HYMENOPTERA.

Notes on Hymenoptera.

By Frederick Smith.

Two years have elapsed since I contributed a few notes on British Hymenoptera to the "Entomologist's Annual," and within my experience, no two seasons will parallel their unproductiveness of novelty, or the scarcity of Hymenopterous insects generally.

I have no species new to the British list to chronicle, and but very few captures of rarities to enumerate. The general scarcity of *Aculeata*, during the past season, can, I think, be readily accounted for; quite in early spring we had an interval of hot summer-like weather, when spring bees appeared in considerable numbers; more so, indeed, than I have observed them to do for some years past; in fact, a recurrence of a glorious season, such as we enjoyed some twelve or fourteen years ago, appeared to be opening upon us; alas! our expectations were speedily doomed to disappointment; winter, as it were, stepped back to give us a parting greeting, and again chilled us with a salute of frost and snow. The hot weather that preceded this unwelcome return had roused the insect world, vast numbers had come forth, probably most of those which had passed the winter in torpidity, in their perfect condition; others that had, during that inclement period, remained in the larva state,

then changed to pupæ, and all such, I have little doubt, perished on the return of the cold, wet and severe weather we again experienced.

Vespidæ were numerous during the hot weather alluded to, and that family, according to my observation, is the first to perish under such circumstances as followed that interval. I have not seen, probably, more than twenty wasps during the past summer and autumn, although, in some districts, I have ascertained, they were numerous; such is, no doubt, usually the case during seasons when these insects are not universally so. In the year 1860, I believe, I only saw three wasps; but I was at that time informed, they had been very plentiful in the neighbourhood of Kelso.

Observation has shown, that seasons in which *Hymenoptera* are generally abundant have been preceded by severe winters, followed by genial spring weather unbroken by any interval of severe frost, or any superabundance of heavy rains; a combination of both is most fatal to insect life.

In the month of June last, I visited a locality where an extensive colony of *Anthophora acervorum* has long been established; on examining their burrows, I found not less than twenty dead bees for every living one; the majority of the dead ones were in the pupa state, others more or less advanced towards the perfect condition; such, I believe, will always be found to be the case, where weather, such as we experienced at the beginning of the last Entomological season occurs.

During the summers of 1858-9, I visited the neighbourhood of Lowestoft in Suffolk; a locality, at that time, extremely rich in rare and local *Hymenoptera;* again I visited the same spot last season, when, on the contrary, an Hymenopterous insect was quite a rarity. In no place, with

which I am acquainted, are *Bombi* usually more abundant; and I am not in the slightest degree underrating the number, when I estimate the number that I saw on the wing at about thirty individuals. During the entire month of August the weather was all that could possibly be desired, even by an Entomologist, yet even this failed to produce insects of any order in abundance.

One circumstance in connexion with such Aculeate *Hymenoptera* as I met with is certainly remarkable; the majority of them were mere Liliputian representatives of their race; some of the working bees, of *Bombus lapidarius*, were so diminutive, that I mistook them for a species of *Osmia*. The sandy cliffs and banks near Lowestoft usually swarm with fossorial insects, but last season they were quite as scarce as the bees; and the specimens of *Tiphia femorata* were miniature representatives of the species.

I have endeavoured to show the effect of certain conditions of weather upon Hymenopterous insects, but their scarcity is not at all times to be attributed to such influences; other causes operate frequently in causing a scarcity, or even a total absence of them, from localities where they may have been found abundantly for several years; such disappearances will frequently occur during the most favourable seasons.

For years past, I have felt assured that *Hymenoptera*, as well as other insects, migrate from one locality to another; and, we are frequently told, that certain species have been hunted up, even to annihilation, in certain places; but observation has induced me to believe that, in most instances, their disappearance is due to other causes. I have observed the common *Anthophora acervorum*,—a bee that colonizes in larger numbers, perhaps, than any other,—after having

occupied a bank for several years, until it has become completely riddled with its burrows, suddenly desert it; the same circumstance has also come under my observation with a large colony of *Eucera longicornis*, which quitted its long-established abode on the south side of Highgate Archway, and established a colony on the north side; where, I believe, it is to be found up to the present time.

