

Notes on the Geographical Distribution of the Aculeate Hymenoptera collected by Mr. A. R. WALLACE in the Eastern Archipelago. By FREDERICK SMITH, Esq., Assistant, Zoological Department, British Museum. Communicated by W. W. SAUNDERS, Esq., F.R.S., V.P.L.S.

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WERE the student of the science of Entomology to start with the intention of making himself intimately acquainted with all the Orders of insects, and equally familiar with every species in those Orders, he would be attempting a task too vast for the allotted duration of human life, a space too brief to enable even the most gifted and industrious inquirer to master a tithe of the subject thus proposed to be carried out.

Such being the case (and I believe no entomologist will dispute the truth of the position), it becomes a necessity that the student should restrict his researches to a portion only of the wide field over which the science of entomology now ranges. Hence it has become the practice of entomologists in many cases to confine their studies to the fauna of their own country—some, and indeed a very large majority, studying only a single Order of that fauna and finding even this amply sufficient to engross the whole of their leisure time, whilst others, whose means in life are such as to give full scope to their inclinations, devote themselves to wider studies; yet even in such cases it is found to be imperatively necessary that a single Order should be selected, should the student propose to collect his materials from all quarters of the globe. In this more extended area of investigation it is that the student enters upon the enchanting field of geographical distribution. Of all the sections into which the study of entomology may be divided, there is none more alluring, and certainly none more important and useful, than that which embraces a knowledge of the geographical distribution of families, genera, and species.

Before proceeding to remark upon the additional knowledge of the Aculeate Hymenoptera that we have obtained through the exertions of Mr. Wallace, it appears highly desirable that a short survey should be made of the known geographical distribution of some of the more extensive genera, and of the more remarkable forms with which we were acquainted previously to Mr. Wallace's explorations.

The ANTS are perhaps the most universally distributed insects belonging to the tribe of the Aculeata; they are found in the

greatest numbers, not only of individuals, but also of species and genera, within the tropics. Ants, however, are scattered in great profusion many degrees both north and south of those limits, penetrating, indeed, in the former direction even to the shores of Arctic America, whence Sir John Richardson brought several European species of the genus *Formica*,—*F. herculanea* and *F. pubescens* being amongst the number. *F. rufa*, *F. sanguinea*, *F. fusca*, *F. nigra*, and *F. umbrata* have been found at Hudson's Bay. *F. pubescens* and *F. lateralis*, both European species, are met with in the Northern States of America, and also in Canada; in fact most of the Ants of northern Europe will probably be found to occur in the great continent of North America. Several of our European Ants are also found in Algeria, as *F. emarginata*, *F. opaca*, *F. pubescens*, *F. viatica*, &c.; the latter also occurs in Palestine. Some species of the genus *Myrmica* have a very extensive range. The common British and European species *M. sulcinodis* is found also in Siberia and North China; *Atta capitata* occurs in Southern Europe, Spain, Algeria, and in Palestine. Some species of Ants which live in houses, and devour provisions, are found in all quarters of the globe.

The MUTILLIDÆ, of which about 350 species are known, have a very extensive geographical range, and also an almost universal distribution. The number of species in northern Europe is not great; the type of the genus *Mutilla*, *M. Europæa*, occurs in Britain, France, Italy, Germany, Austria, and in Russia. The greatest number of species have been found in Brazil and South America; they are numerous in Africa; many occur in Australia, in North America, and in India; and, as will be seen by examining the table of geographical distribution, in the Eastern Archipelago they are very numerous.

POMPILIDÆ.—The insects which compose this extensive family are some of them found in most parts of the habitable globe. North America reproduces as it were the species of Northern Europe—that is, species so closely resembling them that their specific difference is difficult of detection. Some of the largest species of the Aculeate group are found in this family, and also some of the most beautifully adorned; the geographical range of individual species is very extensive.

The SPHEGIDÆ are as universally distributed as the Pompilidæ. The genus *Ammophila* is found in all quarters of the globe; *Ammophila sabulosa* of this country occurs throughout Europe as far north as Lapland; it also penetrates into Algeria, where

A. viatica is also found. The Sphegidae appear to be equally numerous both in the old and new world. Some of the genera are very local, as *Trigonopsis*, found hitherto only in Brazil. The genus *Pelopæus* is very widely distributed, but is not found in northern Europe; it occurs in the South of France, in Italy, Spain, Africa, India, the Indian Archipelago, China, Australia, and is very abundant both in North and South America. The brilliant insects belonging to the genus *Chlorion* are widely distributed in the tropics; four of the six known species are eastern; one occurs in North, the other in South America. No authentic record is known of the occurrence in England of the type of the genus *Sphex*; it is found in Southern Europe and in North Africa; the genus is found in Australia, and indeed in all parts of the tropics, in India and China, even in their northern provinces. The beautiful genus *Ampulex* is, I believe, strictly intertropical; twelve species are known, eight belonging to the old, and four to the new world; the type, *A. compressa*, is found in India, China, Java, and throughout the Eastern Archipelago.

The LARRIDÆ, with a few exceptions, are inhabitants of the warmer regions of the globe. The type of the genus *Larra* has been recorded as a British species; but its title to that distinction is extremely doubtful. The geographical distribution of some of the species is worthy of notice. *Larra aurulenta* occurs in China, the Philippines, India, throughout the Eastern Archipelago, and in Africa from the Cape of Good Hope to Sierra Leone; we are acquainted with twenty Asiatic species, and the same number of African; the new world is known to possess at least thirty species. The very closely allied genus *Tachytes* is generally distributed, and numerous in species, forty having been described; two are found in England; the range of individual species is apparently very restricted. This genus was believed to occur almost everywhere except in Australia; but four species have been found in the latter locality, and one in New Zealand.

The species of the genus *Bembex*, although very generally distributed, have not occurred in Great Britain. The type, *B. rostrata*, is found throughout Southern Europe, in North Africa, and in Finland. *B. olivacea* has apparently a wider range, being found in Southern Europe, in Algeria, and in Tranquebar; about fifteen species are found in Africa, six in Australia, four in India, seven in South America, and about the same number in North America. The very closely allied genus *Monedula* has only occurred in North and South America.

Of the very numerous species which constitute the family CRABRONIDÆ some are found in most parts of the world. The genus *Trypoxylon* is apparently generally distributed; about thirty species are now known; the type *T. figulus* occurs throughout Europe, in the warmest as well as the coldest latitudes, specimens having been received from Italy, France, Germany, Sweden, Finland, and Lapland. The typical genus *Crabro*, if we reject those species which have the abdomen petiolated and form the genus *Rhopalum* of Kirby, inhabits the temperate latitudes; it occurs throughout Europe, also in North America, at East Florida, and Hudson's Bay; the only species at present known from other countries are three from Northern India, two from Brazil, and one from Tasmania; the range of individual species is not very great.

