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DAVID NUTT, LONG ACRE.

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1901.

ORDINARY MEETING.*

LIEUT.-GENERAL SIR H. L. GEARY, K.C.B., IN THE CHAIR.

The following elections took place :—

MEMBERS :—Harry Seymour Foster, D.L., F.G.S.; Martin L. Rouset; Rev. R. Ashington Bullen, F.G.S.†

ASSOCIATES :—F. W. Harmer, Esq., J.P., F.G.S.; Capt. Charles H. Versturme-Bunbury, R.E.

The following paper was read by the Author :—

HORNETS: BRITISH AND FOREIGN (illustrated by specimens from the Author's collection). By Rev. F. A. WALKER, D.D., F.L.S.

IT may almost be regarded as a subject for regret that the name of "hornet" should be employed at all to designate several species of the genus of hymenopterous insects known as *Vespa* which constitutes one tribe of the more comprehensive order *Vespidae*.

Of the so-called "hornet" there only exists one British representative, namely, *Vespa crabro*. Hornets, wasps, and bees have accordingly been considered by outsiders to constitute three distinct tribes, whereas the real fact is that the hornet and the different species of ground wasp, of which *Vespa vulgaris* and *V. germanica* serve as the commonest examples, are far more closely allied in almost every particular than are such widely differing genera as *Vespa*, *Nomada*, *Odynerus*, *Cerceris*, *Eumenes*, *Philanthus*, *Pemphredon*, and many more. Yet, by public consent, all the above-named genera are termed indifferently and indiscriminately wasps, owing to one only mark of similarity, namely, their yellow and black banding. In like manner, such various tribes as *Andrena*, *Melecta*, *Osmia*, *Halietus*, *Apis*, etc., the majority of which are of a dark and dusky tint, are known as bees.

* January 7th, 1901.

† Trans. from Associates.

Yet hive bees, which belong to genus *Apis* among the *Apidae*, are assuredly not more removed in structure and from a scientific point of view from genus *Vespa* among the *Vespidae*, which genus of wasps comprises such species as are gregarious and live in communities, than they are from humble-bees, which serve as the genus *Bombus*, and also as other genera of *Bombyidae*. The truth is *Vespa crabro* has received the distinct appellation of "hornet" because it is quite the largest British species of *Vespa*, and is also larger than all the *Vespidae* inhabiting our island, and because the black ground colour and markings of all other British *Vespidae* are in it replaced by a chestnut brown.

But if our synopsis of species be enlarged, so as to include a survey of foreign and exotic kinds, it will be found to comprise many more sorts of a chestnut brown, some of them about the same size as, and some of them far larger than, our British solitary species. Any review and comparison that regards exclusively only such species as occur in Britain must obviously be very partial and incomplete; and later on in this paper occasion will be taken to refer to one or more foreign kinds. Colour and size, however, serve as only superficial discrepancies. What is more to the point is that the physical structure of *Vespa crabro* and that of our common ground wasps, to wit, *V. vulgaris* and *V. germanica*, is one and the same; also that all the three above-named species alike construct their cells of wood taken from hollow trees, palings, etc., and which is masticated by them for the purpose; that all alike commit depredations on fruit; that all alike become frequently intoxicated by the juice of ripe apples or pears, or by the honey of certain blossoms, and then drop helplessly from the trees; that all have the abdomen similarly spotted and banded; that all alike place their cells on the upper side of the comb only, leaving the under side a flat surface, whereas the hive bee constructs her waxen cells on both upper and under surfaces of the comb; that the sting of the common wasp, and, *a fortiori*, that of the hornet, is far more venomous and painful than that of sand wasps or mason wasps, or indeed, I might add, than that of any other British *Hymenoptera*; that all alike live in common, there being a large number of them in each nest; whereas sand wasps and mason wasps live singly and separately, even though the cells which they construct are situate near together, or at any rate a very short distance apart.

The habit which the hornet and the ground wasp have in

common may also be mentioned, namely, that of invading bee-hives, destroying the inmates, expelling them from their habitation, and plundering their stores.

The respective difference of size in the sexes is also the same in the case of the hornet and in that of the ground wasp, the queen in each instance being the largest, next the male, and the smallest consisting of the neuters or workers among the females. Some, however—*e.g.*, the male hornets—are reported to vary considerably in size. There are a few differences that may be noticed, but these are trivial and scanty indeed in comparison of the similarity—I had almost said absolute identity—of many other habits of the hornet and the ground wasp.

Some of the differences that may be quoted are as follows:—Hornets, I believe, continue to work by night. The common wasps do not, with the sole exception of a few ne'er-do-wells that contrive to knock in late, and even their absence is scarcely to be accounted for by their doing additional work.

Hornets, and most happily so, only number one or two hundred in a nest. The population of a strong nest of the common wasp may be reckoned at 4,000. Hornets will frequently make their nest in a deserted run of a rat, or other hole in the thatch of a cottage or outhouse, as well as in the ground. The common wasps confine themselves more to holes in the ground. Both hornets and ground wasps will make their nests in the roots and elsewhere in hollow trees, and also in the trunks of fallen trees, the hornets probably being more frequently addicted to the practice than the wasps. A correspondent of the *Entomologist* some time back, in a notice respecting hornets that he communicated to that periodical, queries whether hornets do make their nests in the ground and asks for information on the subject, and is replied to in a succeeding number of the same volume in the affirmative. I can myself recall, at the early age of eight, noticing a hornet's nest in the ground, and committing the very imprudent act, although I escaped with impunity, of laying my insect net over the entrance of the hole, which was in a field in my native village in North Middlesex, and to which I commonly resorted in pursuit of entomology.

It will be my object in the course of this present paper to collate the notices respecting the occurrence of hornets contributed by others from time to time to the pages of the

Entomologist, and also to relate such observations as I myself have been able to make.

Hornets are very susceptible of cold and wet. With regard to the range of distribution of this insect, it would appear to be much more restricted than that of the common wasp. Both tree wasps and common ground wasps have been recorded in the pages of the *Entomologist*, five or six species in all, to have occurred one season in a certain district in such astonishing numbers, and their nests to have proved so numerous in that particular part of Scotland, as to constitute a positive terror and serious danger to every passer-by. Speaking as a rule, ground wasps are generally distributed, tree wasps are probably more abundant in Scotland and in the North of England than in the South, and hornets are more confined to the southern counties.

Frederick Smith, the late able curator of the *Hymenoptera* in the British Museum, speaks of *Vespa crabro* as local, but generally distributed in the South of England. The counties in which I have observed the hornet are as follows:—Middlesex, Suffolk, Cambridgeshire, Herefordshire, and Monmouthshire. It is commonly reported to abound near Colchester, and the Suffolk parish of Assington, where I noticed it in numbers, is not far distant from that town.

On referring to Edward Saunders's able and standard work on the *Hymenoptera aculeata*, I find that in his account of that insect it has not been recorded from Ireland. There is a solitary instance of its having been observed in Scotland, as Mr. T. A. Chapman saw a specimen at Glencoe, in the West Highlands, in 1876.

According to Mr. Newstead, it has not been taken in Cheshire or North Wales. The observation of Frederick Smith that he has seen this species busily at work on a bright moonlight night is also quoted by Saunders, and with this statement my own experience concurs, as at the age of eleven on an autumn evening I accompanied the gardener in a well-known park in Monmouthshire that my father then rented for a twelvemonth, for the purpose of sawing off a fine specimen of boletus from a tree trunk. We were aware that there was a hornet's nest not far off, but had forgotten that it was in this particular tree, and the insects soon made us aware of their presence, as, aroused still more by the light, they flew swooping with sonorous hum round our lantern. My companion burnt the wings off one in the grass, and I fortunately escaped without injury, having discovered and

beaten off another just in time after it had crept between my coat and waistcoat and was resting on my shirt close to the arm-hole.

