia, and that thus their origin can be placed already in the Tertiary period. They are ssp. *coriaceus* L., ssp. *rugosus* DEJ., ssp. *kindermanni* WALTZ, and ssp. *cerisyi* DEJ., of which the first three have their origin in the area of the Northern Aegean and the last in the area of the Southern Aegean. The beginning of the differentiation of the first three geographical races occurred in the Tertiary refugia of Europe, viz. ssp. *coriaceus* in the Upper Tertiary Carpatho-Alpine refugium, ssp. *proximus* in the Dinaric refugium, and the differentiation of ssp. *kindermanni* closely connected phylogenetically with ssp. *coriaceus* took probably place in the mountains of the eastern Balkans at the end in the Tertiary and in the course of the Quaternary. After the disappearance of the barrier between the individual refugia the areas of the different geographical forms came to be connected and many forms interbred and formed mixed populations

The history of the origin of the subraces and local forms coming into being under the influence of the outer conditions of the biochore in the widest sense of the word in this northern area of distribution was closely connected with the climatic changes in the Quaternary, when the impact of the glacial periods created barriers and isolated biochores suitable for the origin of these forms.

For the moment I leave out of consideration this complex history of the northern forms and of their migrations, with which I shall deal in more detail in a monograph soon to be published; here I wish to restrict myself only to the data and documents on the penetration of the South Aegean race *cerisyi* DEJ. into the area of the former Northern Aegean as shown by the material investigated.

The initial form of all geographical forms which we place today to the ssp. *cerisyi* DEJ. differentiated as said above in the area of the Southern Aegean at the time when this had still an island character and was separated by the transaegean channel from the Northern Aegean. After the disappearance of the transaegean channel in the Tortonian (cf. JEAN-NEL, La genèse des faunes terrestres, 1942) the way was open for the populations of this race to penetrate to the north to the Balkan Peninsula and to the Pannonian region as well as to the more northerly regions of present Anatolia. Their gradual penetration took probably place in several stages according to the variations of the climate and as the tectonic changes affecting the Aegean region during the Upper Tertiary and the Quaternary permitted it.

When we begin in the south of the Balkan Peninsula we see that the Peloponnesus is inhabited by the form designated as *Pr. coriaceus cerisyi* n. *foudrasi* DEJ., which is distributed over the whole of the Peninsula and in the south of the Island of Cerigo. North of the Peloponnesus the form nearest to the preceding one is m. *koraxensis* BEHEIM et BREUN. described from the Korax Mts. and reaching still into the Veluchi Mts. (Tymphrestos). Similar specimens are found in the northern Peloponnesus in the Chelmos Mts. at Kalavrita. Thus n. *foudrasi* DEJ. with m. *koraxensis* BEHEIM et BREUN. included has an areal distribution in the southern part of continental Greece as far as into the southern part of the Pindus Mts. as well as in the Peloponnesus. This distribution agrees in the main with the distribution of some other *Cara-bidae*, e. g. with the areal distribution of *Nebria taygetana* (cf. MAŘAN, „Le rôle important de la variation géographique des insectes pour les questions zoogéographiques et évolutives.“ Sbor. ent. oddělení Nár. Musea XXIII, 1945) and indicates that its differentiation falls in the time when the present Canal of Corinth did not exist and when the barrier of distribution of these species lay farther to the north.

Concerning the origin of m. *koraxensis* BEH. et BREUN. one can accept that it formed by interbreeding with populations of the Illyrio-Dalmatian ssp. *rugosus* DEJ., which penetrated from the north and where the area of distribution of ssp. *rugosus* DEJ. borders the geographical distribution of m. *koraxensis* to the NW. M. *koraxensis* inherited the coarser sculpture of the elytra from ssp. *rugosus* while in the other features the characters of n. *foudrasi* DEJ. predominate. In the SE and eastern part of continental Greece and in the adjoining islands occurs. n. *emgei* GANGLB., to which

belongs also *m. oetnensis* m. n. from the Oeta Mts., described above. This form, which originated similarly as *m. koraxensis* by the mixing and crossbreeding of two geographical forms, viz. *n. emgei* and members of *ssp. rugosus* DEJ., from which it inherited the coarser sculpture of the elytra, stabilised itself in the Oeta Mts. as a sharply defined local form. The origin of *n. emgei* GANGLB. has to be sought in the region of continental Greece to the NE of the former channel which separated the southern part of Greece from its present more northerly regions.

Populations of the initial Aegean race penetrated to the north and NE into the territory of present Macedonia, Bulgaria, Serbia (the present *n. hopfgarteni*), further into Bosnia and into the Banat, where *n. subrugosus* KR., stabilised itself especially characteristically in the Fruška gora.