Of the beautiful and very generally distributed species of the genus *Cerceris* about one hundred are known. The five species found in this country are common throughout Europe; *C. ornata* has also occurred in Algeria; about thirty species are found in Europe, forty in Africa, two in Australia, twenty in the East, and thirty in North and South America. The very closely allied genus *Philanthus* is much less numerous, about thirty only being known. The type, *P. triangulum*, is found throughout Europe; species are scattered over most parts of the globe, extending north as far as Denmark, but they have not occurred in Australia to my knowledge.

Family VESPIDÆ.—With the exception of the Formicidæ, no family contains individual species so widely distributed as are those belonging to the Vespidae. The typical species, *V. vulgaris*, is common throughout Europe, it occurs in Madeira, North Africa, and is also found in North America; *V. rufa* occurs in America, and, as well as *V. Germanica*, is also met with in Algeria; the latter species has also been found in Northern India and in Syria. One or two species appear to be confined to Northern Europe: *V. Norvegica* is found in the north of England, in Sweden and Norway, *V. media* being apparently confined to the two latter countries. *Vespa crabro* is a species probably more widely distributed than any other belonging to the family; it occurs throughout Europe, to the north, as far as Lapland; it may also prove not to be specifically distinct from *V. orientalis*, which occurs throughout the East, or from *V. crabroniformis* from North China. About forty species of this genus are known, but none have hitherto been found in Australia or in South Africa. *V. orientalis* is found in Greece,

Turkey, Egypt, India, and in some of the islands of the Eastern Archipelago.

Of the extensive genus *Polybia* about sixty species have been described; but only three are of the Old World—two being from China, and one from Africa. In Brazil these insects abound to a degree that no one, without visiting that country, can form any approximate idea of; many species are of minute size; and the nests constructed by them are amongst, if not, the most beautiful examples of insect architecture. The range of the insects of this genus in America is almost entirely tropical; none have been found in North America. The Wasps composing the genus *Chartergus*, whose pasteboard nests are so well known, are also tropical, being principally found in Brazil. The genus *Nectarinia* is composed of honey-gathering wasps; they are principally found in Brazil.

Having taken a cursory view of the geographical distribution of the principal genera of the Formicidæ, the Fossores, and the Vespidæ, it will be equally desirable to treat the family APIDÆ in the same brief, but we hope instructive manner. The Bees most nearly allied to the Vespidæ, taking the form of the tongue as the principal guide in arrangement, are those included in the genus *Colletes*. This genus has a wide geographical range: the species are found throughout Europe, in the Canary Islands, in Egypt, at the Cape of Good Hope, in Chili, Columbia, and North America; no species has yet been found in India, China, or in the Eastern Archipelago. Two or three very closely allied genera are found in Australia and New Zealand.

The genus *Prosopis*, which belongs to the same subdivision as *Colletes*, the Obtusilingues, is of universal occurrence: many fine species occur in Australia, in India, North and South America, and also in Africa.

The extensive genus *Halictus*, of which about one hundred species are described, is confined principally to temperate regions; they are found throughout Europe, in North America, in Northern India, and also in North China. In tropical India, and indeed throughout the Eastern Archipelago, this genus is represented by a very closely allied one, namely the genus *Nomia*; in South America and Brazil it is replaced by the genus *Augochlora*,—the latter genus containing some of the most brilliantly coloured species to be found in the family of the Apidæ: green of every shade, fiery copper, purple, and burnished gold are the colours which principally adorn these beautiful insects. A few species of the

genus *Halictus* have occurred in Australia ; two or three are from the Arctic regions.

The genus *Andrena* is the most numerous in species of the whole tribe of the Anthophila: about one hundred and fifty species are described ; they are almost exclusively confined to the temperate portions of the globe. About one-half of the known species are found in Britain ; twenty have been recorded from North America ; the remainder occur in the south of Europe, Madeira, and Algeria. The species found in this country are generally distributed throughout the north of Europe ; and a few of them reappear in North America: *A. Clarkella* occurs in Nova Scotia ; *A. perplexa* cannot be separated from our *A. nitida*, and several other species appear to be common alike to Great Britain and America. *A. Hattorfiana*, which occurs in the south of Europe, ranges thence as far north as Finland ; and *A. cineraria* has an equally wide geographical range. *A. pilipes* occurs in Finland, is common throughout Europe, and penetrates into North Africa. *A. varians* is equally common in the same localities, and is also found in Nova Scotia ; *A. albicans* has a similar distribution.

Osmia is a genus consisting of about fifty species, forty of which are confined to Europe, many of them being very generally distributed. *O. ænea* is perhaps the most widely scattered of any known species ; it is common in all parts of Europe ; it occurs in Madeira, in the Canaries, and is also found in Algeria ; several species are common in Egypt ; the genus is found at Port Natal ; but not a single species is known from the East or from Australia.

Of all the genera of Bees, *Megachile* is perhaps the most truly cosmopolitan: in temperate latitudes, in the tropics, and in the arctic regions these Bees are alike found ; Sir John Richardson brought species from Lake Winipeg ; many are known from Hudson's Bay and Nova Scotia. The type of the genus, *M. centuncularis*, occurs throughout Europe, and is also found in the United States, in Canada, and at Hudson's Bay. About twenty species are known from Australia, twice that number from Africa, twenty-six from India, and Mr. Wallace has added twenty-one new ones from the Eastern Archipelago.

Of the genus *Anthidium* about one hundred species are known, but only one is found in Britain, *A. manicatum* ; this Bee is common throughout Europe. About thirty-nine species occur in the continent of Europe, and about the same number are known from Africa, six or seven from Brazil and Chili, and about ten

from North America ; not a single species has yet been found in India, China, the Philippines, or in any of the islands in the Eastern Archipelago.

The geographical distribution of the parasitic Bees, as might be expected, is apparently regulated by the distribution of the genera upon which they are parasitic. The genus *Nomada*, parasitic principally upon the *Andrenæ*, is found wherever the latter genus occurs ; *Nomada* is consequently very rare in India and in the Eastern Islands : a few species have been discovered, these probably being the parasites of the genus *Nomia*. Mr. Wallace discovered two species ; these, together with two from Northern India, one from North China, and one from the Philippines, are all at present recorded from the East ; about fourteen are known from Algeria, and twelve from North America.

Cœlioxys, the parasite of *Megachile*, is cosmopolitan. Upwards of fifty species have been described ; they are of course found in all climates. Although no species has yet been received from Australia, I am confident there will be several, the genus *Megachile* being common in that country.

The genus *Crocisa*, although not consisting of more than ten or twelve species, is very widely distributed. It does not occur in England ; but three species are found in Europe : one of these, *C. histrio*, is also found in Algeria and in India. Three have been found in South Africa, two in Australia, and one in North China.