Several causes for these migrations may be suggested; where extensive colonies have for a long time existed, the bank in which they burrow at last becomes, as it were, completely honey-combed, so that fresh space for new burrows becomes exhausted; parasites may also become so numerous, and other insects so obnoxious to the bees, and so formidable in numbers, that the colony is compelled to seek for new and more favourable quarters. Colonies may, probably, sometimes be entirely exterminated by parasitic *Acari*. That such was the case with a very extensive one that formerly existed at Northfleet, I have every reason to believe.

The *Acarus* to which I have alluded was described by Newport in the 21st volume of the Linnæan Transactions, and named *Heteropus ventricosa*; unfortunately the generic name had been used by no less than seven previous authors; I would therefore propose to substitute the generic appellation of *Newportia*.

This extraordinary parasite is only occasionally found, and, as far as my experience enables me to judge, only in old, long established colonies. From the one alluded to above I several times obtained larvæ of *Anthophora* for the purpose of tracing their changes, and also of rearing some of the various parasites by which they are attacked. On one occasion I procured upwards of a hundred, and of these, full two-thirds were destroyed the following spring by this exterminating *Acarus*.

This parasite feeds alike on the larva and pupa of the *Anthophora*, and these, when attacked by it, have the appearance of being covered with minute semi-transparent globules. I had frequently observed these previous to Newport's discovery of their being living creatures: they are extremely minute, and without the aid of a powerful microscope their real nature would scarcely be detected.

I may here record a very remarkable circumstance in connexion with these *Acari*. Having kept several larvæ, attacked by them, in glass tubes for the purpose of observing their progress, I found that the creatures never quitted their victim; their proboscis, or sucking apparatus, being inserted into the larvæ at the time of their birth, and in this state they imbibe its juices, arriving at their full growth, when nothing is left of their victim except its thin epidermis. When the *Acari* are fully matured, their bodies become so distended, apparently with an incalculable number of eggs, that it bursts open, and is then found to be filled with a fine brown powder or impalpable dust, this dust being the eggs of the *Acarus*. The following spring I obtained larvæ of *Anthophora*, as well as those of *Osmia bicornis*; these I sprinkled with some of the dust, and in each case the parasites were shortly developed.

Four years subsequent to this experiment, I found one of the glass tubes containing the dust of the *Acari*, and had the curiosity to try its effect upon fresh larvæ; I therefore procured some, of several species of bees, and to my gratification, with the same successful results. I am strongly inclined to believe, that whenever the eggs of the *Acarus* come in contact with suitable nourishment, their development will follow, irrespective of lapse of time.

These are a few of the causes that may tend to render old bee colonies untenantable, and conduce to the emigration of

the bees: there are many others, but enough has been adduced to show the probability of our position.

In the year 1851, when on a collecting excursion to the Isle of Wight, I captured *Philanthus triangulum* in great numbers in Sandown Bay, since which it has been taken in the same situation by other Entomologists; but I have reason to fear this fine insect has now quitted that locality. Mr. Pascoe, who resided at Ventnor some months during the past season, searched diligently for the species without finding a single specimen. Assuming this to be an example of insect migration, what circumstances have occurred likely to prove an adequate cause? The same slopes in which I found them burrowing still remain at the foot of the cliffs, the blackberry bushes still blossom, on the flowers of which I took them in plenty, and their prey, *Halicti* and Hive Bees, are no doubt as plentiful as ever: such being the case, it becomes a matter of impossibility even to suggest a probable cause, since I am not aware of any attack on *Philanthus* by any species of parasite likely to render their old locality untenantable. Atmospheric changes may no doubt operate strongly upon them—a long continued season of cold wind and rain, coming in an unfavourable direction, might so interfere with their operations as to drive them to seek some more sheltered situation; but of all places in the Isle of Wight, the Undercliff is, perhaps, the least likely to be so visited.

