

ON SOME AMERICAN, AUSTRALIAN, AND PALEARCTIC SIPHONAPTERA.

BY THE HON. N. CHARLES ROTHSCHILD, M.A., F.E.S.

(Plates X., XI.)

1. *Dermatophilus penetrans* L. (1758).

IN our Revision of the *Sarcopsyllidae* in *Thompson, Yates and Johnston Laborat. Rept.* vii. i. p. 15 (1906), we referred to Oviedo as being the first to have mentioned the Jigger or Chigoe. As Oviedo's work* entitled *Historia General y Natural de las Indias* (1551) is not well known, we give here a copy of what Oviedo says (Lib. II. cap. xiv.) about the Chigoe:

"Hay en esta isla y en todas estas Indias, islas é Tierra-Firme el mal que he dicho de las buas, y otro que llaman de las niguas. Esto de las niguas no es enfermedad, pero es un mal acaso; porque la nigua es una cosa viva é pequeníssima, mucho menor que la menor pulga que se puede ver. Pero en fin es género de pulga, porque assi como ella salta, salvo que es mas pequeña. Este animal anda por el polvo, é donde quiera que quisieren que no le haya, háse de barrer á menudo la casa. Éntrase en los pies y en otras partes de la persona, y en espeçial las mas veces en las cabeças de los dedos, sin que se sienta hasta que está aposentada entre el cuero é la carne, é comienza á comer de la forma que un arador é harto mas; y despues, quanto mas allí está, mas come. De manera que como acuden las manos rascando, este animal se da tanta priessa á multiplicar allí otros sus semejantes, que en breve tiempo hace muchos; porque luego que entra el primero, se anida é hace una bolsilla entre cuero é carne tamaño como una lenteja, é algunas como garbanço, llena de liendres, las quales todas se tornan niguas. E si con tiempo no se sacan con un alfiler ó aguja, de la forma que se sacan los aradores, son malas; y en espeçial que despues que están criadas (que es quando comiençan mucho á comer), de rascarlas se rompe la carne y despárcense de manera que si no las saben agotar, siempre hay en qué entender. En fin, como en esto tampoco eran diestros los chripstianos, como en el curarse de las buas, muchos perdian los pies por causa de estas niguas, ó á lo menos algunos dedos dellos, porque despues se enconaban é hacían materia, y era neçessario curarse con hierro ó con fuego. Pero aquesto es fácil de se remediar presto, sacándolas al prinçipio; pero en algunos negros boçales son peligrosas, porque ó por su carnadura, ó ser bestiales é no se saber limpiar, ni decirlo con tiempo, vienen á se mancar de los pies, é assi otros muchos que se quexan. E yo las he tenido en mis pies en estas islas y en la Tierra-Firme, y no me paresçe que en hombres de raçon es cosa para se temer, aunque es enojo en tanto que tura, ó está la nigua dentro; mas fácil cosa es sacarla al prinçipio. Yo tengo averiguado, é assi lo dirán las personas que tienen experiençia en sacar estas niguas, que es menester tener aviso, quando las sacan, para las mater; porque alguna vez, assi como con en alfiler ó aguja la descubren, rompiendo el cuero del pie, assi salta y se va la nigua como una pulga. Esto acaesçe si há poco que allí entró; y por esto se cree que la que entra en el pie, despues que ha hecho su mala simiente, se va

* The work is usually quoted as "*Coronica*" (= Cronica, Chronica) instead of *Historia*.

assi como vino á otra parte á haçer mas mal, ó por ventura por sí se despide del pie, despues de haber dexado en él una mala enxambre de innumerable simiente y generacion."

2 *Parapsyllus coxalis* spec. nov. (Pl. X. figs. 1, 2).

A very near ally of *P. cocyti* Rothsch. (1904), but distinguished at once by the peculiar forecoxa.

In both sexes the forecoxa is strongly widened posteriorly near the base (Pl. X. fig. 1), as shown in the figure. It bears a transverse row of slender bristles near the base, and farther down a row of strong bristles. At the hinder edge just below the widest point of the coxa there are two very stout bristles, and between these bristles and the apex of the coxa there is posteriorly only one more bristle, which is placed at some distance from the hind edge.