Along the coast under the southern slopes of the Rhodope spurs these populations then penetrated to the east, as indicated by *n. xanthiensis* m. from the vicinity of Xanthi, which partly combines the features of *n. emgei* GANGLB. with features of *n. hopfgarteni* KR., and farther to the east *m. štokáni* m. from Alexandroupolis forming the transition to *n. vicinus* WALTL from the vicinity of Constantinople. The origin of these nations and local forms has to be sought in the isolated biochores formed by tectonic changes, marine invasions and climatic variations affecting the Aegeo-Pontic region in the last periods of the Tertiary and especially in the Quaternary, where the impact of the glacial periods caused specially thorough shiftings of the fauna. Farthest to the NE these forms belonging to *ssp. cerisyi* DEJ. penetrated to northern Bulgaria and to the Dobrudja where lives today *n. dobrudjensis* BORN., whose occurrence is, however, isolated from the continuous area of distribution of the area of occurrence of *ssp. kindermannii* WALTL, an endemic race of the eastern Balkans, Strandža Planina (*m. caraboides* WALTL) and the mountain regions of NW Anatolia. Phylogenetically *n. dobrudjensis* is a form of the race *cerisyi* mixed in part with *ssp. kindermannii*, in which the features of the race *cerisyi* DEJ. predominate.

In the other parts of the Southern Aegean the different nations and local forms differentiated on the one hand in the isolated biochores of the Aegean islands, remains of the continental connection with Asia Minor, and on the other hand, probably not before the Quaternary, also in the region of SW and W Asia Minor. From the Aegean insular forms we have *Procrustes coriaceus cerisyi n. cycladicus* BREUN. in the Cyclades (Island of Syra — transition specimens to *cerisyi* s. str. according to GANGLBAUER, and in the Islands of Andros and Tinos). In the Sporades (Rhodos, Karpathos, Kasos, Aramanthia) lives *n. impudicus*, and *n. icaricus* GANGLB. is an endemic form in the Islands of Samos and Nikaia. In Anatolia *n. cerisyi* s. str. links up with these insular forms. This race was originally described by DEJEAN from the Island of Mytilene; but as pointed out by BREUNING also the specimens from the Islands of Chios and Melos and the specimens from Smyrna (described by DEJEAN as *Pr. melancholicus*), Ephesus, Macri, the Lydian Taurus and from the Kuru Dag agree with it. A transition specimen between *n. cerisyi* s. str. and *n. vicinus* WALTL from Gallipoli is in the Museum collections. In the more easterly part of Anatolia south of the

ranges of the Taurus at Mersin and Tarsus the form *mopsucrenae* PEYR. differentiated, and must be considered an independent natio. In the region of Brussa the race *cerisyi* meets the ssp. *kindermanni*, which penetrated here from the north and mixed here with populations of this race, with the features of the race *kindermanni* distinctly predominating so that the mountain form from the Ulu Dag (Mt. Olympus in Asia Minor), m. *olympica* GEH. has to be placed to the ssp. *kindermanni* WALTZ.

The origin of the race *kindermanni* WALTZ which, as correctly pointed already by BREUNING, joins itself geographically and morphologically to sssp. *coriaceus*. especially to n. *furax* CSIKI, took probably place in the eastern region of the Balkan Mts. where its relict is today n. *pseudofurax* m. Whenever the climate became cooler, this form penetrated along the spurs of the Eastern Balkans via the Strandža Planina (where by mixing with the closely related populations of n. *vicinus* WALTZ m. *caraboides* WALTZ formed, with predominating features of the race *kindermanni*, and in the Dobrudja and the adjoining region of Bulgaria m. *dobrudjensis* BON. with predominating features of the race *cerisyi*) in to the region of Constantinople, where it is today the predominating form, and into the NW part of Anatolia, where at Zonguldak it reaches its easternmost limit and at Brussa its southernmost limit.

An interesting phenomenon, which we can observe also in other species of the genus *Procrustes* and in the representatives of the large genus *Carabus* in general, is that where it comes to the contact and mutual interbreeding of two geographical forms the populations are often exceptionally rich in specimens. This can be observed e. g. in Czechoslovakia in the area of Vlára and Trenčín, where natio *coriaceus* L. s. str. and n. *rugifer* KR. mix, and where it came to the formation of n. *pseudorugifer* SOK. The same is the case in the region of the Strandža Planina where n. *vicinus* WALTZ mixes with sssp. *kindermanni* WALTZ and forms here m. *caraboides* WALTZ represented e. g. on the Zeitinburun by a great number of specimens. The same phenomenon can be observed in the region at Rjeka and Trieste, where by the mixing of populations of ssp. *coriaceus* L. with representatives of ssp. *rugosus* DEJ. populations of m. *spreti* DEJ. rich in numbers have formed. Thus it seems that the interbreeding of geographical races leads to an increase in the fertility or at least to a greater resistance against unfavourable or harmful factors, and this could be used also in the methods of the biological fight against pests to increase the activity of the useful species.

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