Among the captures made by Mr. Pascoe of Hymenopterous insects, in the above locality, I noticed examples of most of the rarities which fell to my lot sixteen years ago, the rarest being *Aporus unicolor*, and next in point of rarity may be mentioned the male of *Methoca ichneumonides*. I have only taken five specimens of this male during the long period of my Hymenopterous explorations. It is very probable that this insect is the parasite of some species of *Noctua*—I think, certainly, of some Lepidopterous insect, since Mr. Bakewell obtained species of *Thynnidæ* from cocoons of moths in Australia, and *Methoca* is the only known representative of that family hitherto taken in this country.

The extremely local and rare parasitic bee, *Nomada armata*, also occurred in the same locality as the above insects; but Mr. Pascoe failed to discover the *Cœlioxys Vectis*, one of the most abundant insects when I last visited the Isle of Wight.

I stated, at the beginning of these Notes, that I had no species new to the British list to chronicle, and, strictly speaking, such is the fact; but I have to announce the probable discovery of a genus and species not hitherto recorded in our lists; its history is briefly told.

In October last, I visited Penzance; and, whilst there, met with an inhabitant who had on two or three occasions visited the insect-room at the British Museum; the lady requested the favour of my naming a few flies of her own capturing, principally in Cornwall; of course I was rejoiced to do so; when I received the box I saw, what I took at once to be a North American insect, a species of *Polistes*. I named the insects the night before I left, and queried the *Polistes*, as well as a species of *Bombus* having been taken in Cornwall; my correspondent's own words shall answer my doubts:—"The *Polistes* was caught alive, by myself, on the window-sill of our house, in the summer of 1866. This year I caught three more, about the same time, the last week in July and the first week in August, in the very same situation in the window of our house. Two of these are still in my possession,—the third, not wanting so many, I let go. Their languid movements, so much in contrast with their fierce appearance, their entire strangeness to me,

and the fact of having caught them all in the same situation, led me to the conclusion, that they had probably been introduced in wood from a neighbouring dock-yard, which lies about a hundred yards below the windows of our house, but I did not know that they were foreign insects, till your notice of them apprised me of the fact."

It is at once evident that my correspondent supposes these wasps to be wood-boring insects: such is not the case, they are paper-makers, and construct their nest,—a single exposed comb, and attach it to trees, walls, posts, window-frames, &c., in fact, to anything suitable that is situated in a proper position for their purposes. The timber imported to Penzance is all cut into shape, and comes over, either in the form used for breastsummers for building purposes, or as boards, logs, &c.; untrimmed wood, I imagine, is never imported from America, so that it is difficult to imagine the introduction of these wasps by such means; a wasp might hide away in some hole or crevice, and so reach this country, but that they should do so two years in succession is not very probable. That a wasp imported should survive the winter at Penzance, when brought from a climate like that of N. America, is quite possible; and, also, that in the genial county of Cornwall they should establish themselves, is, to my mind, very probable.

My correspondent having taken the *Polistes* in 1866 proves nothing as to the time when, if imported at all, they were first introduced; in fact, so little has that part of the country been investigated, as to its Hymenopterous fauna, that I shall not be greatly surprised if I find a species of *Polistes* indigenous to that part of Cornwall. The common wasp of Europe, *Vespa vulgaris*, is found in N. America, and we may, therefore, hope to find a *Polistes* inhabiting both countries. (See Note at p. 96.)