The fourth tarsal segment, moreover, is shorter than in *P. cocyti*, being twice as broad as it is long in the foretarsus and very little longer than it is broad in the hindtarsus. The fifth tarsal segment also is broader than in *P. cocyti*, being half as long again as it is broad in the foretarsus. The hindfemur bears a row of 7 to 11 bristles on the inside, and the hindtibia 9 to 12 on the outside, which are often arranged in two rows in the ♂. The longest apical bristle of the hindtibia of the ♀ does not extend to the subapical pair of bristles of the first tarsal segment, while in the ♂ this bristle reaches beyond the apex of the first tarsal segment. The first and second hindtarsal segments have 4 very long and slender apical bristles, the longest of the second segment reaching nearly to the tip of the fifth segment (claws excluded).

The genitalia of the ♂ also show some conspicuous differences. The movable process of the clasper is shorter than in *P. cocyti*, and bears a row of 6 or 7 slender hairs along the hinder edge from the base to the apex. The ninth sternite (Pl. X. fig. 2) more nearly resembles that of *P. corfidii* Rothsch. (1904), and is distinguished by bearing numerous hairs at the apex and by the shape of the vertical portion as shown in the figure. The bristles at the apex of the eighth tergite of the ♀ are more numerous than in *P. cocyti*, and the shorter ones stouter.

We have a series of both sexes from Valparaiso, Chile, found by J. S. Wolffsohn on *Octodon degus*.

3. *Parapsyllus australiacus* spec. nov.

Parapsyllus longicornis Jord. & Rothsch. (nec Enderl., err. determ.), *Parasitology* i. p. 85. t. 2. fig. 12, t. 4. fig. 5, t. 7. fig. 3 (1908).

When describing the present insect in the place quoted we said that our specimens did not exactly agree with Enderlein's figures, and might be a closely allied species. Dr. A. C. Oudemans, who has had an opportunity of comparing a cotype of *longicornis* with our insect, now informs us that our identification was indeed erroneous. It therefore becomes necessary to separate our species under a name of its own, and we propose to call it *australiacus*.

We have two pairs taken off *Eudiptula minor* on Bird Island, near Perth, West Australia, by J. Burton Cleland.

4. *Ceratophyllus graphis* spec. nov. (Pl. X. figs. 3, 4).

♂ ♀. In the shape and the bristles of the head somewhat resembles *C. polionis* Rothsch. (1905), but is abundantly distinct.

Head.—The frons is very strongly curved in the ♂, less in the ♀. It bears three rows of bristles, the row nearest the eye containing 3 strong bristles; the second row 4, of which the upper one is the strongest, and the third row 5 or 6, of which the third from above is the strongest. There are, moreover, a number of minute hairs before the eye near the antennal groove. The occiput bears 3 (less often 2) bristles behind the base of the antenna, a row of 4 or 5 in the centre, and a subapical row of 5. The rostrum nearly reaches to the tip of the forecoxa, its apical segment being four times as long as it is broad, equalling in length the second segment of the maxillary palpus. The hairs of the second segment of the antenna are hardly longer than those of the first segment.

Thorax.—The pronotum bears a comb of 19 or 20 spines, and has, like the meso- and metanotum, a row of 9 or 10 long bristles on the two sides together. On the meso- and metanotum there are in front of this row two rows of small bristles, and on the back a number of additional hairs, these latter being especially numerous on the mesonotum. The epimerum of the metathorax bears 7 or 8 bristles (3, 3—4, 1).

Abdomen.—The tergites have two rows of bristles, except the first, which has a number of additional short bristles in front. There is one long antepygial bristle; above it in the ♂ there is a minute hair and below it a short stout bristle. In the ♀ these two additional bristles are both stout, the lower one being about one-third the length of the central bristle (the upper one is broken). The sternites of segments three to six bear a row of 3 (more rarely 4) bristles in the ♂, and 4 (more rarely 3) in the ♀, there being no bristles in front of this row. The numbers on the seventh segment are 3 or 4 in the ♂, and 5 in the ♀.

Legs.—Similar to those of *C. pollionis*, but the first pair of bristles of the fifth tarsal segment are merely bent inwards, not placed in between the second pair.

