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While studying the ants of the southwestern States I have been impressed with the series of unusually long hairs, or macrochætæ, which occur on the lower surface of the head and mandibles and on the anterior border of the clypeus in the workers and females of several species peculiar to the arid plains and deserts. Examination of the ants from similar localities in South America and from the still more arid regions of Africa, shows a prevalence of the same structures. There is also observable a tendency for these hairs to reach their greatest development in the species inhabiting the driest deserts. Although these structures have long been known to descriptive myrmecologists, no one, to my knowledge, has noticed the connection between their presence and a pronounced xerophily, or has endeavored to ascertain their function. These matters are of some interest, because the macrochætæ occur in several unrelated genera belonging to three of the five subfamilies of the Formicidæ, and therefore represent a striking example of convergent development. It is, furthermore, comparatively easy to account for the structures in question, as they are merely elongated and somewhat modified portions of the general hairy investiture of the ant's body.

Before treating of the function of these hairs and their occurrence in the various genera and subgenera, it will be advisable to give a general account of their arrangement. When most completely developed, they may be said to constitute four series, two paired and two unpaired as follows:

1. *Clypeal Macrochætæ.* — Although many ants have a fringe of long hairs or bristles on the anterior border of the clypeus, these are best developed in the desert species. They are curved downwards at their tips, are longest and most projecting on the free median portion of the clypeal border, and gradually grow shorter towards the lateral corners.

2. *Mandibular Macrochætæ.* — Both the dorsal and ventral surfaces of the mandibles in many ants are clothed with short, more or less projecting hairs, but the xerophilous species have in addition on each of the jaws, a ventral series of long and rather slender macrochætæ, which project downward and have their tips curved inward and sometimes upward. These hairs are longest on the bases and gradually become shorter towards the tips of the mandibles.

3. *Mental Macrochætæ.* — Some of the xerophilous species have a tuft of macrochætæ on the postero-median portion of the mentum, just in front of the anterior border of the gula. In one genus (*Ocymyrmex*) they extend backward and downward, in two others (*Myrmecocystus, Melophorus*) they project forward; in all cases their tips are turned forward or upward.

4. *Gular Macrochætæ.* — In most of the xerophilous species, these constitute the longest and most conspicuous hairs on the whole body. They are inserted, often in an arcuate series, on the posterior or lateral portions of the gula, are directed forward and downward and are often curved upward at their tips.[1]

As these various series of hairs or bristles together constitute a circumoral system, one is naturally inclined, on inquiring into their function, to suspect that there may be a connection between their development and some peculiarity in the feeding habits. It is true, to be sure, that these habits are apt to be highly specialized in desert ants. The natural and primitive food of ants consists of insects or the juices of plants, the latter collected either directly from the floral and extrafloral nectaries or indirectly after passing through the bodies of phytophthorous Homoptera (Aphididæ, Coccidæ, Membracidæ). But as insects and flowers are rare for long periods of the year in arid regions, many xero-

[1] The term *gula* is here used in the sense of Janet ("Recherches sur l'Anatomie de la Fourmi et Essai sur la Constitution Morphologique de la Tête de l'Insecte," Paris, G. Carré and C. Naud, 1900, 205 pp., 15 Pls.) as that portion of the cranial capsule which arises from the fused labial, maxillary and mandibular segments. It comprises the greater portion of the heavily chitinized antero-ventral integument of the head, and is divided into two parts by a median longitudinal suture, the external indication of the gular apodeme. In reality, as Janet has shown, the gular apodeme represents the whole labial and maxillary and the mesial portion of the mandibular segment of the cranium, so that the gula proper comprises not only the lateral, but also the larger portion of the mandibular segment.

philous ants have taken to harvesting and eating seeds. Others, like the honey ants (American species of *Myrmecocystus*, Australian *Camponotus* and *Melophorus*), still collect plant juices with avidity, but as such liquids are scarce or only temporarily abundant, they store them in the distensible crops of certain workers, which thus function as living bottles (repletes, or plerergates). Still other ants, like many *Myrmecocysti*, both in the Sahara and in the deserts of the southwestern States, have exaggerated the primitive entomophagous habit and have become very agile, predatory hunters.