During that same autumn my father, who was himself a most eminent entomologist, told me he had got stung by one that was in his insect box while he was engaged either in setting out another insect or in setting out the hornet itself, supposing it to be dead. The creature turned round its tail and stung him; but he described the sting that he received as not worse than that of the common wasp, probably owing to the fact that it was then in a moribund condition.

The effects of a sting by hornet or by wasp no doubt vary in a great measure according to the physique, the condition of the blood, and general health of the person who experiences it. A cottager at Assington told me that her father many years since had lain insensible for two days, having been stung in the head by a hornet, and I read in the daily paper some years since that the mayor of a provincial town in North Wales succumbed to the sting of a hornet on the back of the neck, through failure of the heart's action. The suddenness of the attack and consequent shock may have had something to do with the fatal result in this instance, as he had not previously been aware of its presence.

To revert to Saunders's description of the hornet, he proceeds to cite Mr. V. R. Perkins, who says in his list of the *Hymenoptera aculeata* of Wotton-under-Edge, "that he had lost no less than three hives of bees by these insects, which found their way into the hives, and not only devoured the honey, but destroyed the bees. On removing the hives he discovered in one of them a hornet's nest as large as a good-sized turnip."

The following table of the British species of *Vespa* may perhaps conduce to a better comprehension:—

- | | | | |
|----|---------------------|------------------|---|
| 1. | <i>Vespa crabro</i> | ... | Hornet. |
| 2. | " | <i>vulgaris</i> | Two commonest species of ground wasp |
| 3. | " | <i>germanica</i> | <i>(germanica</i> possibly being rather the commoner of the two). |
| 4. | " | <i>austriaca</i> | Tree wasps. Only females of <i>austriaca</i> have |
| 5. | " | <i>norvegica</i> | occurred in Britain, building nests in fir trees near Wakefield, Yorkshire, in 1836, according to Smith. <i>Norvegica</i> generally builds in gooseberry, currant, or other bushes, but Mr. Bignell mentions in a letter a nest of this |

- species in a horse-chestnut tree, forty feet from the ground. Its abdomen may be said to be marked by yellow stripes on black ground, rather than by black ditto on yellow, as is the case with *V. vulgaris* and *V. germanica*.
6. *Vespa rufa* ... Ground wasp allied to *vulgaris* and *germanica*. Reported by Saunders to be common and generally distributed. First and second segments of abdomen have black markings margined with reddish brown, and hence its name of *rufa*. The solitary example of this species in my own collection was taken on the banks of the Frome at Wareham in May, 1893.
7. „ *sylvestris* ... Tree wasp. My own examples of this species are from Chorley Wood, Bucks; Tittensor, Staffordshire; and Assington, Suffolk; but in none of these instances did I find the nest. The wasps were either captured on the wing or (at Assington) found drowned in a bottle suspended from a cottage window, that its contents might allure that and other *Hymenoptera* given to depredations on the fruit. Frederick Smith says that he has once or twice found it inhabiting an underground nest. I have noticed this species as commoner in Switzerland than England—at Martigny, for example, and still more abundantly at Chartres, where it greatly affects an umbelliferous flower.

There are, according to Saunders, eleven species of *Vespa* in Europe, of which six are found in England. If we include *austriaca*, which, however, is rare here, and of which apparently only the female is found, that will make seven—to wit, *V. vulgaris*, *germanica*, and *rufa*, ground wasps; *V. austriaca*, *norvegica*, and *sylvestris*, tree wasps. *Vespa crabro*, the hornet, is to be reckoned a ground species also, for the true tree wasps do not, like the hornet, make their nests in hollow trees, but round the bough of a live tree and round a forked bough preferably as tending to give additional security to their habitation. Tree wasps have a more slender body than ground ditto, and their cells are consequently smaller.

As regards other observations on hornets that I was able to make in early days, I remember noticing when eight years old that it greatly affected the blossoms of *Angelica sylvestris*, as indeed wasps and bluebottles did also. A variety of insects, *Diptera* and *Coleoptera* included, are very partial to

Angelica. Hornets had also a nest in the thatched gables of the cottage where I first saw the light, and their presence gave considerable annoyance, as the insects used to fly in and out of the bedroom windows until a sheet of lead was nailed over their entrance hole by night and their egress effectually prevented for the future.

Another instance that I recall also about that date was that of a nest in the root of a tree on the bank of the New River, which was not only completely dead, but entirely denuded of its bark. *Vespa crabro* is rightly described as a local species, and many years of my life have passed by without my coming across one single specimen in England. In the month of August, 1897, however, while in temporary charge of the parish of Assington, near Colchester, owing to their great prevalence and the number of nests in the parish, I was enabled to tabulate the following observations more in detail, which were duly communicated to the *Entomologist* of that date.

"*Vespa Crabro.*—I should be greatly indebted for any information afforded respecting the numerical strength of a hornet's nest. Though there must be many nests in this neighbourhood, I doubt whether any one nest contains more than one hundred or so. This formidable insect seems in such plenty here this season as to prove a positive source of danger, and the fruit crops, especially the apples, suffer accordingly. Only a few hundred yards from the vicarage, along the Stoke and Nayland road, are two cottages under one thatched roof, inhabited respectively by two families related to each other, and comprising jointly about fifteen children. In the side of the thatch of the first cottage there is a hornet's nest, and in the thatch of a low outhouse, on the farther side of the second cottage, there is another. It goes without saying that the time-honoured, and as a rule the best, plan for suffocating the inmates by the application of a folded linen rag, alternating with layers of sulphur, and then set on fire, cannot be adopted here, as the thatch would speedily be in a blaze; and moreover, in the case of the nest in the outhouse, it is believed to be several feet distant from the only hole of entrance, at the far end possibly of the old run of a rat, as the booming sound made by the insects is distinctly heard close to the rear of the building.

"The suspension of wide-mouthed bottles containing a compound of sugar and beer to the sides of the cottage and outhouse has not been without the desired effect, as several

hornets have crawled in and got drowned. But this is only a partial remedy, and the wasps that have met a similar fate therein, many of them tree wasps, if I am not greatly mistaken, are far more numerous. Another method was for the father of one of the families, to whom I lent my insect net for the purpose, to catch them as they flew out and in; but this speedily had the natural effect of rendering them furious. I then suggested what seemed to me to be the only available method, namely, the insertion of a piece of lead piping in the hole, so that the hornets must pass through it on their way to the outer air, and the fixing at the same time of the other end of the said piping well into the neck of the aforesaid bottle, now suspended for the purpose close underneath. By this means many have been caught and drowned, including the queen, who may have only quitted the interior on the supposition, or intimation, that something was wrong. The nest in the outhouse has thus been considerably weakened, but the second nest still remains to be tackled. It cannot be seen to at present, as the cottagers are all so busily employed in getting in the harvest. There is also a third nest within the distance of a short half-mile, down another lane, in the tiled roof of a cottage opposite the short cut across the fields to Boxford, and here the hornets, to reach their hole, crawl along the leaden gutter under the eaves. A fourth nest, situate in the root of a tree in Assington Park, was taken and destroyed several days since. Owing to the number of hornets that fly in and out of the numerous oaks in the wood known here as Assington Thicks, I feel convinced that there are several more nests undiscovered as yet—probably in the hollows of some of the above-mentioned oaks. There is a little summer-house or shanty in this wood for the gamekeepers to shelter when it rains, and for several seasons past hornets have suspended a nest from the interior of its ceiling, flying in through the open pane of glass in its side. This year, however, they have not put in an appearance there. I believe one such nest in the shanty was cut down and presented to the museum at Colchester.