Modified Segments.—♂. The eighth tergite bears 4 or 5 long bristles. The eighth sternite (Pl. X. fig. 4, viii. st.) is quite small, and has 3 to 5 long bristles. The clasper (Cl) is truncate, with the upper distal angle obtuse. The movable process is nearly halfmoon-shaped, and bears 3 strong bristles as shown in the figure (Pl. X. fig. 4, F). The ninth sternite is widened ventrally in the middle, and bears here several short stout hairs and a number of small ones. The apical portion of the ninth sternite is straight ventrally and bears several short bristles. The manubrium (M) of the clasper is but very slightly curved, and its apex is obtuse. The penis (Pen.) is much widened at the apex, and bears ventrally on each side a spine-like process as indicated in the figure.—♀. The eighth tergite has about 12 short bristles above the stigma, 2 very long and 1 short bristle below the stigma, and about 12 on the lower portion of the sides. The apical edge of the seventh sternite is very oblique (Pl. X. fig. 3).

Length, ♂ 2.5, ♀ 3 mm.

We have 3 ♂♂ and 2 ♀♀ from Nicaragua, taken off *Sciurus dippiei*, and received from Mr. W. F. H. Rosenberg.

5. *Ceratophyllus lasius* spec. nov. (Pl. X. fig. 6; Pl. XI. fig. 10).

♂ ♀. A very hairy species, which is very distinct from any other we know.

Head.—The frons bears a row of 3 bristles before the eye and in front of this row another row of 4 to 6 smaller ones, there being also a number of small hairs before the eye. The occiput has 1 bristle behind the base of the antenna,

a row of 2 to 4 in the centre, and a subapical row of 8 or 9. The bristles of the second segment of the antenna nearly reach the apex of the club in the ♂, while they are longer than the club in the ♀. The rostrum only extends to the apical third of the coxa, being but a little longer than the maxillary palpus. The first segment of the latter is longer than the second.

Thorax.—The prothorax bears a comb of 42 spines and one row of 15 (♂) or 18 (♀) bristles. The mesonotum is nearly covered all over with small hairs from the base to the postmedian row of bristles, these small hairs being less numerous in the ♂ than in the ♀. The metanotum bears two rows of small hairs in front of the row of long bristles and some additional hairs on the back. The mesosternite also has a number of small hairs in front.

Abdomen.—All the tergites bear two (♂) or three (♀) rows of small bristles in front of the row of long ones, besides a number of additional small dorsal bristles. The first to fourth tergites have 2 or 3 apical spines on each side. The basal sternite has on each side 3 to 5 bristles in the ♂, 7 or 8 in the ♀; the sternites of segments three to six have a row of 3 or 4 bristles in the ♂ and 8 to 10 in the ♀, with a number of rather long bristles in front of the row. There is one long antepygial bristle, which is accompanied by 2 minute hairs in the ♂ and by 2 short bristles in the ♀. The seventh sternite, which in the ♂ bears 2 or 3 bristles on each side, has more than 30 on each side in the ♀. The hindmargin is shallowly incurved in the ♀, as shown in the figure (Pl. XI. fig. 10).

Legs.—The hindfemur bears a row of bristles on both sides, the number of bristles varying from 6 to 10. The hindtibia is covered with bristles all over the outer surface, and has a row of 6 lateral bristles on the inside. The longest apical bristle of the first hindtarsal segment reaches beyond the apex of the second segment, and the longest bristle of the second segment beyond the apex of the fourth. The fifth segment is peculiar. It is rather short, and bears a number of short stout bristles on the ventral surface, 4 of them being placed at and near the apical margin. Moreover, the first as well as the third pair of lateral bristles are distinctly shifted towards the middle line.

Modified Segments.—♂. The eighth tergite has the upper portion of the apical margin more slanting than usual, there being at and near this margin about 14 long bristles, while the lower proximal portion of the tergite bears about 8 long bristles. The eighth sternite is long and slender. Its apex cannot clearly be made out in our only specimen. The clasper (Pl. X. fig. 6) is long, and bears before the apex a vertical process (v) which is rounded at the tip. The movable process (f) is very strongly curved near its base and slightly widens towards the apex, the distal margin being rounded and the proximal apical angle pointed. This process bears 2 short stout bristles near the base and 2 long ones near the apex. The outline of the ninth sternite cannot clearly be made out. It appears to be widened ventrally proximally to the centre and to bear on this widened portion numerous minute hairs and a row of short stout bristles.—♀. The eighth tergite has about 18 short bristles above the stigma, a patch of 4 long and 4 to 6 short bristles below it, and about 24 bristles on the lower half. The stylet is nearly five times as long as it is broad.

Length: ♂ 2.6, ♀ 3.2 mm.

We have one pair from the foot of the Sierra de la Venturo, province of Buenos Aires, found on *Diplochelidon cyanoleucus* by Dr. K. Wolffhügel, July 28, 1905.