As the circumoral macrochætæ occur in desert ants that have specialized in each of these three directions, it is difficult to detect any relation between the development of such structures and the character of the food. But inasmuch as the food of all ants really consists exclusively of liquids either imbibed directly or carefully expressed from moist solids, I was led at first to adopt the following hypothesis: When the mandibles are wholly or partially closed, the macrochætæ are seen to form a crate or lattice-work, enclosing a lenticular space on the ventral side of the head. A drop of liquid carefully introduced into this space by means of a fine pipette will fill it and hang securely suspended from the flat or concave gula, with the spherical surface supported by the hairs of the crate. This experiment led me to the opinion that the hairs might be used for one or both of two purposes: first, to retain regurgitated drops of liquid and prevent their falling to the earth while the ants are feeding their larvæ or one another; and second, to enable the ants to collect from the stones and desert plants drops of rain water and to carry these to their nests. The hairs would certainly seem to be admirably adapted to both of these liquid-saving functions. This hypothesis seemed to be confirmed by the following observation on our northern *Stenamma* (*Aphænogaster*) *fulvum*, published by Miss Fielde:[1] "I have observed that these ants, like the termites, are able to carry water for domestic purposes. They probably lap the water into the pouch above the lower lip and eject it at its destination. A hundred or two ants that I brought in and left in a heap of dry earth upon a Lubbock nest, during the ensuing night took

[1] "Further Study of an Ant," *Proc. Acad. Nat. Sci. Phila.*, 1901, pp. 521–544.

water from the surrounding moat, moistened a full pint of the earth, built therein a proper nest, and were busy depositing their larvæ in its recesses when I saw them on the following morning." Miss Fielde assures me that she has repeatedly observed this interesting occurrence, especially when the ants had larvæ or pupæ, to which contact with perfectly dry earth would, of course, soon be fatal. There is, therefore, nothing extravagant about the view that desert ants, living in very dry soil, might carry water in the macrochætal crate instead of in the crop or hypopharyngeal pocket.

In order to ascertain, if possible, the true state of affairs from the ants themselves, I requested Miss Augusta Rucker to send

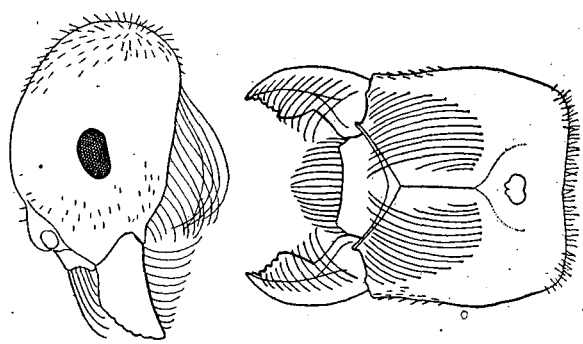

FIG. 1. *Pogonomyrmex barbatus* F. Sm.

me a number of living workers of the Texan harvester (*Pogonomyrmex barbatus* F. Smith var. *molefaciens* Buckley), a species with well-developed circumoral macrochætæ. The study of these insects in an artificial nest soon convinced me that my hypothesis, at least so far as this form is concerned, was erroneous. Though the ants were kept for several days without water and then given the liquid in small drops on the floor of their nest in imitation of the drops left by a shower on the stones and plants around the nests in their native environment, they were never seen to take it up into the macrochætal crate but simply lapped it up with their tongues. Protracted observation also proved that these ants never feed one another by regurgitation but that each worker partakes individually of the seeds, sugar, insects,

etc., brought into the nest. I had previously found that this species does not feed its larvæ by regurgitation but with pieces of seeds or insects.

Continuing my observation of the living harvesters I was soon led to what I believe to be the true function of the macrochætæ. Each of the fore legs, as in other Formicidæ, bears a well-developed strigil, or enlarged and pectinated spur (Fig. 2) which in the living insect is usually carried at an angle of about 70° with

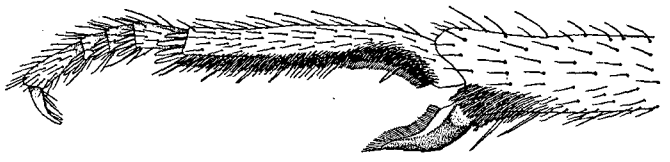

FIG. 2. *Pogonomyrmex barbatus*, fore tarsus, mesial side.

the long axis of the tibia. The tibia is furnished at its tip on the mesial side with a dense brush of blunt hairs and the metatarsus is curved outward at the base, with a regular comb of fine bristles at the concavity and a series of coarser and blunter bristles along its whole mesial border. The pectinated strigil may be opposed to the pectinated and concave base of the metatarsus, and is especially adapted for cleaning the antennæ, which are drawn through the orifice between the two combs.

McCook[1] has described and figured (Pl. XIV., Fig. 64) the fore leg of *P. molefaciens*. I quote the following from his detailed account of the toilet habits (pp. 127–129): "The ants engaged in cleaning their own bodies have various modes of operating. The fore legs are drawn between the mandibles, and, so far as could be ascertained, also through or along the lips, and then are passed alternately back of the head, over and down the forehead and face, by a motion which closely resembles that of a cat when cleansing with its paw the corresponding part of her head. Sometimes but one side of the head is cleansed, in which case the foot used is drawn through the mandibles or across the teeth of one mandible after every two or three strokes upon the face.