"During my short sojourn at this vicarage I have captured twelve hornets with my net as they came successively to regale themselves on the sap exuding from the trunk of an oak in the back shrubbery. I note that there is hardly ever more than one hornet at a time, either where the sap exudes, or on a partially devoured apple. Probably there is not

room for the operations of both. But if one be captured thereat, within a brief space (say ten minutes) another visitor, in brown and yellow jerkin, flies up with a sonorous hum to take his place. Sometimes, but more rarely, two may be seen together seated on one apple. Are these solitary visits due to some well understood and defined arrangement between themselves?

"The present unsettled state of the weather here (sunshine alternating with clouds and frequent showers) renders the hornets all the more dangerous, as apt to creep about noiselessly in a semi-torpid condition resulting from the heavy wet. Query, do the queens leave the nest at this period of the year? It would seem so, as when my wife was in the orchard here a few days since, on picking up a fallen apple, she heard a loud buzzing in the grass close to the fruit, and in a few moments a hornet ascended a blade of grass and flew away. Luckily for herself she did not touch it, as at first sight she mistook it for a dragon-fly, and from the size which she described it could only have been a queen.

"Of late years I have seen very few hornets in England, and during the whole of my residence in my Cambridgeshire parish I only recall the occurrence of one nest in the roof of a farmhouse or cottage three or four doors from the rectory, and taken by an elderly parishioner to whom various odd jobs were delegated, and commonly supposed to possess a very thick cuticle; at any rate, he went about his work fearlessly. 'They do *hom* so,' he said.

"One of the very few occasions on which I have seen a queen hornet alive was in the winter season on the drawing-room window-sill of the said Cambridgeshire rectory, when it was in an almost torpid state, and covered with soot, and I naturally dreaded its presence on account of my children, who were then very young. I remember in boyhood's hour being greatly diverted at beholding a hornet sweep in its flight into a hole in the side of a large jargonelle pear, and no fewer than twenty wasps forthwith to tumble out therefrom in a state of the most abject terror to the ground. In those days also a relative observed a hornet seated on the bough of an apple tree, and tearing a hive bee to pieces for the sake of its honey-bag.

"The hornet does not always score, however, for while two English ladies were walking in the environs of Chartres (Lake of Geneva) in the month of July, 1893, while I held

the chaplaincy of that place, they recounted to me how a wasp and hornet dropped struggling together from an orchard tree in front of them, and how the wasp, being more agile, managed to dart about and sting his adversary here and there until the latter succumbed.—Assington Vicarage, near Colchester, August 24th, 1897."

Extract from Ramie's "Insect Architecture," pp. 92-95.

"The nest of the hornet is nearly the same in structure with that of the wasp; but the materials are considerably coarser, and the columns to which the platforms of cells are suspended are larger and stronger, the middle one being twice as thick as any of the others. The hornet, also, does not build underground, but in the cavities of trees, or in the thatch or under the eaves of barns. Réaumur once found upon a wall a hornet's nest which had not been long begun, and had it transferred to the outside of his study window; but in consequence, as he imagined, of the absence of the foundress-hornet at the time it was removed, he could not get the other five hornets, of which the colony consisted, either to add to the building or repair the damages which it had sustained. M. Réaumur differs from our English naturalists, White, and Kirby and Spence, with respect to the materials employed by the hornet for building. The latter say that it employs decayed wood; the former, that it uses the bark of the ash tree, but takes less pains to split it into fine fibres than wasps do, not, however, because it is destitute of skill, for in constructing the suspensory columns of the platforms a paste is prepared little inferior to that made by wasps. We cannot, from our own observations, decide which of the above statements is correct, as we have only once seen a hornet procuring materials, at Compton-Bassett, in Wiltshire; and in that case it gnawed the inner bark of an elm which had been felled for several months, and was, consequently, dry and tough. Such materials as this would account for the common yellowish-brown colour of a hornet's nest. Hornets often choose for their home the space between the roof and the ceiling of summer-houses, and the nests that are made in such localities are mostly large and handsome. When hornets make choice of a tree for their domicile, they select one which is in a state of decay, and already partly hollowed; but they possess the means, in their sharp and strong mandibles, of extending the excavation

to suit their purposes; and Réaumur frequently witnessed their operations in mining into a decayed tree, and carrying off what they had gnawed. He observed, also, that in such cases they did not make use of the large hole of the tree for such an entrance, but went to the trouble of digging a gallery, sufficient for the passage of the largest hornet in the nest, through the living and undecayed portion of the tree. As this is perforated in a winding direction, it is no doubt intended for the purpose of protecting the nest from the intrusion of depredators, who could more easily effect an entrance if there were not such a tortuous way to pass through. Industrious as is this insect, it never takes needless trouble, and alters its nest according to circumstances. The courts are defended by a complete cover when the nest is placed in an open situation. But when it is built in the hollow of a tree, there is no cover at all, the insect evidently knowing that the wooden wall with which the cells are surrounded affords a sufficient protection. In cases where a cover is made, the hornets do not form only a single entrance, as is the case with the wasp, but have a large number of small entrances in different parts of the wall. Hornets are, in one sense, more industrious than wasps. But if the moon be up, the hornet is sure to work throughout the entire night, and will often do so even when no moon is visible."

Extract from Wood's "Natural History," p. 501.

"Many species of wasp inhabit England, the hornet (*Vespa crabro*) being the largest, and indeed being nearly equal in dimensions to any tropical species. This formidable insect makes a nest very similar to that of the wasp, but the cells are necessarily much larger. The nest is generally placed in hollow trees, but I have known a colony of these insects to establish themselves in an outhouse, and to cause great annoyance before they could be expelled."

*Extract from Lyddeker's "Royal Natural History," vol. vi,
p. 41.*

"Of the better known forms, the common hornet (*Vespa crabro*) is readily distinguished from other species of wasps by its large size and prevailing tint on the anterior portions of the body. It is universally distributed throughout Europe and occurs as far north as Lapland. The solitary female,

after her hibernation, commences to build the first foundation of her nest in May, on some convenient beam in a loft or outhouse, or frequently in the holes made in the eaves of thatched cottages by sparrows. The food of the grubs consists of bodies of insects, bees, etc., which the workers chew up for their benefit. On the approach of autumn, the remaining larvæ, which have not yet been hatched out, are torn from their cells and left to perish."

"*Encyclopaedia Britannica*," vol. xxiv, p. 392.

"The hornet (*V. crabro*) is the largest species occurring in Great Britain. They have a more distinctly red colour than the common wasp, and appear to be almost confined to the southern half of England. Their nests resemble those described above, but are larger; they are found in hollow trees or deserted outhouses. Their communities are smaller in number than those of wasps. The hornet, when it occurs in any number, does a considerable amount of damage to forest trees by gnawing the bark off the younger branches to obtain material for constructing its nest. It usually selects the ash or alder, but sometimes attacks the lime, birch, and willow. Like the wasp, it does much damage to fruit, upon the juices of which it lives."

Extract from Kirby's "Text Book of Entomology," p. 128.