There are no less than eight genera of parasitic Bees peculiar to South America : of these, *Euritis*, *Melissa*, *Mesocheira*, *Thalestria*, *Ctenioschelus*, *Acanthopus*, and *Aglaë* are only found in Brazil ; of the genus *Liogastra* two species occur in Brazil, and one in Mexico.

The genus *Melecta* is also restricted in distribution ; nine species have been described as European, one is Algerian, and two have been recorded from Chili.

In the family SCOPULIPEDES, all of which are true working Bees, we find the genera *Eucera* and *Tetralonia*, very closely allied to each other, consisting of upwards of one hundred and twenty species. The present known range of the former genus is Europe, Egypt, and North Africa ; the type *E. longicornis* is common in Europe and Algeria. The genus *Tetralonia* does not occur in England ; but about twenty species are found in Europe ; it is also found in North Africa, in India, China, and Australia ; several species are found in Brazil and other parts of South America ; but no species has yet been discovered in any of the islands of the East-

ern Archipelago. *Melissodes*, another genus of the long-horned Bees, is strictly American, most of the species being found in the South, principally in Brazil. *Anthophora* is a very extensive genus, one hundred and twenty-three species having been described. The type, *A. retusa*, is found in all parts of Europe, from Italy to Sweden; *A. acervorum* is equally widely distributed; *A. furcata* is found as far north as Lapland; about forty species are inhabitants of Europe; about thirty-seven have been discovered in Egypt and Algeria; and a few have occurred in South Africa: three species have been found in Australia; one of these, *A. cingulata*, I am strongly inclined to believe, is only a variety of *A. zonata*, which is common to China, the Philippines, Ceylon, India, Java, and throughout the Eastern Archipelago; Mr. Wallace found it in almost every island that he visited; he also discovered three beautiful new species—one in Borneo, one in Celebes, and one in Key Island.

Xylocopa is a genus containing a large number of species very widely distributed, although none are found in Great Britain: *X. violacea* is the type of the genus. About seven species are found in Europe, about thirty in Africa, and about fourteen in India. *X. æstuans* is widely distributed, being found in China, India, Celebes, Aru, Timor, and Australia. Mr. Wallace added eight new species to the list, already amounting to one hundred and one, described in various works. Many fine species are found in Brazil and other parts of South America; but only six are recorded from North America.

We have now to direct our attention to the division of the SOCIAL BEES, commencing with the genus *Bombus*, which comprises the well-known Humble-Bees. These insects are found in Europe and America, being scattered over both the north and south continents of the latter. About eighty species are known, thirty-six being indigenous to Europe, eighteen of which belong to the fauna of this country; thirteen species are known from China, India, and Java; but Mr. Wallace did not find one in the Eastern Archipelago; and none have occurred in Australia or in South Africa. The geographical range of the genus is, however, very great, several species being found in Brazil; and Ross, the arctic navigator, found two species in Boothia Felix: more recently Sir John Richardson brought two or more species from the Great Bear Lake; one of these I could not separate from the *B. hortorum* of this country; the latter insect therefore ranges from the Arctic regions to Spain and Italy. Ten of the British species are also found in Lapland;

one has also been described from Kamtschatka; fourteen species are known from North America, and eight from Brazil and South America.

The social stingless genera of honey-gathering Bees, *Melipona* and *Trigona*, are at present known as being principally South American; about sixty-seven species of these genera are recorded from that locality. All the known species of *Melipona* are South American. Of the genus *Trigona* one species is described from Australia, and one from Ceylon.

The genus *Apis* includes the Honey-Bees proper: the number of known species previous to Mr. Wallace's discoveries was about fifteen. The typical species has been conveyed to most parts of the habitable globe; but, judging according to our present knowledge of the range of species in a state of nature, their distribution or geographical range appears to be limited. *Apis mellifica*, of which *Apis ligustica* would appear to be only a climatal variety, does not appear to range beyond the temperate regions of Europe. Our knowledge of the exotic species is too limited at present to enable us to add much information respecting them.

In the sketch here attempted, it will be observed that we have confined our remarks to the predominant genera, omitting none that appeared important as bearing upon geographical distribution; we will now proceed to offer some remarks upon the various species collected by Mr. Wallace in the Eastern Archipelago.

In the introductory remarks, it will be observed that I have, in some instances, said that the range of British species extends to North America—*Vespa rufa* and *V. vulgaris* being examples of this kind. I may here remark that such determinations have not been based upon colour alone. It has been proved long ago that the males of *Vespa* in different species have generative organs of totally different forms; and the constancy in form in each individual species renders such forms unerring guides in their determination. I have had recourse to this test in the cases alluded to above, and also in those of *V. crabro* of this country and *V. crabroniformis* from China: I have not been able to obtain a male of *V. orientalis*, but I expect it will prove to be a variety of *V. crabro*.

The above conclusions lead me, in the next place, to notice a very important circumstance to be regarded in the study of the geographical distribution of species—the effect, namely, of climate on their coloration. I have previously remarked upon the richness of colouring peculiar to *Apis ligustica*, or, perhaps more correctly, to the form of *A. mellifica* so termed, and which

colouring is soon lost when the two forms commingle, which cannot be prevented when they are kept in close proximity. Now the colouring of *Vespa rufa* is the reverse of this: the more sober-coloured insect is the British; examples from Nova Scotia are exceedingly bright in colour, much, very much more so than any found in Great Britain; specimens from Sweden are intermediate in colour. If I am right in considering *V. orientalis* a variety of *V. crabro*, then the more highly coloured form is Indian, whereas in Northern China the species again exactly resembles the British in colouring.

These instances apparently prove that different species are affected by climatal influences in opposite ways: it cannot be laid down as a rule that a species is necessarily of a more sombre colour in colder latitudes. We shall have some further observations to offer on this subject when remarking upon the distribution of the different species of Vespidae.

In a collection of Hymenoptera made by an entomologist so eminently qualified as Mr. Wallace, the Formicidae (as might be expected) constitute a very important portion, the number of species amounting to about two hundred and eighty. Of these, upwards of two hundred proved new to science. The majority of the larger species were previously known. *Formica gigas* of India and Malacca was found by Mr. Wallace in Singapore and Borneo. *F. compressa*, known as Indian, and also from China and the Philippines, is now known to inhabit Borneo; this Ant, no doubt, will be found throughout the Archipelago, as it has occurred in Australia. It is very interesting to find the European genus (as it has hitherto been regarded) *Tapinoma* occurring in Celebes, Malacca, and Bachian.