[1] "The Natural History of the Agricultural Ant of Texas, a Monograph of the Habits, Architecture and Structure of *Pogonomyrmex barbatus*." Author's edition. *Acad. Nat. Sci. Phila.*, 1879.

These strokes are always made downward, following thus the direction of the hairs." . . . "Not only the fore pair, but also the other legs are passed — as above described — through the mouth. The second and third pairs are also and oftener cleansed by the fore legs, as follows: The ant throws herself over upon her side, draws up the middle and hind legs, which are interlocked at the tarsi, and then clasping them with one fore leg, presses the other downward along the other two. The fore legs alternate in this motion. When the legs on one side are cleansed, the ant reverses her position and repeats the process. When the antennæ are cleansed they appear to be taken between the curved spur at the extremity of the tibia and the tibia itself, as one would clasp an object between the base of the thumb and the hand, and are drawn along toward the tip of the flagellum evidently with one pressure." The cleansing of the abdomen or gaster is described as follows: "The hind legs are thrown backward and well extended, the middle pair nearly straight outward from the thorax, and less extended, so that the body is able to assume a nearly erect posture. The abdomen is then turned under the body and upward toward the head, which is at the same time bent over and downward. The body of the ant thus forms a letter C, or nearly a circle. The fore feet have meanwhile clasped the abdomen, and the work of brushing has begun. The strokes are directed upward toward the apex of the abdomen, and the foot passes around and beneath the under part, which is now toward the sternum, the apex is frequently licked by the tongue, and the feet are occasionally passed through the mouth (not simply between the mandibles), after which they are again applied as before."

This description is correct as far as it goes. The four cleaning reflexes, that of the antennæ, sides of the head, posterior legs and gaster, are distinctly differentiated and are so often repeated in the artificial nest that they can be readily studied under a lens of low magnification. These reflexes may be elicited with even greater frequency by powdering the ants with dry dust, chalk or plaster of Paris.

The cleaning of the antennæ, which is far and away the most frequent of these reflexes, is sometimes abbreviated, as when the

ant merely raises one of her fore feet, grasps the scape or funiculus of the antenna of the same side between the strigil and the curved base of the metatarsus, passes the opposed combs along the apical portion of the appendage and again places her foot on the ground. Very often, however, the foot is carried forward directly from the antenna, thrust between the partially opened mandibles and then drawn back across the teeth, along the lower surface of the mandible and between the maxilla and labium. The maxilla is furnished with a comb very much like that on the strigil.[1]

This motion, of course, removes much of the dirt that may have been collected from the surface of the antenna, since the strigil and the fore tarsus are drawn through the clypeal macrochætæ, across the mandibular teeth, along the mandibular macrochætæ and over the maxillary comb. The function of the gular macrochætæ is not, at first sight, so apparent. Occasionally, however, I have seen an ant, while thrusting her fore foot forward, enclose between the strigil and metatarsus one or more of the long gular hairs, and draw them through the combs or along the notch between the insertions of the strigil and metatarsus. This observation, coupled with the fact that these hairs are very long, slender and directed forward, makes it highly probable that they are used for cleaning the strigil, much as we would use threads in cleaning a comb. In ants like the Old World species of *Myrmecocystus* (Figs. 8 and 9) which possess long mental but very poorly developed gular macrochætæ, the former probably answer the same purpose. The advantage to xerophilous ants of possessing a number of macrochætal brushes in addition to the strigils is obvious when we stop to consider that these insects live in dry soil, which, during long seasons of the year, is in a very friable and dusty condition. Both while traversing the surface in search of food and while carrying on their excavations, these ants are liable to become coated with dust or sand. Under such conditions the strigil must often become clogged with earthy particles or sand grains, and an apparatus for cleaning it, such as the gular and mental macro-

[1] See Janet's figures of the mouthparts of *Myrmica rubra* in his paper entitled: "Observations sur les Fourmis," Limoges, 1904, pp. 18 and 19.

chætæ, and hairs like those on the clypeus and mandibles for brushing the fore tarsi, must be of considerable utility. Ants living in sandy deserts often have the gular hairs unusually long, and well developed, probably because sand particles, with their sharp edges, are more injurious to the delicate combs of the strigil and metatarsus and interfere more with their normal movements of occlusion than do particles of soil. If, as I believe, the circumoral macrochætæ have the function here assigned to them, they may be designated as *ammochætæ* to distinguish them from the long hairs or bristles on other portions of the ant's body.