6. *Ceratophyllus danubianus* spec. nov. (Pl. X. fig. 5).

Both sexes closely resemble *C. tesquorum* Wagn. (1898); distinguishable by the somewhat more numerous bristles and by the genitalia of the ♂.

♂. The eighth abdominal tergite bears a lateral row of 11 to 13 bristles and an apical row of 9 to 13. The eighth sternite (Pl. X. fig. 5, viii. st.) bears 3 pairs of bristles ventrally near the apex. The clasper resembles that of *C. tesquorum*, but the movable process (F, Pl. X. fig. 5) is broader proximally, and bears 1 long bristle instead of 2 short ones as in *C. tesquorum*.

♀. Exactly like *C. tesquorum*, except that the abdominal segments bear one or two more bristles and that the fifth tarsal segment has one or two short spine-like bristles ventrally in front of the two apical spine-like bristles.

We have a series of both sexes from Malcoci, Roumania, off *Spermophilus cityllus*, collected by A. Rettig in March 1908. This insect is apparently the western representative of *C. tesquorum*.

Caenopsylla gen. nov.

♂ ♀. This new genus shows affinities on the one hand to *Ceratophyllus* and on the other to *Ctenopsyllus*.

Frons strongly curved, especially in the ♂, with a tubercle (Pl. XI. figs. 9, 11). Eye present, but not fully developed. Genal process with two spines. Antenna and antennal groove as in *Ceratophyllus*. Pronotum much wider above than at the sides, with a comb of curiously deflected spines. Mesonotum with setiform spines between the postmedian series of bristles and the apical margin. Metanotum with some short apical spines, similar spines being present on the three anterior tergites of the abdomen. The internal incrassation at the anterior edge of the metasternite narrow, being longer than it is broad. The tibiae resemble those of *Ctenopsyllus* in the exterior dorsal bristles being numerous and forming a kind of comb, although these bristles are not of such even length as in *Ctenopsyllus*; the hindtibia bears only 3 long dorsal bristles, the first being placed in the second notch, the second in the centre, and the third near the apex. The fifth hindtarsal segment has 5 lateral bristles, of which the first is very slightly bent inward.

Type : *Caenopsylla mira* spec. nov.

7. *Caenopsylla mira* spec. nov. (Pl. XI. figs. 9, 11, 12).

Head.—The frons bears a row of 2 or 3 bristles at some distance from the eye, and further forward a row of 4 or 5 smaller ones (Pl. XI. figs. 9, 11). The two spines situated at the apex of the genal process are narrow and directed backwards. The frons is very much more curved in the ♂ than in the ♀, its outline almost resembling in the ♂ that of *Ctenopsyllus musculi*. The occiput has 1 bristle behind the base of the antenna, 1 or 2 in the centre, and a row of 5 or 6 near the apex. The antennal groove extends to the vertex in the ♂, while it does not extend so far upwards in the ♀, there being in this sex also no internal incrassation from the base of the groove to the vertex. The first segment of the antenna is long in the ♂. The second segment bears a few very short bristles at the apex in both sexes.

Thorax.—The pronotum has a comb of 14 spines and one row of bristles (Pl. XI. fig. 9). The mesonotum has two rows of bristles and a number of additional hairs on the back, which are particularly numerous at the base. The mesosternite has 9 bristles. The metepisternum bears 2 or 3 bristles and the epimerum 6 or 7

bristles (2, 3—4, 1). The metanotum has two rows of bristles, the posterior row containing 10 bristles on the two sides together, there being also an apical comb of 6 short spines.

Abdomen.—The tergites bear each a postmedian row of 12 bristles on the two sides together; the first three tergites have an additional row of 6 to 8 bristles in front of this row, the additional row being represented on the other tergites by 1 or 2 bristles only. There are in the ♂ 2 antepygial bristles, the upper one being short and the second moderately long; beneath the latter there is a small hair. The ♀ has 3 antepygial bristles, the upper one being short, the second long, and the third nearly as long as the second. The sternites of segments three to six bear 2 bristles on each side in the ♂ and 3 in the ♀, the seventh segment having 2 in the ♂ and a row of 7 in the ♀.