The genus *Polyrhachis* includes all those species that closely resemble *Formica*, but which have the thorax and node of the peduncle armed with spines or hooks: of this genus fifty-eight were described, to which number Mr. Wallace has added seventy-seven. As the type of the genus I regard the *Formica bihamata* of Drury; it was known as an inhabitant of India and Sumatra; it has now been captured in Celebes, Bachian, Ceram, and Waigiou. *Polyrhachis sexspinosa* of India and the Philippines has been taken in the Aru Islands, and also in Waigiou. Eight or nine species are known from Africa, six from Australia, and four from Brazil. It would therefore appear that the metropolis of the genus lies in the East. The species of this genus construct small semicircular nests of a kind of network on the

leaves of trees and shrubs. Their communities are small, seldom exceeding twenty individuals; such is the concurrent testimony of Mr. Jerdon and Mr. Wallace. No species has occurred in Europe.

The genus *Æcophylla* consists of two species, one Eastern, the other African. *Æ. smaragdina* is generally distributed in the East; it builds large nests on trees, uniting together a number of leaves for that purpose: this species is found commonly in India, China, the Philippines, and, by Mr. Wallace, in Borneo and Celebes; it has also occurred in Sumatra and Java, and is no doubt widely distributed; I have considerable doubts of its being really specifically distinct from the African species *Æ. virescens*, which insect also occurs in Australia.

In the next family, the Poneridæ, the genus *Odontomachus*, previous to Messrs. Wallace and Bates visiting Brazil, consisted of four known species from Brazil, one from Cuba, and one from Ceylon; through the exertions of those naturalists it now numbers twenty-two species, nine having been discovered in the East by Mr. Wallace. These insects are essentially tropical; one species only has occurred in Australia: some of the species are widely distributed; *O. simillimus* is found in Ceylon, Celebes, Aru, Ceram, and Waigiou.

The genus *Ponera* is almost universally distributed; we have one British species. Twelve species were known from the East previous to Mr. Wallace's expedition to those latitudes; to that number he has added thirty. Of the range of individual species we have scarcely any data: the type, *P. contracta*, is found in most parts of Europe, it also occurs in the Island of Madeira; one or two of the Bornean species also occur in Celebes and Bachian.

Of the interesting genus *Typhlopone* twelve species are described, eight being found in South America, two in Africa, and one in Ceylon, and Mr. Wallace has added a fine species from Borneo. It has been suggested that these insects, all that are yet discovered being workers, are sexes of the genus *Labidus*; should this prove to be the case, probably the Eastern species of *Typhlopone* may prove to be sexes of the genus *Enictus*, three species of which have occurred in India.

Dorylus, belonging to the same family as *Labidus*, although so common in India, does not appear to range into the Archipelago; at least no specimen was found by Mr. Wallace. The habits of the genus being nocturnal, probably accounts for the fact of no one having discovered either the female or worker of *Dorylus*.

To the family MYRMICIDÆ Mr. Wallace's additions are very

important. To the typical genus *Myrmica* twenty-eight species are added: the cosmopolitan species *M. molesta* was found at Singapore and Celebes; it is truly a domestic species, few localities being free from it; it is conveyed in merchandise to all parts of the globe, and, apparently, propagates equally well in all latitudes.

Several new genera belonging to the Myrmicidæ are added. One of these, *Heptacondylus*, was founded upon the examination of workers which are remarkable for having only seven joints in the antennæ; subsequent investigations have led me to believe these to be the workers of the genus *Myrmecaria* of Saunders—a female of the latter genus having been sent with workers of *Heptacondylus*; the female has the same number of joints in the antennæ as the workers, the antennæ of the males having thirteen joints. This genus is found at Port Natal, in Borneo, and Java.

To our knowledge of the geographical distribution of the CRYPTOCERIDÆ much information has been added. The typical genus, *Cryptocerus*, is peculiar to South America,—Brazil having furnished the majority of the species. Of the genus *Meranoplus* eight species are at present known: three are from Brazil, one from India, and four, discovered by Mr. Wallace, are from Malacca, Borneo, and Aru: this genus is also found in Australia. Of the genus *Cataulacus* nine species are known—five having been discovered by Mr. Wallace, found in Malacca, Borneo, Key Island, Waigiou, and Mysol.

The genus *Echinopla* is placed in the family Cryptoceridæ in the papers descriptive of Mr. Wallace's insects; but it belongs to the Formicidæ: when first received, a single example was all the material for examination; subsequently others have been obtained and the true situation of the insect ascertained. Seven species have been discovered; they are from Malacca, Borneo, Celebes, Singapore, Aru, and Ceram.

The MUTILLIDÆ are of universal occurrence, the typical genus *Mutilla* as at present constituted being perhaps the most extensive in the order Hymenoptera. Thirty-six new species have been discovered by Mr. Wallace. Some species have a wide geographical range; *M. suspiciosa* occurs in Borneo, Celebes, Bachian, Bouru, and Amboyna. Several of the known Indian species were found in Celebes and Borneo.

One of the most interesting discoveries made by Mr. Wallace, with respect to the geographical distribution of the genera of Hymenoptera, is his tracing species of the genus *Thynnus* to the islands Bachian, Gilolo, Ceram, Waigiou, and Mysol,—Gilolo being the

most northern locality known for this genus of insects. The only species hitherto found in the eastern hemisphere have occurred in Australia and Tasmania, none having been found north of the former continent previous to the captures made by Mr. Wallace. Many species and genera are found in similar latitudes in Brazil.

The family SCOLIADÆ is one of great extent, and of wide geographical distribution, some species being found in all the quarters of the globe. Not a single species is found in England; but five or six occur in Europe. Some species have a wide distribution; *Scolia erythrocephala* is found in France, Italy, Spain, Algeria, and Egypt. Thirty new species were discovered in the Archipelago; one, the *S. dimidiata*, is found in India, Celebes, Bachian, Gilolo, Ceram, Bouru, and Amboyna. The distribution of other species is equally extensive, as will be seen on a reference to the table.

The POMPILIDÆ is a very extensive family, nearly four hundred species having been described; the typical genus *Pompilus* consists of upwards of two hundred and ninety species, fifty-six having been discovered in the Eastern Archipelago. Some species are known to have a wide distribution: *P. analis* of Fabricius, originally known as an Indian species, has been found in Celebes, Bachian, and Java; *Agenia blanda* inhabits Singapore, Borneo, Celebes, Key Island, and Ceram; *Macromeris violacea* is perhaps the most generally distributed insect belonging to the family; it is found in India, China, Borneo, Celebes, Java, Aru, Ceram, Bouru, and New Guinea.

The beautiful genus *Ampulex* is exclusively tropical; it is found in India, Africa, and South America. The type, *A. compressa*, occurs in India, China, Java, Celebes, and the Mauritius; four new species are added from the Archipelago, the genus now consisting of fifteen species.