The absence of ammochætæ in several desert ants, such as the species of *Monomorium* and *Pheidole*, is probably to be explained by the very small size of the workers in both of these genera, and the fact that the soldiers of *Pheidole* do not excavate and rarely leave the galleries of the nest. For the same reason the ammochætæ are usually absent or feebly developed in the males of xerophilous species. That the workers and females of several other desert ants belonging to the genera *Solenopsis*, *Cremastogaster*, *Camponotus*, etc., should lack these structures is no more surprising than that many desert plants have failed to acquire the peculiar adaptive characters of the Cactaceæ. We may now consider briefly the occurrence of the ammochætæ in the various genera of xerophilous ants.

Subfamily Myrmicinæ.

Pogonomyrmex Mayr. — This genus embraces a number of species peculiar to North and South America and assignable to three subgenera, *Janetia* Forel, *Ephebomyrmex* Wheeler and *Pogonomyrmex* s. str. The single known species of *Janetia* (*J. mayri* Forel) occurs in Colombia. *Ephebomyrmex* comprises some four species, *E. nägelii* Forel of Brazil, *schmitti* Forel of Haiti, *imberbiculus* Wheeler of Texas and *townsendi* sp. nov. of Chihuahua. None of the species of these two subgenera has ammochætæ, and it should be noted that *J. mayri* and the first two species of *Ephebomyrmex* occur in comparatively humid regions, and that *E. imberbiculus* and *townsendi* though xerophilous, are not true desert ants. *Pogonomyrmex* s. str. comprises some twenty species, spread over portions of the high arid plains

and deserts of two continents, from Montana to Patagonia, with a possible interruption in tropical Central and South America. One of the species, *P. badius* Fabr., is found in the dry, sandy regions of Georgia and Florida. All of the members of this subgenus have very well developed clypeal, mandibular and gular ammochætæ, as shown in Fig. 1, representing the head of the Mexican and Texan *P. barbatus* F. Smith, the type of the subgenus. In certain species, like *P. californicus* Buckley, which is almost exclusively confined to sandy spots in the deserts of the southwest, the gular hairs are even longer and more prominent. The species of *Pogonomyrmex* s. str. and *Ephebomyrmex* are harvesters and subsist very largely on stored seeds. According to Forel *Janetia mayri* is entomophagous. There is reason to suppose that the genus *Pogonomyrmex* represents a granivorous American offshoot of the subboreal genus *Myrmica* or of some similar but now extinct group.

Ocymyrmex Emery. — This genus was erected by Emery for four species (*barbiger, nitidulus, robecchi* and *weitzekeri*) which he described from Somaliland, Basutoland and the Cape of Good Hope. It is probable that all of these species, which resemble

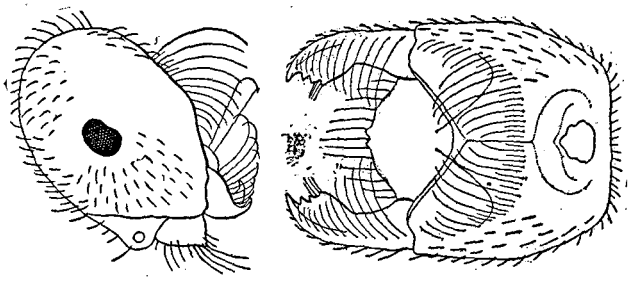

FIG. 3. *Ocymyrmex weitzekeri* Em.

Pogonomyrmex, live in the dry plains and feed on seeds. I have examined a few workers of *O. barbiger* and *weitzekeri* and find that they agree in having well-developed clypeal, mandibular and gular ammochætæ, and also a pair of long hairs on the mentum. These hairs, as shown in Fig. 3, extend backward, diverging from their insertions, and have their tips abruptly bent forward. The gular hairs are alternately long and short, and

the longer ones are less reclinate and shorter than in *Pogonomyrmex*. They are slightly curved upward at their tips. The mandibular ammochætæ are unusually long and curved.

Cratomyrmex Emery. — This genus is based on a single species, *C. regalis*, which Emery described from two large female specimens (19 mm. long), taken at Benue in western Africa.[1] They resemble *Pogonomyrmex* in having long hairs on the lower surface of the head, but these hairs are said to be shorter and less regularly arranged than in *P. barbatus*.

Stenamma Mayr. — This extensive genus may be divided into six subgenera: *Stenamma* s. str., *Aphænogaster*, *Ischnomyrmex*, *Messor*, *Goniomma* and *Oxyopomyrmex*. The species of *Stenamma* s. str., are moisture-loving ants living in small colonies in the woods of the north temperate zone. The much more numerous species of *Aphænogaster* are widely distributed and occur in a great variety of environments, some even living in dry deserts, but none of them seems to have developed ammochætæ, although the lower surface of the head, like the body in general, is usually provided with coarse erect hairs. From species of this or some very similar group the remaining subgenera, *Ischnomyrmex*, *Messor*, *Goniomma* and *Oxyopomyrmex*, seem to have been derived. All of these comprise xerophilous or deserticolous species with ammochætæ and seed-eating propensities.