The most interesting captures made in Suffolk were stylopized specimens of *Halictus abdominalis* and *H. obovata*,—these are the first examples of the larger species of the genus which I have seen so attacked; notwithstanding a most diligent search, I failed to obtain the male of the parasite; I found two bees from whose bodies it had emerged; and, judging from the size of the pupa cases remaining in the abdomen of the bee, I am satisfied of its being a much larger species than any of those that have been captured, and believed to have emerged from species of the genus *Halictus*. Younger students of Entomology, who have never seen stylopized bees, will readily detect the parasite, if the bees are carefully examined; they will observe a distortion, usually of the fourth upper abdominal segment; not invariably the fourth if there is more than one *Stylops* subsisting upon the bee; I have seen two under the third and one under the fourth, and possess several examples with one under each of those segments. When the protuberance is small, flattish, pale-coloured, and scale-like, it is the female of the parasite; should it be that of a male *Stylops*, it will be dark-coloured, black, or nearly so, and cylindrical in form; exactly resembling the apical portion of a Lepidopterous pupa case; of course, a miniature resemblance.

Of the stylopized *Halicti*, I took two males and four females. I do not, therefore, think the parasite can be rare in the vicinity of Lowestoft.

Several of the smaller species of *Halicti* have been observed to be attacked by these parasites: the *H. nitidiusculus* most frequently so; also *H. minutus*, *H. æratus*, and *H. quadrinotatus*; the genus *Halictophagus* is supposed to be the parasite of these smaller *Halicti*, but no Entomologist

has succeeded in rearing the parasite from the bee. Mr. Dale captured *Halictophagus* in company with *H. æratus*, which is certainly strong presumptive evidence of their relationship. This parasite is very minute, not exceeding the twelfth of an inch in length; the species which attacked *H. rubicundus* and *H. obovata* must, certainly, belong to some new genus, or be a new and grand species of *Halictophagus*.

Judging from the great difference in the size of the females found imbedded in the bodies of the various *Andrenidæ* and *Halicti*, I am led to the conclusion, that we have yet much to discover in this most curious and interesting family of parasites. I have seen a British species of *Prosopis*, in whose abdomen a parasite had been nourished, and also a species of *Odynerus*, belonging to the *Vespidæ*.

Taking into consideration our present knowledge of the family of the *Stylopidæ*, we are somewhat startled when we read in the pages of the last work published on the "British Bees," by Mr. Shuckard, "their natural history is but imperfectly known, and I believe the males have not yet been discovered;" and in another passage we are informed, that "*Melöe* is the reputed parasite of the genus *Andrena*," whereas *Anthophora*, a genus belonging to the family of true bees, *Apidæ*, is the only insect upon which *Melöe* has been proved to be parasitic, and of which Mr. Newport published a most elaborate and interesting account in the "Linnæan Transactions;" surely, the information quoted is sadly in the wake of our present knowledge of the subject.

Of all the genera of wild bees, we are perhaps best acquainted with the history of the *Bombi;* and yet, year by year, we are picking up additional facts in elucidation of

it, a truth which teaches us that the study of Entomology is inexhaustible; and we feel convinced that the complete history of a species has yet to be written.

It is usual to place the Humble Bees in two divisions, one containing such species as construct their nests on the surface of the ground; the second division, those that excavate, or that take possession of some cavity underground. Such is the general rule, but, like all rules, it has its exceptions; surface builders sometimes take possession of the nests of birds, suspended in bushes, or attached to roofs or other parts of buildings.

Among the surface builders is ranked *Bombus sylvarum;* last summer I noticed numbers of this bee frequenting a clump of the dead-nettle, *Lamium purpureum*, and being anxious to find their nest, watched their homeward passage, great was my surprise on seeing them enter a hole in the ground, after the manner of *Bombus terrestris*. This was so interesting a circumstance, that I went the following day, provided with the necessary implements for digging out the nest. It proved to be about a foot underground: the cavity which contained the nest was about five inches in diameter, and was lined with a mixture of dried moss and grass; the community was small, there being seven females, six recently disclosed, and the parent bee, whose wings were either worn off, or had been clipped off by the workers; there were twenty-two males, and about forty workers; half-a-dozen females were still undeveloped, as were also about twenty workers. This is the first instance in which I have observed a surface-building bee occupying an underground nest.