Much information respecting the distribution of the SPHEGIDÆ will be found by reference to the table. *Pelopæus spirifex*, a species common to Europe, was found by Mr. Wallace in the island of Timor. *Sphex sericea* of Fabricius is found in the Philippines, throughout the Archipelago as far south as the island of Timor. Extensive as this distribution certainly is, it is not comparable to that of *Sphex argentata*, which occurs in the south of Europe, in India, Sumatra, Java, Celebes, Aru, Bachian, Dory, and Ceram; in Africa it has been found at Congo and Sierra Leone; in America, at St. John's Bluff, East Florida.

The genus *Larrada* is widely distributed: there is no British species; but four or five occur in Europe, about thirty have been

found in the East, nearly twenty in Africa, the rest in North and South America, with the exception of two or three from Australia. *L. aurulenta* is one of the most widely distributed species of the genus, it is found in China, India, throughout the Eastern Archipelago, at the Cape of Good Hope, and on the Gambia.

The genus *Pison* is composed of species that do not appear to be abundant in any locality, though they occur in all quarters of the globe. About twenty-four species are described; four are added to the list from the Archipelago: individual species do not appear to be widely distributed.

The family CRABRONIDÆ is one of great extent, the majority of its members being European. Of the genus *Trypoxylon* about twenty-two species were described previous to Mr. Wallace's researches, two only being known from India; nine were discovered in the Archipelago; the genus also occurs in Europe, Africa, and North and South America.

Of the extensive genus *Crabro* the majority of the species are found in Europe and North America; two are now recorded from Borneo, one from Celebes, and one from Aru; two species only were previously known from the East.

Of the genus *Psen* one species was found in Celebes, and one in Mysol. The genus had not previously been recorded from the East; four European species were known, and one Brazilian.

To the genus *Cerceris* five new species are added from the Archipelago; thirty are found in Europe, and about the same number in Africa; sixteen are recorded from China, India, Sumatra, and Java; and three or four are known from Australia.

Of the genus *Philanthus* four species are known from India and Ceylon, and Mr. Wallace discovered one in Celebes. Species belonging to this genus do not appear to be very numerous in any locality: four occur in Europe, ten are known from Africa, seven from North America, and about the same number from South America.

In no family of the Aculeata have Mr. Wallace's researches added so much to our knowledge of geographical distribution as in that of the Vespidae. To the rare genus *Gayella*, belonging to the EUMENIDÆ, a new species from Borneo is added; the two previously known are from Chili.

Of the genus *Eumenes* about ninety species were recorded, when through Mr. Wallace's researches eighteen new ones were discovered in the Archipelago. The geographical distribution of some species is very extensive: as an example *E. arcuata* may

be quoted; this species occurs in Northern India, in Madras, Borneo, Bachian, Dory, Mysol, and in Australia.

The majority of the species belonging to the genus *Rhynchium* are tropical. The *R. hæmorrhoidale*, first recorded as an Indian species, has occurred in Malacca, Singapore, Java, throughout the Eastern Archipelago, and also at the Cape of Good Hope; an examination of examples from these various localities shows a great variation in the colour of the insect in different situations, and at the same time how constant those varieties are to the countries in which they are found: Indian examples are black, with the legs, antennæ and tip of the abdomen red; in Gilolo not only are the same parts red, but the head and prothorax are of the same colour; specimens from Bachian have scarcely any trace of red, some being almost or entirely black: the most highly coloured examples are found at Amboyna and Ternate; these have the head, entire thorax, the tip of the abdomen, and the margins of all the segments red. Numerous instances might be adduced in order to show that, amongst the Vespidæ, bright or sombre colouring is not to be regarded as a character of much value when we endeavour to ascertain the limit of a species; form and sculpture alone can be relied upon for that purpose.

The genus *Odynerus* is of universal distribution. In Arctic America, in Europe, throughout both North and South America, in Asia, in Africa, and in Australia these solitary wasps are abundant. Nineteen new species will be found in the tabular list of species from the Eastern Archipelago.

Amongst the Vespidæ, the species of the genus *Ischnogaster* have hitherto been of very rare occurrence; our list will show that seven new species have been discovered,—only four having been previously known—two from Java, one from New Guinea, and one from Cayenne. Previous to Mr. Wallace's captures, not a single example existed in any collection in this country. The metropolis of the genus would appear to be the islands of the Eastern Archipelago.

To the erratic genus *Vespa* no great addition of species could well be expected: four new ones will be found in the table; these added to the previously recorded species from the East make the number twenty-two from that quarter. The genus becomes rare as we approach the equator from the north; the island of Java is, apparently, its limit south of the line. The genus has not been found in New Guinea or Australia, neither has it occurred in

South Africa, and I believe no one has recorded the capture of a species south of the Isthmus of Panama.

To our knowledge of the geographical distribution of the tribe ANTHOPHILA, which contains the various families and genera of bees, much has accrued through the exertions of Mr. Wallace. Of the genus *Prosopis* only a single species was known from the East; our table will show that two have been discovered in Mysol, one in Key Island, and one in Dory.

The genus *Sphcodes* is very rare in India and the adjacent islands; one species was discovered in Celebes.

Of the genus *Nomia* seventeen species are recorded in the tabular list, not a single example having been previously discovered in Malacca, Singapore, Celebes, Aru, Gilolo, or Mysol.

Nomada is a genus of very rare occurrence within the tropics; one species was, however, found in Ceram, and one in Timor. Four new species of Honey-Bees were discovered—two in Borneo and two in Celebes.

Of the genus *Trigona*, which is composed of the stingless species of Honey-Bees, two only were previously described from the East; nine new ones are now added to that number from the Eastern Archipelago.

The TENTHREDINIDÆ are apparently rare insects within the tropics. One or two interesting discoveries of genera may be noticed, namely a species of *Oryssus* from Aru, a *Xiphydria* from Aru, and a second species from Amboyna; it is also very interesting to find that the genus *Tremex* inhabits the same regions—a fine new species having been discovered in Borneo, and another in Aru.