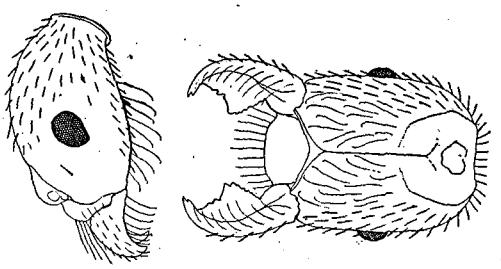

FIG. 4. *Ischnomyrmex albisetosus* Mayr.

Ischnomyrmex Mayr. — Our two North American species of this subgenus, *I. cockerelli* André and *albisetosus* Mayr are closely related and both inhabit the driest deserts of western Texas, New

[1] Voyage de M. Ch. Alluand dans le territoire d'Assinie (Afrique Occidentale), Formicidæ. *Ann. Soc. Ent. France*, LX., 1891, pp. 553–574, Pl. XV.

Mexico, Arizona and northern Mexico. We should therefore expect them to have well-developed ammochætæ. These are, in fact, present in both species, but, as shown in Fig. 4, the gular hairs are diffuse and not arranged in an arcuate series. They are, however, longer and more slender than the blunt, white hairs covering the remainder of the body, and are distinctly hooked or curved upward at their tips. This peculiar modification of the gular hairs is not seen in the other members of the subgenus inhabiting more humid regions, like *I. araneoides* Emery of Central America, *swammerdami* Forel of Madagascar, and *longipes* F. Smith of Burmah and Sumatra. In pilosity these resemble our northern species of *Aphænogaster*.

Messor Forel. — This subgenus of harvesting ants is represented by a number of species, subspecies and varieties in Africa,

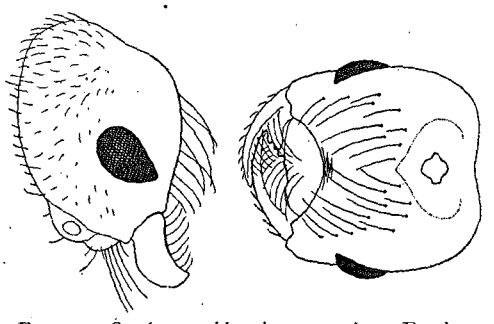

FIG. 5. *Goniomma blanci*, v. *tuneticum* Forel.

especially in the Sahara, in southern and central Europe and Asia and by five species in Arizona, Nevada, California and northwestern Mexico. In both hemispheres the xerophilous species have well-developed ammochætæ, whereas these structures are small or lacking in the moisture-loving forms. To the latter group belongs the widely distributed *M. barbarus* L. which even in Africa, according to Forel "vit dans les lieux moins secs; fait souvent des nids maçonnés dans la terre, dans les prairies,"[1] and Lameere[2] says: "Je n'ai rencontré le type de cette moissonneuse que dans les parties cultivées des oasis; dans le désert cail-

[1] See Emery, "Revision Critique des Fourmis de la Tunisie, in Exploration Scientifique de la Tunisie," Paris, 1891, p. 10.

[2] "Note sur les Moeurs des Fourmis du Sahara," *Ann. Soc. Ent. Belg.*, XLVI., 1903, pp. 160–169.

louteux, alluvial, j'ai toujours trouvé la race *ægyptiacus* Emery, et dans le désert rocailleux la race *striaticeps* André." Now the race or subspecies *ægyptiacus* has well-developed ammochætæ, and in *striaticeps* these bristles are also present, though more feebly developed. *M. arenarius* Fabr., and *caviceps* Forel, two species peculiar to the dry sandy portions of the Sahara, and apparently also *M. bugnioni* Forel of the same region, have highly developed ammochætæ, but these are absent in the European *M. structor*, and in *lobicornis*, a form discovered by Forel in the oasis at Biskra.[1]

Among our American species, *M. pergandei* Mayr and *julianus* Pergande have well-developed ammochætæ, whereas *andrei*

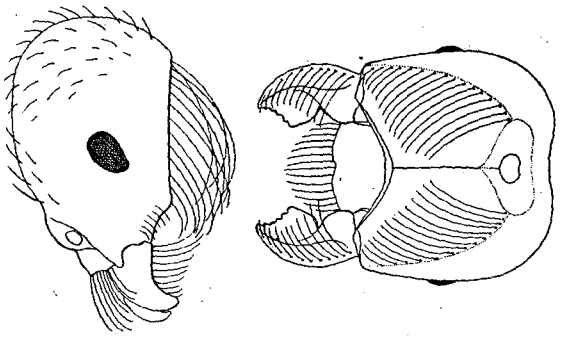

FIG. 6. *Messor pergandei* Mayr.