During an entire month's collecting in Suffolk and Norfolk, I did not see a single surface-building *Bombus*, except *B. sylvarum*, whereas, in former years, I have seen them in abundance. I ascertained, on inquiry, that the spring and

the early part of summer had been unusually cold and wet, which fully accounted for this scarcity.

An Entomological friend found the nest of one of the brown surface builders, constructed of cow's hair, but whence the bees had obtained it he could not ascertain. I have recorded the fact of one of these bees building with horsehair, in which instance the bees were observed collecting it from the currying of horses thrown into the loophole of a stable wall. My acquaintance also picked up a disabled *Bombus*, that had a specimen of the well-known Coleopterous insect —*Antherophagus nigricornis*— clinging to its palpi.

I have several times found *Antherophagus pallens* in the nest of *Bombus muscorum*, and have supposed it to have been attracted there by the store of honey; these beetles, being-flower frequenting species, are probably in the habit of attaching themselves to the bees when they are rifling the flowers of their sweets, and so get conveyed into their nests.

Mr. Packard informs us that the larvæ of *Bombi* are attacked by those of the genus *Melöe*, but he has not given any particulars of the development of the parasite, or whether any American Entomologist has traced the history of it, so as to confirm the statement satisfactorily. The *Bombi* are also said to be attacked by some species of *Stylops*, a circumstance not hitherto observed in Europe; it would be extremely interesting to ascertain the genus to which the parasite belongs.

Several interesting captures and observations have been made of different species of *Formicidæ;* of the *Myrmica unifasciata*, of which I possessed the only British example in this country, Mr. Pascoe took a specimen in the Isle of Wight, my own example having been found by Mr. Lewis, some years ago, at the land-slip, at no great distance from

the spot where the second specimen was taken, and which has been liberally added to my collection. There were three or four specimens from the same locality in the cabinet of Mr. Curtis, which was purchased for the Melbourne Museum.

Ants' nests, and the myrmecophilous beetles found therein, have excited great zeal and assiduity, but principally on account of the rarity of some of the species, and the consequent natural desire of Coleopterists to add them to their collections. Not any Entomologist has, I believe, made any discovery whereby a clue to their relationship to the ants has been clearly ascertained. That they act the part of scavengers in those nests in which they are found is, I conceive, the most apparently reasonable conjecture. The majority of these are rarely found in any other situation, and appear to be entirely dependant upon the ants for support; *Claviger*, never seeing the light of day during its entire existence, has consequently no need of eyes to enable it to find its way from one situation to another.

But there are other connections equally obscure in many respects, namely, those existing between one species of ant and another which live in community. We know that certain species are found in the nests of the slave-making ant, *Formica sanguinea*, in whose nest we find most commonly, in the capacity of slavery, the *Formica fusca;* these are principally carried there in the pupa state, and are consequently born, as it were, part of the household; others are carried there by force, and appear soon to become contented, and to work in unison with the rest; but there are several other species found there which appear to be interlopers, living on sufferance, but allowed unmolested to rear their progeny in perfect security.

I have received from a young and most observant Hymenopterist, a list of species found in a nest of *F. sanguinea*, at Shirley; it is an extremely interesting record, and, I trust, Mr. Rothney will continue his observations on this subject; although I have repeatedly searched the nests of this slave-making ant, I never met with some of the species contained in the list.

"*Formica fusca*, common; *F. nigra* and *F. flava*, several specimens; *Tapinoma erratica*; *Myrmica ruginodis* and *M. scabrinodis*, common; *Myrmica lobicornis*, the workers very abundant, but only one female; *Leptothorax acervorum*, all the sexes abundant in August; *L. Nylanderi*, several specimens. No nest of *Formica fusca* or of *F. flava* could be found near that of the *F. sanguinea*, but those of *F. nigra*, *T. erratica*, *Myrmica ruginodis*, and *M. scabrinodis*, were all within the distance of a few yards." The *Leptothorax Nylanderi* has never been found in any other situation than in ants' nests, usually those of *Formica rufa*. I believe Mr. Rothney to be the first who has observed *Tapinoma erratica* and *L. Nylanderi* in the nest of the slave-making ant. Some of the species named, it will be observed, are only occasional inhabitants of the nests of other ants, others appear to be permanent ones; to the latter class belongs *Myrmica muscorum* found by Dr. Nylander in the nest of *F. rufa*; it is a very minute ant, and has probably been overlooked. Such species as appear to be constantly associated with other ants may probably be deprived, or may be, more correctly speaking, deficient of the instinct that prompts others to construct their own nests, or it may be, that they find some necessary aliment in the habitations of the species they are associated with. *Claviger*, it would appear, must be entirely dependant upon *Formica flava* for its subsistanee, and this may also be the case with other species of insects.