The following Table exhibits the known Species of Aculeate Hymenoptera inhabiting the Eastern Archipelago, and their geographical distribution:—

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiou.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
ormica																												
gigas	*	*	*	*	*	*			*	*																		
compressa	*	*	*	*	*	*			*	*																		
stricta	*	*	*	*	*	*			*	*																		
festina	*	*	*	*	*	*			*	*																		
mistura	*	*	*	*	*	*			*	*																		
pilosa	*	*	*	*	*	*			*	*																		
ruficeps	*	*	*	*	*	*			*	*																		
badia	*	*	*	*	*	*	*		*	*																		
diligens	*	*	*	*	*	*			*	*																		
irritans	*	*	*	*	*	*			*	*																		
fervens	*	*	*	*	*	*			*	*																		
gracilipes	*	*	*	*	*	*			*	*					*													
irritabilis	*	*	*	*	*	*			*	*					*							*						
sedula	*	*	*	*	*	*			*	*					*							*						
exasperata	*	*	*	*	*	*			*	*					*							*						
tenuipes	*	*	*	*	*	*			*	*					*							*						
camelina	*	*	*	*	*	*			*	*					*							*						
pallida	*	*	*	*	*	*			*	*					*							*						
fragilis	*	*	*	*	*	*			*	*	*				*							*						
fulvitaris	*	*	*	*	*	*			*	*	*				*							*						
coxalis	*	*	*	*	*	*			*	*	*			*	*							*						
cordata	*	*	*	*	*	*			*	*	*			*	*							*						
oculata	*	*	*	*	*	*			*	*	*			*	*							*						
mutilata	*	*	*	*	*	*			*	*	*			*	*							*						
quadriceps	*	*	*	*	*	*			*	*	*			*	*	*						*						
laevissima	*	*	*	*	*	*			*	*	*	*		*	*	*						*						
nitida	*	*	*	*	*	*			*	*	*		*	*	*							*						
scrutator	*	*	*	*	*	*			*	*	*		*	*	*							*						
angulata	*	*	*	*	*	*			*	*	*		*	*	*							*						
familiaris	*	*	*	*	*	*			*	*	*		*	*	*							*						
subtilis	*	*	*	*	*	*			*	*	*	*		*	*							*						
vitrea	*	*	*	*	*	*			*	*	*	*		*	*							*						
cruda	*	*	*	*	*	*			*	*	*	*		*	*							*						
lactaria	*	*	*	*	*	*	*		*	*	*	*		*	*	*						*						
incursor	*	*	*	*	*	*			*	*	*	*		*	*	*						*						
rufifrons	*	*	*	*	*	*			*	*	*	*		*	*	*						*						
pavida	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
familiaris	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
Dorycus	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
desecta	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
consanguinea	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
circumspecta	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
leucophæa	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
tropica	*	*	*	*	*	*	*		*	*	*	*	*		*	*						*						
virulens	*	*	*	*	*	*	*		*	*	*	*	*		*	*						*						
longiceps	*	*	*	*	*	*	*		*	*	*	*	*		*	*						*						
Capinoma																												
glabrata	*	*	*	*	*	*			*	*	*	*		*	*							*						
thoracica	*	*	*	*	*	*			*	*	*	*		*	*							*						
nitida	*	*	*	*	*	*			*	*	*	*		*	*							*						
pratensis	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
gibba	*	*	*	*	*	*			*	*	*	*	*		*	*						*						
albipes	*	*	*	*	*	*			*	*	*	*	*	*	*							*						

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
olyrhachis																												
fervens		*													*		*											
hastatus		*													*		*											
bicolor								*																				
Orsyllus															*													
Mutilla															*													
Olenus															*													
Democles															*													
Valerus															*													
trispinosus															*													
Diaphantus															*													
Amanus															*													
coleomanes															*													
exasperatus															*													
Vibidia							*								*													
Chaonia															*													
Numeria															*													
hippomanes															*													
Lycidas															*													
Zopyrus															*													
Eurytus															*													
Dolomedes															*													
Trophimus															*													
Alpheus											*				*													
Bubastes											*				*													
Paromalus											*				*													
Xiphias											*				*													
Euryalus											*				*													
Derecynus											*				*													
Sparaxes											*				*													
nigriceps											*				*													
Paxillus											*				*				*									
chinopla																												
melanarctos					*	*			*						*													
pallipes					*	*			*						*													
striata				*	*	*			*						*													
dubitata															*													
nitida															*													
prætexta											*				*													
deceptor											*				*				*									
Ecophylla																												
smaragdina	*	*	*	*	*		*			*	*	*	*	*	*							*	*		*			
Dontomachus																												
rixosus						*		*							*													
rugosus						*		*							*													
simillimus	*										*				*													
tyrannicus											*				*													
sævissimus											*				*													
malignus											*				*													
gladiator											*				*							*	*					
animosus											*		*		*							*	*					
nigriceps											*	*	*		*							*	*					
cephalotes											*	*	*		*							*	*					
aciculatus											*	*	*	*	*	*						*	*					

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigou.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
<i>Atta</i>																												
<i>cingulata</i>					*																							
<i>Physatta</i>																												
<i>dromedarius</i>					*																							
<i>Typhlatta</i>																												
<i>læviceps</i>					*										*													
<i>Solenopsis</i>																												
<i>cephalotes</i>												*			*													
<i>transversalis</i>															*													
<i>laboriosa</i>															*													
<i>pungens</i>															*													
<i>calida</i>															*													
<i>Pheidole</i>																												
<i>militaris</i>															*													
<i>notabilis</i>												*			*													
<i>pungens</i>												*			*													
<i>rubra</i>											*	*	*	*	*													
<i>megacephala</i>											*	*	*	*	*								*					
<i>plagiaria</i>											*	*	*	*	*													
<i>singularis</i>											*	*	*	*	*													
<i>pabulator</i>											*	*	*	*	*													
<i>mordax</i>											*	*	*	*	*													
<i>penetralis</i>											*	*	*	*	*													
<i>Cataulacus</i>																												
<i>insularis</i>					*	*									*													
<i>horridus</i>				*	*	*									*													
<i>reticulatus</i>				*	*	*									*													
<i>setosus</i>				*	*	*					*	*	*	*	*													
<i>flagitiosus</i>				*	*	*				*	*	*	*	*	*													
<i>Meranoplus</i>																												
<i>castaneus</i>				*	*	*									*													
<i>cordatus</i>				*	*	*									*													
<i>mucronatus</i>				*	*	*									*													
<i>spinus</i>				*	*	*									*							*						
<i>Mutilla</i>																												
<i>blanda</i>	*	*	*	*	*	*									*													
<i>repræsentans</i>	*	*	*	*	*	*									*													
<i>Deidamia</i>			*	*	*	*									*													
<i>Urauia</i>			*	*	*	*									*													
<i>suspiciosa</i>			*	*	*	*					*				*		*											
<i>gracillima</i>			*	*	*	*					*				*		*			*								
<i>familiaris</i>			*	*	*	*	*				*				*		*			*								
<i>Calliope</i>			*	*	*	*					*				*		*			*								
<i>Proserpina</i>			*	*	*	*					*				*		*			*								
<i>Pandora</i>			*	*	*	*					*				*		*			*								
<i>Sibylla</i>			*	*	*	*					*				*		*			*								
<i>Cassiope</i>			*	*	*	*					*				*		*			*		*						
<i>Dardanus</i>			*	*	*	*					*				*		*			*		*						
<i>unimaculata</i>			*	*	*	*					*				*		*			*		*						
<i>unifasciata</i>	*	*	*	*	*	*					*				*		*			*		*						
<i>rufogastra</i>			*	*	*	*					*				*		*			*		*						
<i>volatilis</i>			*	*	*	*					*				*		*			*		*						
<i>manifesta</i>			*	*	*	*					*				*		*			*		*						
<i>carinata</i>			*	*	*	*					*				*		*			*		*						