Mayr, *carbonarius* Pergande and *stoddardi* Emery have only the usual hairs on the lower surface of the head. The habits of *carbonarius, julianus* and *stoddardi* are unknown but *pergandei*, as I can assert from my own observations, lives only in the driest portions of the deserts of Arizona and California, and *andrei* and *stoddardi* are cited only from more humid portions of the latter state. The head of *pergandei*, which is represented in Fig. 6, shows a fine development of the clypeal, mandibular and gular bristles. The gular series form an arc on each side bounding a distinctly concave median region separated from the convex lower portions of the cheek by a distinct ridge (represented in the figure by a dotted line along the insertions of the bristles).

[1] "Les Formicides de la Province d'Oran (Algerie)," *Bull. Soc. Vaud. Sci. Nat.* XXX., no. 114, 1894, pp. 31–33.

Goniomma Ern. André. — Of the few forms that have been assigned to this Mediterranean genus, I have examined only *G. blanci* André var. *tuneticum* Forel from the Sahara. The head of the worker, represented in Fig. 5, shows well-developed clypeal and mandibular ammochætæ. On the gula, however, which has no distinct median suture, the bristles are diffuse and only moderately developed, and not arranged in an arc. This ant is probably granivorous like *G. hispanicum*, whose habits have been studied by Forel.

Oxyopomyrmex Ern. André. — This group, like the preceding, comprises a few small Mediterranean species. I have been able to examine a number of workers and females of *O. santschii* Forel kindly sent me by Dr. F. Santschi of Kairouan, Tunis. The ammochætæ are similar to those of *Goniomma tuneticum*. The gular bristles are diffuse and rather short, though conspicuously longer than the hairs on other parts of the body. Santschi has recently shown that this ant garners seeds.[1]

Both *Goniomma* and *Oxyopomyrmex* seem to represent depauperate offshoots of the grain-storing portion of the genus *Stenamma* (*Messor*). The depauperate character is apparent in the small size of the insects and their colonies and in the vestigial condition of the gular ammochætæ.

Holcomyrmex Mayr. — This genus of harvesting ants, apparently confined to southern Asia and northern Africa, was at first regarded by Emery[2] as being hardly distinct from *Stenamma*, but somewhat later[3] he says: "Dans ma clef analytique des genres des formicides j'ai exprimé des doutes sur la validité des caractères qui séparent le genre *Holcomyrmex* de *Stenamma*. Toutefois l'aiguillon est bien développé chez *Holcomyrmex*, faible ou rudimentaire chez tous les sous-genres de

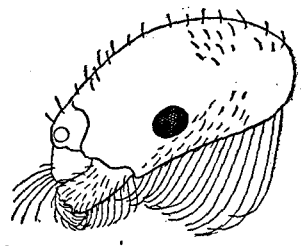

FIG. 7. *Holcomyrmex chobauti* Emery.

[1] See Forel, "Miscellanea Myrmécologiques, *Rev. Suisse Zool.*, T. XII., 1904.

[2] Clef Analytique des Genres de la Famille des Formicides, pour la Determination des Neutres," *Ann. Soc. Ent. Belg.*, T. XL., 1896, p. 185, *nota*.

[3] "Description d'une Fourmi Nouvelle d'Algérie," *Bull. Soc. Ent. France*, 1896, p. 419.

Stenamma. Ce charactère qui m' avait échappé à son importance me porte à croire que les analogies frappantes entre les deux genres sont dues à une adaptation convergente. *Holcomyrmex* est la modification granivore de *Monomorium*, comme *Messor* est celle de *Stenamma* (*Aphænogaster*)." There are no ammochætæ in the Asiatic species of *Holcomyrmex* (*criniceps* Mayr and *scabriceps* Mayr of India), though the lower surface of the head is abundantly pilose like the remainder of the body. These species evidently inhabit rather humid regions. In the species from the dry Sahara (*H. chobauti* Emery and *faf* Forel) the ammochætæ are beautifully developed. In *chobauti* (Fig. 7) the gular bristles are very long and inserted in an arcuate series, and the head is very flat, with concave gular surface. Forel describes *H. faf* as having long red hairs on the lower surface of the head. In *H. lameerei* Forel, which also inhabits the Sahara, the gular hairs are shorter, straighter and diffuse, but nevertheless abundant.

Subfamily Camponotinæ.