"The hornet (*Vespa crabro*, Linn.) is nearly half as large again as the other species, from which it may be distinguished by its redder colour and the row of reddish spots on each side of the abdomen. Some species of wasps construct their nests in the ground, and others in trees; these nests are composed of a material resembling thin coarse brown paper. The hornet is less numerous than the smaller wasps; it lives in smaller communities, and is not only a much less abundant species, but appears to be almost confined to the South of England; on the continent it is much more generally abundant. But it is not a quarrelsome insect, though its powerful sting makes it formidable if molested. It generally constructs its nest in hollow trees, but will also build under the eaves of houses. The wasps construct their nests of rasped wood or bark; and I possess a beautiful hornets' nest which was found fixed to the rafter of a house at Colchester which was being rebuilt. It has every appearance of being constructed of deal shavings."

Extract from "Insects at Home," J. G. Wood, p. 354.

"Now we come to the largest and most formidable of the British wasps, the terrible hornet (*Vespa crabro*).^{*} The figure represents a perfect female of the natural size. The workers are much less, and indeed many worker hornets are no bigger than the common wasp, from which, however, they can at once be distinguished by the dark red-brown of their markings. The nest of the hornet is exactly similar in character to that of the common wasp, but the cells are very much larger. The nest is usually made in hollow trees; and within a few hundred yards of my house are several hornets' nests—a fact which I take care *not* to mention, lest any anxious parent should destroy them, fearing that they might injure his children, a fate that befel one of these nests last year. There is really not the least occasion for fear. The hornet has a great deal too much to do to spend its time in stinging children, and, unless its nest be attacked, it is peaceable enough. Mr. Stone kept many hornets' nests at work, and was no more stung by them than a bee-master is stung by his bees. Outhouses and similar places are favourite localities for hornets' nests. The successful capture of a hornets' nest is a very difficult business, and that of a wasps' is child's play to it. In the first place, it is much more difficult to cut a nest out of a hollow tree than to dig it out of the earth; and in the next place, the hornet works all night, provided the moon shines, whereas the wasp stays at home. The food of the hornet consists of other insects, and it has a special liking for wasps. My brother once saw a hornet in chase of some Atalanta butterflies, and the instinct exhibited by the insect was really wonderful. In the open air the short-winged, heavy-bodied hornet would have no chance of catching the ample-winged butterfly. So the hornet kept flying backwards and forwards in front of the butterfly, until the Atalanta thought to escape by flying through the branches of an elm

* Scientific description of *Vespa crabro* (Saunders's *Aculeate Hymenoptera*, pp. 151, 152) —Red-brown; head punctured, yellow, clothed with long pale hairs, apical margin of mandibles, a line across the face, above the clypeus, and the region of the scutellum, black or dark, antennae brown, very long in the ♂, the joints bituberculate beneath, scape yellow in front, thorax punctured and hairy like the head, sides of the mesonotum and a narrow central line dark, wings smoky, nervures testaceous; abdomen rather remotely punctured, clothed with pale hairs, apex of the first segment very narrowly and regularly, of the second, broadly and irregularly, and the whole of the following segments, except two or three basal spots, yellow, beneath yellow, the segments more or less spotted with brown at the base; legs with projecting hairs, and also clothed with very fine, short, silky pubescence, femora in the ♂ densely fringed with long hairs beneath, anterior pair in both sexes strongly curved.

L. ♂ 23–25 mm., ♀ 25–30 mm., ♀ 18–23 mm.

tree. This was the object of the hornet's manœuvres, for it at once dashed among the foliage, where the wide wings of the butterfly were at a disadvantage, captured the unfortunate Atalanta, bit off its head and wings, and flew away with the body."

Report of Observations of Injurious Insects and Common Farm Pests in the Year 1893. By Miss ELEANOR ORMEROD.

Page 114.

"The *Vespa crabro*, or hornet, is easily distinguishable from the other species of wasps by its greater size and the large proportion of its rusty or reddish colouring. In the part of Gloucestershire mentioned above, where there was much woodland, it was not at all uncommon, but its range of habitat is given as not extending, as far as known, so far north as Yorkshire.

"In general habits it resembles the smaller *Vespidae*, commonly known as wasps, but by preference appears neither to build underground, nor where exposed to weather in trees or hedges, but to select the inside of hollow trees, or logs, or roofs of lofts or sheds; the individual colonies are less in number than those of the wasps, and the paper of which the nests are composed is much coarser. The nests sometimes run to a great size, the largest which I have seen, and assisted in securing when deserted in the winter, was taken from a cottage roof in Gloucestershire, and measured fifteen inches across and nineteen inches in height, although some of the lower part had been removed."

Page 124.

The following particulars were communicated to Miss Ormerod by Mr. Edward A. Atmore, F.E.S., of King's Lynn, Norfolk:—

"Hornets (*V. crabro*) have also been unusually plentiful here, the nests, as usual, occurring generally in hollow trees. These powerful insects seem to be as fond of destroying wasps as wasps themselves are of destroying flies. I have several times witnessed this habit of theirs."

Also on page 124.

"Worcestershire.—On applying to Mr. J. Hiam, The Wren's Nest, Astwood Bank, near Redditch, with regard

to what he might have observed of hornet presence in the past season, he informed me that 'hornets' had been more numerous than ever remembered in that locality, and also for a few miles round. Eight nests had come under his own observation, and he had heard of others being taken at a short distance beyond the extent of his own walks. Later on, on November 9th, Mr. Hiam favoured me with the results of his further inquiries as to amount of hornets' nests observed and damage done by the insects as follows:—'I find there were about a score of nests within a few miles that were known of, and doubtless others in woods and lonely places would escape observation. Considerable damage was done in gentlemen's gardens to wall fruits of the best sorts, and also to fruit in orchards, and in the fields to cider fruit; but the latter has been so plentiful and cheap that it is hardly worth taking into account.'

"I have taken a large quantity of queen hornets from various nests, some of which I have alive now (November 9th). This will materially lessen the number of nests next season, but from what I know of several colonies in inaccessible positions, in roofs of houses and otherwise, a large increase may be expected."

"Mr. Hiam further remarked with regard to the habit of the hornets of stripping young bark:—'Near one hornets' nest I noticed the young ash sticks had been stripped in pieces of the bark all round, or in other cases in patches, which is not unusual, but for the exact purpose I am not quite certain, because the combs, and paper covering on the outside of nests, appear to be composed entirely of dead rotten wood, nicely blended in coloured layers. Hornets also take the sap oozing from wounds, whether caused by hornets or otherwise, of the elm, and also tap dahlia stems, and suck the flowing sap.'"

Pages 124, 125.

"Some very good figures of shoots of ash and also of birch, injured by removal of bark by the hornets, will be found at page 405 of the valuable volume by Dr. J. Ritzema Bos on animals injurious and useful in agriculture, horticulture, etc. Dr. Ritzema Bos, speaking on the following page of the damage done by wasps (including in this, of course, hornets) in this way, notes that although the building material is chiefly of rotten wood, they will gnaw down to the sap

wood of young branches or stems for the purpose, apparently, not only of using the torn-off pieces of the bark for building purposes, but that they may suck the sap that flows from the wound. Ash is mentioned as preferred; after this willow, alder, birch, beech, lime, and elder.

"(In an instance where I had myself, together with my sister, the opportunity of watching hornets at their operations in removing patches of bark from some ash saplings by a pool in Gloucestershire, we were able to see them definitely sucking in the sap from the torn edge of the bark.—Ep.) Necessarily, where much bark is taken; or the young bough, or sapling, completely ringed, much damage is done.

"Mr. J. Masters, Hon. Sec. of the Evesham Fruit Growers' Experimental Committee, writing to me from Evesham on the 11th of September, in reply to my inquiries, observed:—‘It is singular, but here in our immediate locality we have had no more wasps than in ordinary years. This, my opinion, is confirmed by that of others. The men have taken the hornets’ nests this year in my orchard. The nests were built in the cavities of two old trees. The powder-ball, that is, the paste made of wetted gunpowder, was applied to the hole; this ignited the pith or decayed wood, which gradually burned the interior of the tree and destroyed the nests. Of course it killed the tree. The usual method employed here in taking wasps’ nests is by the fizzy or powder-ball.’"