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigou.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
<i>Priocnemis</i>																												
<i>optimus</i>						*																						
<i>verticalis</i>				*	*																							
<i>rufifrons</i>																												
<i>pulcherrimus</i>															*													
<i>fervidus</i>													*	*	*													
<i>flavipennis</i>					*							*	*	*	*	*						*						
<i>confechor</i>								*				*																
<i>adustus</i>														*														
<i>genia</i>																												
<i>blanda</i>		*		*	*	*									*	*					*							
<i>Atalanta</i>				*	*	*						*			*													
<i>Ægina</i>				*	*	*																						
<i>Daphne</i>				*	*	*																						
<i>Laverna</i>				*	*	*																						
<i>Melampus</i>				*	*	*																						
<i>flavopicta</i>				*	*	*																						
<i>Hippolite</i>				*	*	*																						
<i>Celæno</i>					*	*																						
<i>bimaculata</i>				*																								
<i>Callisto</i>																												
<i>jucunda</i>																							*	*	*	*	*	*
<i>Althea</i>																							*	*	*	*	*	*
<i>Aleyone</i>																							*	*	*	*	*	*
<i>Amalthea</i>							*				*	*											*	*	*	*	*	*
<i>Lucilla</i>							*										*											
<i>honesta</i>															*	*												
<i>assimilis</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>nitidiventris</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>agitata</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>gracilipes</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>ingenua</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>facilis</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>nasuta</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>jucunda</i>															*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Eudora</i>														*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Numeria</i>														*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Metella</i>														*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>Vesta</i>														*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
<i>clavata</i>										*																		
<i>taeromeris</i>																												
<i>violacea</i>	*	*		*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>argentifrons</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>iridipennis</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>calius</i>																												
<i>malignus</i>		*		*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>lygnimia</i>																												
<i>flava</i>		*		*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>anthracina</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>ducalis</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>princeps</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>iridipennis</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>fumipennis</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*
<i>Aspasia</i>				*	*	*	*			*			*		*	*	*					*	*	*	*	*	*	*

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Terate.	Sumatra.	Java.	Waigiu.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
Larrada																												
exilipes		*																										
Sycorax																												
polita					*	*																						
Tisiphone.					*	*																						
Alecto						*																						
carbonaria						*																						
aurantula	*	*	*		*	*			*	*					*											*		
modesta						*														*	*							
vindex						*																						
tarsata						*							*															
Ædilis						*							*		*													
aurifrons						*							*	*	*													
personata						*							*	*	*													
rufipes						*							*	*	*													
festinans						*							*	*	*													
chrysobapta						*							*	*	*													
funcrea						*					*																	
ducalis						*							*															
sabulosa						*							*			*												
Tachytes						*																						
nitidulus		*			*	*																						
morosus		*			*	*									*													
argentatus		*			*	*									*													
aurifex					*	*									*													*
sedulus					*	*									*								*					
Morphota						*																						
formosa						*					*				*													
Pison						*																						
suspiciosus						*																						
obliteratus						*																						
nitidus						*							*															
pallidipalpis						*							*			*												
Larra						*																						
prismatica				*	*	*									*													
simillima					*	*									*													
modesta					*	*					*				*													
Bembex						*			*						*													
melancholica	*				*	*		*			*				*							*						
trepada		*			*	*	*		*						*													
Trypoxylon						*																						
bicolor		*				*																						
petiolatum						*																						
coloratum					*	*																						
eximium					*	*														*	*							
elegantulum						*									*						*							
ferox						*									*						*							
gracilescens						*									*						*							
providum						*					*				*						*							
placidum						*								*							*							
gracillimum						*							*								*							
Crabro						*								*							*							
familiaris					*	*								*							*							
rugosus					*	*								*							*							

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sunatra.	Java.	Waigiu.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
Crabro																												
agilis															*													
solitarius																					*							
Oxybelus																												
agilis															*													
Arpactophilus																												
bicolor														*														
Psen																												
erraticus															*													
petiolatus														*														
Gorytes																												
constrictus																					*							
vagus																					*							
basalis																												
Mellinus																												
crabroniformis					*																							
Cerceris																												
instabilis	*	*													*													
unifasciata	*														*													
fuliginosa															*													
varipes					*										*													
sepulcralis															*													
prædator												*																
immolator											*																	
Philanthus																												
notatulus															*													
Gayella																												
pulchella					*																							
Zethus																												
cyanopterus										*					*													
Eumenes																												
arcuatus		*				*				*	*	*	*	*						*				*				
flavipictus		*				*				*	*	*	*	*						*				*				
Blanchardi		*				*				*	*	*	*	*						*				*				
quadrispinosus		*		*		*				*	*	*	*	*						*				*				
xanthurus		*			*	*				*	*	*	*	*						*				*				
hæmorrhoidalis		*			*	*				*	*	*	*	*						*				*				
quadratus	*				*	*				*	*	*	*	*						*				*				
inconspicuus					*	*				*	*	*	*	*						*				*				
singularis					*	*				*	*	*	*	*						*				*				
circinalis		*				*				*	*	*	*	*						*				*				
fulvipennis										*	*	*	*	*						*				*				
vindex										*	*	*	*	*						*				*				
architectus										*	*	*	*	*						*				*				
floralis										*	*	*	*	*						*				*				
esuriens	*	*				*				*	*	*	*	*						*				*				
pictifrons										*	*	*	*	*						*				*				
artifex										*	*	*	*	*						*				*				
laboriosus										*	*	*	*	*						*				*				
tricolor							*	*		*	*	*	*	*						*				*				
Praslina							*	*		*	*	*	*	*						*				*				
eximius							*	*		*	*	*	*	*						*				*				
agilis							*	*		*	*	*	*	*						*				*				
blandus							*	*		*	*	*	*	*						*				*				