Myrmecocystus Wesmæl. — This genus includes the only prominent and characteristic Camponotine ants common to the arid regions of both hemispheres. The Old World spe-

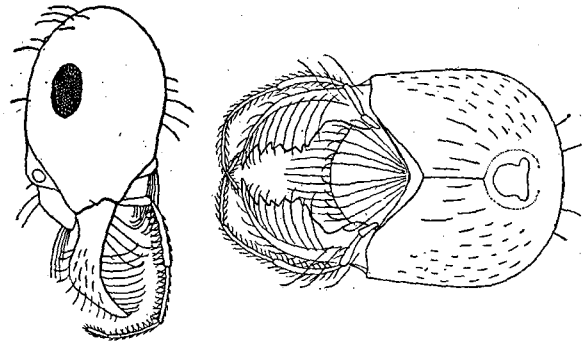

Fig. 8. *Myrmecocystus bicolor* F. (= *M. viaticus desertorum* Forel).

cies, ranging from the plains of central Asia through central and southern Europe and north Africa to Spain and Morocco, are all very agile, entomophagous ants, which run rapidly over the dry, sunny soil in pursuit of their food. In nearly all of these

palearctic forms the clypeal and mandibular ammochætæ are well developed. The gular bristles, however, are vestigial, their function being usurped by a fan-shaped tuft of long recurved hairs on the mentum. It is a significant fact that the hairs of this tuft are rather short in *M. cursor* Fonsc., a species which, according to Emery does not occur in Africa.[1] It belonged originally to the central Asiatic fauna, but just after the glacial period migrated into central and southern Europe. In the north African forms (*M. albicans* Roger, *viaticus* Fabr., *bicolor* Fabr. (= *viaticus desertorum* Forel), *bicolor megalocola* Foerster) the ammochætæ, especially those on the mentum, are longer (Fig. 8). In *M. bombycinus* Roger, a typical Saharan species, the bristles reach their highest development (Fig. 9), and there are also fringes of long curved hairs on the third joint of the greatly elongated maxillary palpi so characteristic of the ants of this genus.

There seem to be only two American species of *Myrmecocystus*,

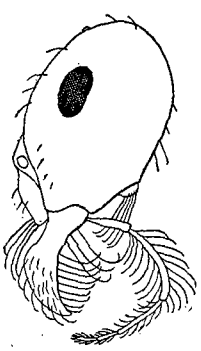

FIG. 9. *Myrmecocystus bombycinus* Roger.

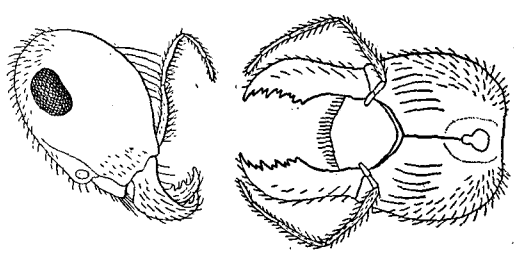

FIG. 10. *Myrmecocystus hortideorum* McCook.

mexicanus Wesm. and *melliger* Forel, but each of these has a number of subspecies and varieties, still in part undescribed and all confined to the arid plains and deserts of the southwestern States and northern Mexico. Some of the forms of each of the species collect the secretions of plants and the ejecta of aphids and store the liquids thus obtained in the replete workers ("honey ants"). Other subspecies and varieties do not seem to have this

[1] "Rassegna Critica delle Specie Paleartiche del Genere Myrmecocystus," *Mem. R. Accad. Sci. I.t. Bologna*, 1906, pp. 1–17, 35 figs.

habit but live on insect food. The clypeal and mandibular ammochætæ are smaller than in the palearctic species. There are no hairs on the mentum, but the gular bristles are long, arcuately inserted, rather stiff, directed downward and but little curved. The development of these, as well as that of the clypeal and mandibular ammochætæ varies directly as the aridity of

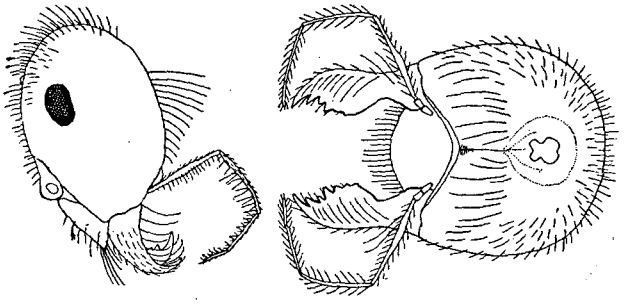

FIG. 11. *Myrmecocystus melliger orbiceps* sp. nov.

the region inhabited by the ants. Thus *M. mexicanus* var. *hortideorum* McCook (Fig. 10) which lives on the high plains in comparatively humid regions, has very poorly developed clypeal and mandibular bristles and the gular ammochætæ are rather short. In *M. melliger orbiceps* subsp. nov. (Fig. 11) which inhabits the drier regions of central and western Texas, all of the bristles are

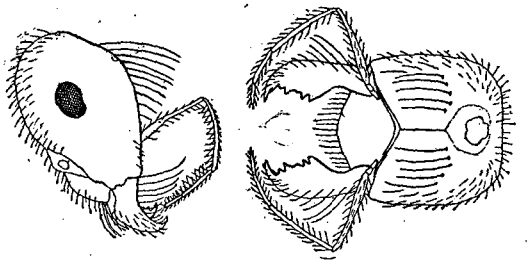

FIG. 12. *Myrmecocystus melliger semirufus* Emery.

longer. Finally *M. melliger semirufus* Emery (Fig. 12), a small form peculiar to the sandy spots in the dry deserts of Arizona and southern California, surpasses all the other American forms in the development of the ammochætæ.