Pages 133, 134.

Netherlands.

"State Agricultural College, Wageningen.—On the 20th of October, Dr. J. Ritzema Bos, Professor at the State Agricultural College, was good enough to tell me, in reply to my inquiries, that ‘wasps were also very inconveniently prevalent in the Netherlands, and also in Germany, at least in the Harz, where we were in August. *Vespa vulgaris*, *V. germanica*, and *V. media* were very prevalent here—indeed, the grapes were eaten by them on a large scale’; also, in one place, a little boy died in consequence of being stung by a great number of *Vespa crabro* (our English hornet).”

Norway.

Dr. Schoyen, State Entomologist, Christiania, writing to Miss Ormerod from that city on the 31st of October, 1893, mentions *Vespa crabro* as occurring in the south-east districts of Norway, in addition to eight other species of *Vespidae*.

Page 113.

“Species of British Wasps.—The seven kinds of wasps are divided into two sections of ground wasps and tree wasps, according to whether their nests are customarily formed in a hollow in the ground, or suspended in the air from a bough, or in a hedge, or, as with our largest species, the *Vespa crabro*, the splendid species known as the ‘hornet,’ the nests may be found in decayed trees, in roots, under eaves, or, as I have myself found it, down in the ground by a small post of a field palings.”

Pages 135, 136.

“General Summary.

“(British observations.) The hornet (a true wasp, although not popularly considered as such) was ‘plentiful’ in some localities, but only reported from a few.

“Of hornets, in one locality nine nests were known of within the limits of ‘a ramble,’ and twenty in the more extended area of a few miles.”

Page 139.

“Also in the case of the large species, known as hornets, the juice flowing from young bark, which they have gnawed down to the quick, forms an additional article of diet given by an additional department of mischief.”

F. A. WALKER.

Extract from Rev. J. G. Wood’s “Homes without Hands,”
pp. 436–439.

“The common hornet (*Vespa crabro*) is tolerably plentiful in many parts of England, but seems to be almost absent from others. The nest of the hornet is much like that of the wasp, except that it is proportionately larger and is almost invariably built in hollow trees, deserted outhouses, and places of a similar description. Whenever the hornet takes up its residence in an inhabited house, as is sometimes the case, the inmates are sure to be in arms against the insect, and with good reason. The hornet is much larger than the wasp, and its sting is proportionately venomous. It is popularly said that three hornets can kill a man; and

although in such a case the sufferer must previously have been in bad health, the poisonous properties of the hornet are sufficiently virulent to render such a saying popular. Moreover, the hornet is an irascible insect, and given to assault those whom it fancies are approaching its nest with evil intentions. It is not pleasant to be chased by wasps, but to be chased by hornets is still less agreeable, as I can personally testify. They are so persevering in their attacks that they will follow a man for a wonderfully long distance, and if they be struck away over and over again, they will return to the charge as soon as they recover from the shock. There is a deep, ominous menace in their hum, which speaks volumes to those who have some acquaintance with the language of insects; and no one who has ever been chased by these insects will willingly run the same risk again. Mr. S. Stone, whose interesting letter upon the wasp has already been mentioned, tells me that he has been successful in breeding hornets as well as wasps, and forcing them to build nests much more beautiful than they would have made if they had been at liberty. One nest, when of moderate size, was removed from the head of a tree and placed in a large glazed box similar to those which have been mentioned in connection with the wasp. Within the box the hornets continued their labours, and a most beautiful nest was produced, symmetrical in shape, and variegated with wonderfully rich colours. 'Such a nest as that,' writes Mr. Stone, 'is not produced by hornets in a general way. They do not trouble themselves to form much of a covering, especially when a small cavity in the head of a tree is selected, which is often the case. The walls of the chamber they consider a sufficient protection for the combs. If you expect them to form a substantial covering, the combs must be so placed as to have ample space around them, and if you expect them to fabricate a covering of great beauty, you must select the richest coloured woods, and such as form the most striking contrasts, and place them so that the insects shall be induced, nay, almost compelled, to use them in the construction of their nest. This is exactly what I did with reference to the nest in question.' Knowing from experience the difficulty of assaulting a hornets' nest, I asked Mr. Stone how he performed the task, and was told that his chief reliance was placed on chloroform. Approaching very cautiously to the nest, he twists some cotton-wool round the end of a stick, soaks it in chloroform, and pushes it into the aperture.

A mighty buzzing immediately arises, but is soon silenced by the chloroform, and as soon as this result has happened, mallet, chisel, and saw are at work, until the renewed buzzing tells that the warlike insects are recovering their senses, and will soon be able to use their formidable weapons. The chloroform is then reapplied until they are quieted, and the tools are again taken up. The extrication of a nest from a hollow tree is necessarily a long and tedious process, on account of the frequent interruptions. Even if the insects did not interfere with the work, the labour of cutting a nest out of a tree is much harder than could be imagined by those who have not tried it. Moreover, the habits of hornets are not quite like those of the wasps. At night, all the wasps retire into their nest, and in the dead of night, the nest may be approached with perfect safety, the last stragglers having come home. Hornets are apt to continue their work through the greater part of the night, and if the moon be up, they are nearly sure to do so. Therefore the nest hunters are obliged to detail one of their party as a sentinel, whose sole business it is to watch for the hornets that come dropping in at intervals, laden with building materials or food, and that would at once dash at the intruders upon their domains. Fortunately, the light from the lanterns seems to blind them, and they can be struck down as they fly to and fro in the glare. The nest that has just been mentioned was rather deeply embedded in the tree, and cost no less than six hours of continuous labour, the work of excavation having been begun at 8 P.M. and the nest extracted at 2 A.M. on the following morning."

Compare the following observations respecting the occurrence of *Vespa crabro* as contributed by correspondents on different occasions to the pages of the *Entomologist* :—

November 20th, 1893.

"*Birmingham Entomological Society.*

"Males, females, and neuters of *Vespa crabro* from Astwood Bank were exhibited by Mr. R. C. Bradley.

"On December 18th some fine specimens of *Vespa crabro* from Alvechurch, where it has been unusually abundant, were exhibited by Mr. H. J. Sands."

"Notes from Ringwood, 1893.

"*Vespa crabro* was very abundant everywhere around here. The females in March were very large, neuters during the summer, and males later.—J. HENRY FOWLER."

"Collecting at Tunbridge Wells and Ashdown Forest.

"The hornets coming to sugar on some nights were a great nuisance, especially as they carried away insects.—R. A., Dallas Birchling."

"Hornets in Worcestershire.

"Hornets have appeared this season in a certain district in Worcestershire in unusual numbers, though for several years they have been on the decrease.—W. HAROURT, Bath."

1893.

"On August 6th I went to Brockenhurst, and found everything over, and a remarkable scarcity of insects of any kind save hornets and wasps, which were a perfect nuisance. The treacle at night attracted more hornets than moths.—F. W. FREIR."

1881.

"Hornets in Norfolk.

"My garden here has been full of them all the summer. They and the wasps between them devoured certainly one-half of a magnificent crop of plums. I find several hornets every night on my sugar, and one evening I discovered a handsome nest of them in a loft. It hangs suspended from a beam, and is about the size of a moderate pumpkin. If you or any of your correspondents can tell me how to destroy the insects without injuring the nest, I should be greatly obliged.—R. S. STANDEN, The White House Alley, Norwich."