Mr. Rothney observed a very interesting occurrence in the habits of *Formica fuliginosa*; the nests of this ant are extremely abundant in old oak trees at Barham, in Suffolk; two such trees were situated on the opposite sides of a gravel pathway, beneath which the ants had excavated a tunnel of communication.

Tetramorium cæspitum was found at Shirley; the only other locality I know of in the vicinity of London is at Plumstead Wood; this ant is much more abundant on the sea-coast.

Mr. Rothney found the rare bee *Cœlioxys quadridentata* plentifully at Ipswich. I have only taken it at Deal and in Yorkshire.

Many, like myself, have no doubt found it most pleasurable to visit some locality, rendered historic through the records of former Entomologists; amongst such, Mousehold Heath, near Norwich, is conspicuous; here, as Mr. Curtis informed me, Kirby, Marsham, Wilkin, as well as himself, had collected insects; it was in fact a favourite spot for that purpose with Curtis himself. Judging from the success I met with, on a visit of a few hours, I should be inclined to rank it very high as an Hymenopterous treasury. The elevated situation of the heath, its delightfully broken and hilly surface, backed on the north-west by a wood of pines; its many gravel-pits, some in operation, others long deserted, and left just in the right condition to attract fossorial insects; the extensive portions covered with the purple heath, intermixed in parts with bramble bushes and fern, altogether combine to make it just the locality that bees and fossorial *Hymenoptera* most delight in. A visit to this spot, at

different periods of the season, would, I feel certain, amply repay any one inclined to investigate it fully. On the 24th of August, I there took specimens of the following *Hymenoptera*:—*Colletes succincta* and *C. Daviesana*; *Halictus rubicundus*, *H. abdominalis* and *H. flavipes*; *Andrena pubescens*, *A. tridentata*, *A. Afzeliella* and *A. convexiuscula*; *Nomada solidaginis* and *N. alternata*; *Epeolus variegatus*; *Miscus campestris*; *Tachytes pompiliformis*; *Mimesa bicolor* and *Cerceris labiata*.

NOTE.—Since the observations (pp. 87, 88) on the species of *Polistes* taken at Penzance were written, I have received two of the specimens, which I have carefully compared with all the species with which I am acquainted from North as well as from South America; the Cornwall specimens do not quite agree with any known species, but most closely resemble the *Polistes biguttatus* of Haliday; they are, however, rather larger, and have not the two yellow spots on the basal segment of the abdomen which characterize that species; the thorax is entirely ferruginous with the prothorax narrowly bordered, posteriorly, with yellow, and one specimen has a transverse line on the post-scutellum, and two longitudinal ones on the metathorax, yellow; in *P. biguttatus* the thorax is black with the exception of the sides of the prothorax, which is ferruginous. Under these circumstances I am inclined to wait the results of a further search for specimens next season before I refer it to any species either from North or South America, although I am inclined to the belief of its being a variety either of the *Polistes biguttatus*, or of *P. versicolor* from Brazil, a most abundant and also an extremely variable species. If the insect is an importation, it is an extremely difficult thing even to suggest the means by which it was conveyed to Penzance. I trust the coming season will afford the means of clearing up that which at present is involved in mystery; the most satisfactory elucidation would be the proof of its being an insect indigenous to Cornwall.