The uniform presence of mental ammochætæ and the larger size of the males in the Old World forms of *Myrmecocystus* would

seem to indicate that these are at least subgenerically distinct from the American forms. It may be advisable, therefore, to reinstate for the palearctic members of the genus the name *Cataglyphis*, published by Foerster in 1850. The name *Myrmecocystus*, established in 1838 by Wesmael for *mexicanus*, would then comprise the American species.

Melophorus Lubbock. — This interesting genus embraces three subgenera: *Melophorus* s. str., *Prolasius* Forel and *Lasiophanes* Emery, all peculiar to the southern hemisphere. Many of the species of *Melophorus* proper resemble *Myrmecocystus*. In *M. bagoti* Lubbock and *M. wheeleri* Forel, which inhabit the most arid portions of Australia and have dimorphic workers (*M. bagoti*, at least, being a honey ant, as Lubbock has shown!), the ammochætæ are highly developed and all the series are present, even to the tuft on the mentum. The gular series are longer and more abundant than in the American species of *Myrmecocystus*. These hairs are less developed in *M. iridescens* Emery, *æneovirens* Lowne, *curtus* Forel, *hirtus* Forel, and *ludius* Forel, as I have found from an examination of specimens of all of these forms in Professor Forel's collection. In *M. nitidissimus* André and *formicoides* Forel all the series of ammochætæ are inconspicuous, so that these forms may be taken to represent a transition to the *Lasiophanes* species of Chile and *Prolasius advena* F. Smith of New Zealand, which are not deserticolous and have no prominent hairs on the lower surface of the head and mandibles.

Subfamily Dolichoderinæ.

Dorymyrmex Roger. — This peculiarly American genus is the only one of the Dolichoderine subfamily in which I have found ammochætæ. A single species, *D. pyramicus* Roger, with at least three varieties (*niger* Pergande, *flavus* McCook and *bicolor* Wheeler) is widely distributed through the subtropical and tropical portions of both continents. It lives exclusively in dry soil or sand, preferably in the latter. More numerous species occur in the dry regions of Argentina, Patagonia and Chile, which probably represent the original home of the genus. Several of these species (*D. planidens* Mayr, *mucronatus* Emery, *tener* Mayr and *baeri* André) have well-developed ammochætæ especially on

the clypeus and gula. I find that the conditions shown in Fig. 13, taken from one of Emery's recent papers,[1] obtain in all of these species. The gular macrochætæ are arranged in an arc on each side and the insertion of each bristle is marked by a black

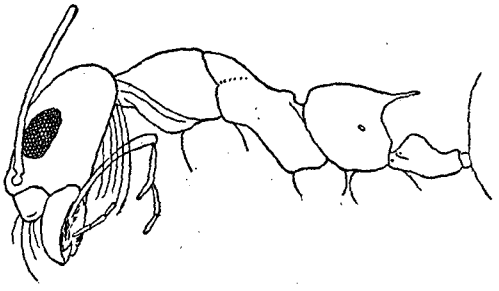

FIG. 13. *Dorymyrmex mucronatus* Emery.

dot. In our North American forms of *D. pyramicus* (Fig. 14), the ammochætæ are reduced to a very prominent series on the clypeus and a few short bristles, inserted in a short irregular arc on

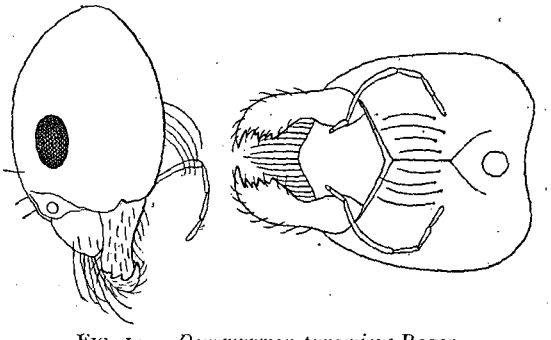

FIG. 14. *Dorymyrmex pyramicus* Roger.

the middle of the gula. The latter, which are all the more conspicuous because the remainder of the body is nearly destitute of hairs, nevertheless represent what may be regarded as a degenerate condition.

[1] "Studi sulle Formiche della Fauna Neotropica," *Bull. Soc. Ent. Ital.*, XXXVII., 1905, Fig. 34.