1872.

"The Common Hornet in Siberia.

"*Proceedings of Entomological Society, March 18th.*—Mr. Smith said that the discussion respecting Siberian insects of the common hornet type had induced him to examine specimens of the common hornet from Europe, Siberia, and North America, and he found that individuals from these districts

presented no appreciable difference, and their specific identity was proved by the genital organs being alike in all cases, whereas those of the Asiatic *V. orientalis* differed considerably."

"*Proceedings of the Entomological Society.* March 6th to April 3rd, 1871.

"*Hornet barking an Ash Branch.*--Mr. Smith exhibited portions of two small branches of ash, from which the bark had been neatly removed all round. He had received them from Mr. J. Hellins, of Exeter, accompanied by a note, in which Mr. Hellins stated that one day last summer he had observed a hornet busily engaged in removing the bark from these branches. Mr. Smith could not believe that the hornet was providing building materials for its nest, as he had invariably found this to be composed of friable paper, apparently formed from dead or decayed wood. Upon referring to Réaumur's *Mémoires*, he found that that keen observer had recorded a precisely similar circumstance, and he (Mr. Smith) was inclined to think the insect was endeavouring to extract the sap, from the inner wood, as food.

"*The Hornet gnawing the Smooth Bark of Elm.*--During the dry, hot weather in August and September, 1870, I frequently noticed hornets gnawing the young and smooth bark from wood of eight or nine years' growth of a variety of *Ulmus campestris* or *U. montana*. So busily were they engaged that they would allow me to draw the branch sufficiently near to minutely watch their operations, but in no instance could I see that they carried on their work systematically, or removed the bark in circles; they only appeared to cut it with their mandibles to suck out the sap.--HENRY REEKS."

"*Early Appearances, 1897.*

"Throughout the past month (February) the weather, as far as this part of the country is concerned, has been remarkably mild and light. On one especially light day a fine *V. crabro* (female) was noticed flying around a window, evidently enjoying its winter's flight.—AUGUSTUS D. IMMS, 'Linthurst,' Oxford Road, Moseley, Worcestershire, March 4th, 1897."

"Death through the Sting of a Hornet.—The deputy coroner for the Reading division of Berkshire has held an inquest at Mortimer, a village near Reading, touching the death, under extraordinary circumstances, of Mrs. Sarah Merrett, a labourer's wife. Deceased was standing in the road near her house, when a hornet flew out from a nest in the bank and stung her on the right side of her neck. She went indoors, and a neighbour bathed her neck with water and vinegar. However, she fainted almost immediately, and expired in a few minutes, before a medical man could reach the house. Mr. G. H. Davis, surgeon, stated at the inquest that he knew Mrs. Merrett as a nervous, excitable woman, and he believed the immediate cause of her death was syncope, the result of a nervous shock caused by the sting of the hornet. The jury returned a verdict in accordance with that opinion. Deceased was fifty years of age.

“(This is one of the best authenticated instances of death from the sting of a hornet that I have ever met with, and I think admits of no doubt.)—EDWARD NEWMAN.”

“Death from the Sting of a Hornet.—You certainly have some entomological readers in the neighbourhood of Reading. Could you not get them to investigate this case more thoroughly? Not that I think it at all impossible that a nervous, excitable person may die through the sting of a hornet, wasp, or bee; in fact, if I remember rightly, the Hon. Grantley F. Berkeley some few years ago recorded in the *Field* newspaper the death of an old man from the sting of a bee. This occurred in the garden of Mr. Lovegrove, Waldron, near Lambourne, Berks, I think. What I want to know is this—was it a hornet or a wasp? I ask this because I never yet saw a hornet's nest in the ground, and never heard of an authentic instance of one being found in that situation. But then, on the other hand, I have never resided anywhere where hornets may be said to be very common; and I have known of some dozen nests within a radius of two miles, but none of them were in or very near the ground, but in roofs of cottages, outhouses, and hollow trees, and these are decidedly the favourite resorts. Perhaps, however, Mr. T. Smith, or some other hymenopterist, will kindly say if I am wrong. Any one would think that even a child who had once had a hornet shown him could never again confound it with a wasp, or *vice versa*, but you would be surprised at the ignorance in this matter of many well

informed persons, who certainly ought to know a wasp from a hornet, there being quite as much difference in size as between a hive bee and a humble bee (*Bombus terrestris*). Some years ago, my friend the late Mr. S. Stone wrote to me to find out some hornets' nests, and I made several inquiries for him in the neighbourhood. One intelligent keeper said that he did not *then* know of a hornets' nest, but he had seen dozens of them in previous years, and he perfectly remembered one very strong colony that attacked every one who passed near the nest, which, he said, *was suspended from the under side of a fir bough*. This statement at once floored all my previous faith in his tales of hornets, their nests, and shape; and he likewise told me that on another occasion one crawled into his boot and stung his foot. That the hornet could raise a colony from a nest suspended in the open air is a simple impossibility; the first rough wind would blow its frail but beautiful nest, constructed of rotten wood, to atoms. Even when taken for the cabinet, it requires most careful handling, or it will crumble to pieces in the hand with only a very slight pressure.—HENRY REEKS, Thruxton, September 7th, 1874."

"Do hornets ever build in the ground?" This question is asked by Mr. Henry Reeks in the last number of the *Entomologist* (*Entom.* vii, 232). I can, from personal observation, assure him that they do so. In the month of August, 1871, I found a hornets' nest in a bank at a wood-side near Sidmouth; it was at the latter part of the month, when the colony was numerous. I stood within two yards of the entrance to the nest for some time, the hornets passing in and out, but exhibiting no dislike to my close observation. I was anxious to ascertain whether hornets posted a sentinel within the mouth of the burrow; I failed, however, to detect one. In the fifth volume of the *Entomological Magazine*, p. 479, will be found a record of the hornet building in a perpendicular bank at the side of a river.—FREDERICK SMITH, 27, Richmond Crescent, Islington."

Vespa Orientalis.

It is much to be wished that those who contributed the appendix "Insects of the Bible" to the Teachers' Bible, in making the statement that four species of hornets (resembling ours, but larger) have been found in Palestine, would also have given the place and date of their occurrences, and the

scientific names of all these four kinds. No opportunity is afforded to us of verifying the assertion, however correct, and why, if four species larger than our own do occur there, are their names not given? Whereas the name of our own British species, *Vespa crabro*, is given in the third column of the page devoted to the Latin scientific names of Bible insects, the first and second columns being devoted to the English and to the Hebrew and Greek appellations respectively. Again, what proof is given that our British hornet occurs in Palestine? I have never captured or even seen it there. But let us suppose that it does for the moment and admit that others have been more observant and fortunate. Why is the foreign species, *Vespa orientalis*, never so much as mentioned by those entrusted with the responsible duty of compiling the notes on Scripture for Sunday-school teachers in general. That it is widely distributed may be proved from my personal experience, as I caught it at the River Meles, Smyrna, and again at Philadelphia, and also at Lycopolis, Hélwan, and Heliopolis, in Egypt, and saw it, moreover, at Cairo, Denderah, Minieh, and in the two former of these last-named three places in abundance.