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Ambayna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
Alastor																												
<i>cognatus</i>													*															
Ischnogaster																												
<i>cilipennis</i>				*	*																							
<i>Mellyi</i>				*	*					*																		
<i>nigrifrons</i>				*	*																							
<i>micans</i>				*	*					*																		
<i>iridipennis</i>														*														
<i>pictus</i>															*	*												
<i>agilis</i>															*	*												
<i>aurifrons</i>															*	*												
<i>unicolor</i>											*			*														
Icaria																												
<i>opulenta</i>					*																							
<i>speciosa</i>				*	*				*																			
<i>ferruginea</i>		*		*	*										*	*												
<i>lugubris</i>				*	*																							
<i>modesta</i>					*																							
<i>pilosa</i>															*	*												
<i>maculiventris</i>													*		*	*												
<i>fasciata</i>															*	*												
<i>gracilis</i>															*	*												
<i>unicolor</i>															*	*												
<i>nigra</i>														*														
<i>conservator</i>													*															
<i>impetuosa</i>											*					*	*											
<i>morosa</i>																												
<i>irritator</i>														*														
<i>torrida</i>																*												
<i>deceptor</i>														*														
Polistes																												
<i>Sagittarius</i>	*	*			*										*	*												
<i>Picteti</i>		*													*	*												
<i>fastidiosus</i>															*	*												
<i>stigma</i>		*												*	*	*												
<i>Philippinensis</i>			*											*	*	*												
<i>tepidus</i>										*	*	*	*	*	*	*												
<i>diabolicus</i>										*	*	*	*	*	*	*	*											
<i>nigrifrons</i>										*	*	*	*	*	*	*	*											
<i>elegans</i>													*	*	*	*	*				*	*						
<i>colonicus</i>													*	*	*	*	*											
<i>simulatus</i>												*	*	*	*	*	*											
<i>multipictus</i>							*				*	*	*	*	*	*	*											
<i>Smithii</i>													*	*	*	*	*										*	
Vespa																												
<i>affinis</i>	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*										
<i>cincta</i>	*	*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*										
<i>tyrannica</i>				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*										
<i>doryloides</i>		*		*	*	*	*	*	*	*	*	*	*	*	*	*	*	*										
<i>bellicosa</i>				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*										
<i>annulata</i>				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*										
<i>fervida</i>				*	*	*	*	*	*	*	*	*	*	*	*	*	*	*										
<i>Philippinensis</i>			*																*									
<i>Alduini</i>									*	*	*	*	*	*	*	*	*	*								*		

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
Anthophora																												
<i>insularis</i>
<i>vigilans</i>
<i>elegans</i>
Apis																												
<i>zonata</i>
<i>nigrociucta</i>
<i>socialis</i>
<i>dorsata</i>
<i>Indica</i>
<i>Perrottetii</i>
<i>andreniformis</i>
<i>testacea</i>
Trigona																												
<i>ventralis</i>
<i>atripes</i>
<i>thoracica</i>
<i>nitidiventris</i>
<i>læviceps</i>
<i>apicalis</i>
<i>canifrons</i>
<i>collina</i>
<i>fimbriata</i>
Trigonalys																												
<i>pictifrons</i>
Evania																												
<i>striata</i>
<i>lævigata</i>
Fœnus																												
<i>gracilis</i>
Fœnatopus																												
<i>ruficeps</i>
Megischus																												
<i>Indicus</i>
<i>insularis</i>
<i>ducalis</i>
<i>coronator</i>
<i>viduus</i>
<i>tarsalis</i>
<i>spoliator</i>
<i>insidiator</i>
Stenophasmus																												
<i>ruficeps</i>
Ichneumon																												
<i>penetrans</i>
<i>commissator</i>
<i>insularis</i>
<i>prædatorius</i>
<i>ephippium</i>
<i>pallidipectus</i>
Cryptus																												
<i>croceipes</i>
<i>elegans</i>
<i>lepidus</i>

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
Megaproctus																												
ruficeps						*																						
Rhyssa																												
mirabilis					*																							
maculipennis					*																							
fasciata					*																							
vestigator														*								*						
nobiligator														*								*						
viator														*								*						
Macrogaster																												
flavopictus						*																						
Glypta																												
maculipennis															*													
iridipennis															*													
fracticornis													*															
Ophion																												
iridipennis					*																							
vestigator				*																								
vittator												*																
unicolor												*																
insinuator																												*
Anomalon																												
falcator																*												
Xylonomus																												
flavifrons								*																				
fulgidipennis					*																							
fracticornis												*																
Epixorides																												
chalybeator																*												
Bracon																												
aculeator				*	*								*															
quadriceps				*	*																							
suspiciosus				*	*																							
insignis				*	*																							
cephalotes				*	*																							
perplexus				*	*																							
vagatus				*	*																							
inquietus				*	*																							
rugifrons				*	*																							
floralis				*	*																							
vultuosus				*	*																							
foveatus				*	*																							
laboriosus				*	*																							
crassipes				*	*																							
insinuator				*	*										*													
intrudens				*	*										*													
basalis				*	*										*								*	*	*	*	*	*
albo-marginatus				*	*										*								*	*	*	*	*	*
nigripennis				*	*										*								*	*	*	*	*	*
exoletus				*	*										*								*	*	*	*	*	*
abdominalis				*	*										*								*	*	*	*	*	*
nitidus				*	*										*								*	*	*	*	*	*
pallifrons				*	*										*								*	*	*	*	*	*
deceptor				*	*									*									*	*	*	*	*	*

	China.	India.	Philippines.	Malacca.	Borneo.	Singapore.	Gilolo.	Ternate.	Sumatra.	Java.	Waigiu.	Bachian.	Dory.	Mysol.	Celebes.	Ceram.	Amboyna.	Martabello.	Bouru.	Key.	Aru.	Timor.	Kaisaa.	Australia.	New Hebrides.	Madagascar.	Africa.	Europe.
Oryssus maculipennis	*							
Xyphidia rufipes	*						
Xyphidia lævipes	*	*						
Tremex insignis	*						
Tremex insularis	*						
Cladomacra macropus	*						
Tenthredo coxalis	*						
Tenthredo purpurata	*						
Cynips insignis	*						

Notes on the Food and Parasites of the *Salmo salar* of the Tay.

By W. CARMICHAEL M'INTOSH, M.D., F.L.S. Communicated
by T. S. COBBOLD, M.D., F.L.S.

[Read Dec. 4, 1862.]

THE nature of the food of the *Salmo salar* has been variously estimated. Dr. Knox read a paper to the Linnean Society "On the Food of certain gregarious Fishes," including the Salmon, in which it is stated*, "From the time the salmon enters the fresh water, it ceases to feed, properly speaking, although it may occasionally rise to a fly, or be tempted to attack a worm or minnow, in accordance seemingly with its original habits as a smolt. But after first descending to the ocean and tasting its marine food, it never again resorts to its infantile food as a constant source of nourishment." He goes on to state that nothing whatever is found in the stomach or intestines of the fresh sea-salmon but a little reddish substance, which he found to be the ova of some species of Echinodermata, and affirms that such is the sole food of the salmon in the sea. He combats the views of M. Valenciennes, who describes the salmon as voracious and a devourer of fishes, and

* In abstract of paper, *Annals of Nat. Hist.*, 2nd series, vol. xvi. p. 60.