The Rev. J. G. Wood hits the mark much more nearly when in page 616 of his work *Bible Animals* he states:—"The species of hornet represented in the illustration is *Vespa orientalis*, the insect and nest being drawn from specimens in the British Museum." His remark on page 615 is also perfectly accurate:—"The hornets of Palestine and the neighbouring countries are far more common than our own hornets in England, and they evidently infested some parts to such an extent that they gave their name to those spots. Thus the word *Zoreah*, which is mentioned in Joshua xv, 33, signifies 'The Place of Hornets.'" This word is evidently derived from the sound of their buzz, as is also *Tzireh*, the word used in these passages for hornets—Exodus xxiii, 28, "And I will send hornets before thee, which shall drive out the Hivite, the Canaanite, and the Hittite, from before thee." A similar use of the word is made in Deut. vii, 20, "Moreover the Lord thy God will send the hornet among them, until they that are left, and hide themselves from thee, be destroyed." And again in Joshua xxiv, 12, "And I sent the hornet before you, which drove them out from before you, even the two kings of the Amorites; but not with thy sword, nor with thy bow." The Rev. J. G. Wood adds (also on page 615), "It is needless to say that the passages in question might be literal statements

of facts, and that the various nations were actually driven out of their countries by hornets. Let the insects be brought upon the land in sufficient numbers, and neither man nor beast could stay in it." But then, again, on page 613 he inclines to the contrary view and says, "It is most probable that in these passages the word is used rather as a metaphor than as the statement of a fact." As a corroboration of the circumstance of hornets proving an actual and a literal scourge, one has only to recall the prevalence of *Vespa orientalis* in and around the bakers' shops in Cairo, and flitting about the walls of sun-dried clay in the outskirts of that city, as I can bear witness, in December, 1883. Again, in the month of February, 1897, members of Perowne's party of tourists, I am credibly informed by one of the company, when in the plain of Jericho were forced to scatter precipitately while engaged in driving horizontal passages into the old mounds of the Canaanite and Perizite on the westernmost side of the plain under the hills of Judea in search of fragments of ancient pottery, as thereupon they encountered *Vespa orientalis*, and found the hornets very much "at home."

The following paragraph contains the record in detail of my own observation of *Vespa orientalis* in Egypt. Some account of this insect, as a species widely distributed in Bible lands, may possibly prove interesting. In the first place, though almost identical with its British congener, *Vespa crabro*, in point of colour, it may readily be distinguished from the latter insect in having a larger portion of chestnut-brown covering the whole of the upper portion of the abdomen, and only the two lower segments consisting of yellow spotted with brown instead of three or four, as is the case with *V. crabro*. Also, if there is any difference in shape, *V. orientalis* is rather the more slender of the two. Never having myself come across a nest of this species, I of course cannot judge as to its composition, but infer that it may be of clay instead of wood from paling or hollow tree, after the manner of *V. crabro*, *V. vulgaris*, *V. germanica*, etc., when engaged in sawing with their mandibles the requisite materials for the preparation of their cells; and indeed on the confines of the Egyptian desert, there are no timber trees, as a rule, with the sole exception of the date palm, for any such purpose; but these hymenoptera flit about the walls of sun-dried clay in the outskirts of Cairo, Heliopolis, etc., and also numerously frequent the bakers' shops in the bazaars. After my ascent by the southern staircase to the roof

of the time-honoured temple of Isis at Denderah (anciently Tentyra) on December 24th, 1883, I found myself in a somewhat uncomfortable position, as the summit of the wall was fenced by no parapet and there was a drop of probably 30 feet on the outer and possibly 20 feet on the inner side of the wall, and the hornets that were clustered on the patches of clay on the outer wall of the little chapel of Isis on the roof, being disturbed in their depredations by our advance, began to fly wildly about our heads. The said clay cells were the work of the little tawny-coloured bee scientifically known as *Calicodoma sicula*, and they have plastered not only the hieroglyphics, but the whole side of the exterior of the temple. I have three specimens of *V. orientalis* from the cliffs of Lycopolis that I visited on December 22nd, and doubtless the presence of *C. sicula* accounted for their being here also, as on p. 130 of my *Nine Hundred Miles up the Nile* the following passage occurs:—"Nor must the wonderful labours of hymenopterous insects be left unnoticed that have selected the western side of the cliff as doubtless the most sheltered for their abode, and completely covered it, in one particular spot, with masses of clay cells." Great interest attaches to the fact of the modern traveller finding *V. orientalis* and *C. sicula* side by side, as there can be little doubt but what these are the identical hornet and bee mentioned in Holy Writ. *V. orientalis* was also noticed at Minieh, Upper Egypt, in the outskirts of the town, and around its sugar factory on December 20th (*cf. Nine Hundred Miles up the Nile*, pp. 120 and 122):—"Hornets were very abundant. Five days only from Christmas, and the thermometer is 79° in the sun, and several hornets are settled on the ground outside the mill, to regale themselves on the mingled molasses and water that drips from the waste pipe." And p. 103, *apropos* of Helwán, "Hornets are abundant" (*Entomologist*, vol. xxxi, pp. 170, 171).

Apropos of *Vespa orientalis*, the Rev. J. G. Wood (p. 615 of his *Bible Animals*) says:—"They make their nests in various ways, some species placing them underground, and others disposing them as shown in the illustration (said illustration represents the nest as suspended from two forked branches of a tree) and merely sheltering them from the elements by a paper cover. Such nests as these would easily be disturbed by the animals which accompanied the Israelites on their journeys. In such a case, the irritated insects rush out at the intruders, and so great is the terror of their stings that

men and beasts fly promiscuously in every direction, each only anxious to escape from the winged foes.

"The Talmudical writers inclined to the literal view of the passage, and dilated on the terrible power of the hornet, four of which could destroy a horse, and one kill a boy nine years of age, or a man, provided he was stung in the forehead. The sting of the hornet is very severe indeed, exceeding in virulence that of the wasp, to which it is closely allied, and it is possible that a boy, or even a man, might be in so feeble a state of health, or be naturally so sensitive to poison, that the sting of a hornet would be fatal. As a rule, however, the sting of the hornet, although exceedingly painful, is scarcely more injurious than that of a bee or wasp. The Talmudists stated that the hornets mentioned in Joshua killed the people by stinging them in the eye."

Vespa constitutes the only British tribe of wasps which is social and gregarious in its way of life. On the continent there are other genera that similarly live together in nests, e.g., those belonging to the family *Polistes*, of which *Polistes gallicus*, that I have taken in Switzerland, and also in Spain, and is common along the Mediterranean, is a well known example. Its cells are very small, as befitting such a slender-bodied insect, and it was possibly the forsaken fragment of a nest of this species that I discovered in 1882 on a bush in the neighbourhood of Tarsus and brought away with me.

For good illustrations of some of the exotic species of hornets, all who are interested in the subject are referred to Rev. J. G. Wood's work. *Insects Abroad* represents the neuter of the splendid Chinese wasp, which is appropriately called *Vespa mandarinia*. The female is shown on Plate IX, Fig. 3. This fine insect is found in China and Japan and throughout the whole of said countries. It is coloured very much like our common hornet, but is much richer in appearance, owing to the very broad and ample head and the amount of bright yellow upon it. The colours are rich dark brown, banded, striped, and marked profusely with "king's" yellow. The jaws are enormously powerful. The wings are yellow, darker at the base, and becoming lighter towards the tips (p. 499 of same work); the male has no spots on the abdominal band.

I possess several specimens of the male (believed to be from China) in my own collection.

I may remark that Wood's *Insects Abroad* contains two illustrations of *Vespa mandarinia*, one of the largest, and

doubtless most formidable, known species, and three ditto of *Vespa cincta*.

Vespa Cincta.

The species mentioned above is a native of Asia, and is spread over a very large tract of country. There are several Asiatic species of *Vespa* which are almost exactly similar in their habits, and this may safely be taken as the typical species. The head and thorax of *Vespa cincta* are dark brown, covered with a moderately thick grey down, and the abdomen is very dark brown, crossed with a bold band of bright yellow, whence is derived the specific name of *cincta* or "banded."

I will here quote *in extenso* from my note-book the notes which refer to Indian "hornets," by which term both *Vespa cincta* and *V. orientalis* are designated :—

August 15th, 1863.—"These insects are very abundant at Benares, but not generally spiteful. One may see hundreds of them flying about the sweetmeat stalls, like wasps in the fruit shops in England; and the vendor drives them away with a whisk—a piece of palm leaf in a cloth—and is very rarely stung. If one, however, be incautiously touched the sting is very suddenly given and very sharp; its pain is intense, and it induces considerable inflammation. They make their nests in the mud walls, and the form of these is just like that of the English hornet.

"Yesterday I was drying some sugar in the sun, and this attracted a large number of them. My man killed many, throwing down their bodies on the spot, when the ants appeared to carry off the carcases; but not only did the ants so employ themselves, for the hornets also alighted, and carried off their dead brethren as food.

"The ants (*Ecophylla smaragdina*) appear to be naturally very destructive to these insects. I have seen the hornets trying to carry off their tiny tormentors. Again and again have they darted at them; but it invariably ended in the hornet quietly sitting down among his enemies to be bitten or stung to death, and then carried off in triumph to be eaten by them, or in his falling to the ground with two or three ants hanging on, when his fate was equally certain. One of these insects stung me on the thumb, but by sucking the place for about a quarter of an hour I drew out the poison, and the pain and swelling were afterwards very slight."

August 20th, 1863.—"This evening, having prepared two large squibs filled with damp gunpowder, I proceeded to take two nests, one of *Vespa orientalis*, and one of *Vespa cincta*, both in similar situations. Having lighted the touch-paper, the end was placed at the mouth of the hole, and wet clay was plastered around. The dense smoke and intense heat thus killed every perfect insect in the nest, which I shortly dug out for the purpose of examination. One nest was buried forthwith in a hole previously prepared, and the one taken to be set up was that of *Vespa orientalis*, to which all the succeeding remarks will refer.

"Both nests were constructed of earth tempered with water, and I could trace no sign of gluten of any kind in them. In the nest prepared by me were seven ranges of cells, and at the time of taking it from 400 to 500 hornets were at home. Although I took out every perfect insect, there were from 40 to 50 nearly hatched by 5 A.M. next morning, showing with what enormous rapidity they increase. The nest was placed under a large wire dish cover, and a nest of the yellow ant before referred to was placed with them, so that every young hornet was destroyed as soon as born."

July 1st, 1864.—"Benares. As a boy, when in England, I have seen a hornet carry off a fly sitting on a door handle, and to-day I saw one pounce on a small honey bee deep in the pollen of a flower, and taking him off, sit down and eat him quietly, and from the number hovering about flowers, this would seem to be a favourite food."

July 19th, 1864.—"Benares. Watched hornets catching and eating the workers of termites, whose galleries I had just destroyed on the bark of a tree, when, in consequence, the blind insects were running wildly about."

August 19th, 1864.—"Watched them more narrowly and carefully. Saw that one caught at least ten termites, one after the other, and made them all up into a ball with its jaws, when the said ball was taken away, evidently to feed the young larvæ with a rich and juicy morsel, which, however, would be strongly tinctured with acid."

APPENDIX.

SYNOPSIS OF SPECIES OF *Vespidae* IN THE NATIONAL COLLECTION.

The accompanying table is a synopsis of most, if not all, of the species of *Vespidae* in the national collection. There are, of course, many more genera of aculeate *Hymenoptera* represented there, but the following represent the true *Vespidae* occurring both in the old and new world, but the larger proportion of species, especially as regards the hornets, would appear to be met with in the former. The distinction in colour and in size between so-called "hornets" and "wasps" would appear to hold good not only in England, but in most countries of the world wherever these insects occur. Some of the species of *Vespidae* in the collection at the British Museum are still unnamed, and several specimens are overcrowded, the great number of those of *Vespa orientalis* having caused them to become mixed with those of *Vespa crabro*. I have been unable to discover that *Vespa crabro* occurs in Bible lands, or indeed in any part of Asia or Africa, though it is recorded in a catalogue of American *Hymenoptera*, and two specimens in the British Museum are labelled "New York."

OLD WORLD SPECIES.

WASPS.

1	<i>Vespa vulgaris</i>	Europe, most of them also British.
2	" <i>germanica</i>	...	...	...
3	" <i>rufa</i>	...	...	...
4	" <i>arborea</i>	...	...	...
5	" <i>sylvestris</i>	...	...	...
6	" <i>saxonica</i>	...	...	...
7	" <i>norvegica</i>	...	...	...
8	" <i>media</i>	...	...	...
9	" <i>Lewisii</i>	...	...	...
10	" <i>bellicosa</i>	...	...	...
11	" <i>flaviceps</i>	...	...	...
12	" <i>strutor</i>	...	...	...

Also three unnamed species of wasps from N. India and Persia (13, 14, 15). One or more of these may be the same as the named European kinds.

HORNETS.

1	<i>Vespa analis</i>	...	...	...	India, China.
2	" <i>auraria</i>	...	...	...	N. India.
3	" <i>basalis</i>	...	...	...	India.
4	" <i>tyrannica</i>	...	...	...	Singapore.
5	" <i>bicolor</i>	...	...	...	India, China.
6	" <i>velutina</i>	...	...	...	India, Java, China.
7	" <i>crabro</i>	...	...	...	Europe.
8	" <i>cincta</i>	...	...	...	Batavia, Bangkok, Ceylon.
9	" <i>orientalis</i>	...	...	...	{ Arabia, Gwalior, Persian Gulf, Muscat, Bible lands.
10	" <i>vivax</i>	...	...	...	North India.
11	" <i>obliterata</i>	...	...	...	"
12	" <i>deusta</i>	...	...	...	Philippine Islands.
13	" <i>mandarinia</i>	...	...	...	N. China.
14	" <i>crabroniformis</i>	...	...	...	"
15	" <i>ducalis</i>	...	...	...	"
16	" <i>affinis</i>	...	...	...	E. Indies, Formosa.
17	" <i>luctuosa</i>	...	...	...	Philippine Islands.
18	" <i>nigripennis</i>	...	...	...	"
19	" <i>Philippinensis</i>	...	...	...	"
20	" <i>Bellona</i>	...	...	...	Yunan.
21	" <i>Japonica</i>	...	...	...	Hakodadi.
22	" <i>simillima</i>	...	...	...	"

NEW WORLD SPECIES.

WASPS.

1	<i>Vespa sulphurea</i>	....	....	....	California.
2	" <i>arenaria</i> ....	....	....	....	New York, Vancouver.
3	" <i>cuneata</i> ....	....	....	....	Mexico.
4	" <i>diabolica</i> ....	....	....	....	S. America.
5	" <i>vidua</i> ....	....	....	....	N. America.
6	" <i>borealis</i> ....	....	....	....	Nova Scotia.
7	" <i>Koreensis</i> ....	....	....	....	Korea.
8	" <i>dorylloides</i> ....	....	....	....	Java, India.
9	" <i>maculata</i> ....	....	....	....	U. States, Canada, New- foundland, New York, Vancouver, Massachu- setts.

Also two unnamed species from Mexico, and two from British Columbia, one from Hudson's Bay, one from U. States (10, 11, 12, 13, 14, 15).

HORNETS.

1	<i>Vespa carolina</i> ....	....	....	....	N. America
2	" <i>crabro</i> ....	....	....	....	New York.

November 26th, 1900.

F. A. W.