Legs.—The bristles situated at the upper edge of the femora are long. The hindfemur bears exteriorly 2 subapical bristles and on the inner side a row of 5 to 7. The hindtibia has a row of 8 or 9 bristles on the outer surface, and bears 21 bristles at the dorsal edge, 3 of them being much longer than the others. The short bristles of the hindtarsi are numerous. The first segment has six notches on the hinder side and five on the anterior side, besides the apical notch, the ventral surface of this segment bearing 8 or 9 bristles. The longest apical bristle of the second hindtarsal segment is a very little longer than the third segment. The proportional lengths of the segments are in the midtarsus 15, 14·5, 9·5, 6, 13·5, and in the hindtarsus 27—31, 19—20, 11, 7, 14.

Modified Segments.—♂. The eighth tergite bears 2 or 3 bristles below the stigma and another pair close together farther back. The ventral edge of this tergite is apparently straight and the lower apical angle pointed. The eighth sternite (Pl. XI. fig. 12, viii. st.) is smaller than the tergite. It is about as long as it is basally wide vertically, being rounded-triangular and bearing near the apex 5 or 6 bristles. The clasper is sinuate on the distal side, the lobe above the sinus being short, while the one below it is long (r). The movable process (F) is slender. It is widest about the centre, and bears on the apical half of the distal edge one fairly long and several small hairs. The clasper bears 4 long bristles near the base of the movable process. The ninth sternite (ix. st.) is narrow. The ventral portion has numerous rather stout bristles along the ventral margin, and bears a triangular lobe at the apex. This lobe has some very short bristles at the lower angle. The tenth sternite is broad.—♀. The eighth tergite bears 5 small bristles above the stigma, and about 24 long and short bristles on the ventral half. The stylet is about three times as long as it is basally broad. The anal sternite is large, and is clothed with numerous bristles. It bears beneath on each side 3 short spine-like bristles.

Length: ♂ 2 mm., ♀ 2·3 mm.

We have one pair off *Ctenodactylus gundi*, collected by the Hon. L. W. Rothschild and Dr. E. Hartert at Biskra (Algeria).

Ctenoparia gen. nov.

♀. Near *Macropsylla* Rothsch. (1905), but easily recognised by the spines at the anterior edge of the antennal groove and the internal incassation of the occiput being absent, and by the structure of the fifth tarsal segment.

Head.—Eye vestigial. A comb along the ventral edge of the gena (Pl. X.

fig. 7), somewhat recalling the comb of *Ctenocephalus* situated in this place. Antennal groove continued upwards to vertex. No internal incrassation on occiput. Club of antenna segmented all round.

Thorax.—Pronotum with comb. Internal incrassation situated at anterior margin of metasternum longer than it is broad and slightly curved upwards.

Abdomen.—Second segment with complete comb; third to sixth tergites mesially slightly emarginate. Seventh tergite with 3 long apical bristles on each side. Two receptacula seminis.

Legs.—The first segment of the midtarsus much longer than the second. The fifth segment of all the tarsi small, with 5 lateral bristles, the first pair not being more ventral than the others.

Type: *Ct. inopinata* spec. nov.

8. *Ctenoparia inopinata* spec. nov. (Pl. X. figs. 7, 8).

Head.—The frons bears an anterior row of 8 bristles, farther back two rows of 3 strong bristles each, and beneath the vestigial eye 1 more long bristle, there being also a number of small hairs in between these bristles. The ventral genal edge has a comb of 8 spines. The occiput bears three rows of bristles. The rostrum reaches to the apex of the forecoxa, the labial palpus consisting of five segments. The first segment of the maxillary palpus is longer than the second.

Thorax.—The pronotum bears a comb of 28 spines and two rows of bristles, besides some additional dorsal bristles. The meso- as well as the metanotum bears five rows of bristles, the anterior rows being somewhat irregular in position. The epimerum of the metathorax bears three rows of bristles (about 13 altogether).

Abdomen.—All the tergites have two rows of bristles besides a few dorsal bristles in front of these rows. The second tergite bears a comb of 38 spines, the other tergites having no spines at the apex. The three antepygidial bristles of the seventh tergite are of equal length, being longer than the second hindtarsal segment. The sternites of segments three to six have a row of 4 bristles on each side and before this row several smaller bristles. The apical edge of these sternites is distinctly emarginate.

Legs.—The forecoxa is very hairy. The sinus posteriorly near the apex of the hindcoxa is deep and narrow. The hindfemur bears ventrally before the apex 3 bristles on the outer side and 1 on the inner. The tibiae have several irregular rows of bristles on the outer surface. The foretibia has 7 long and about 13 short and stout dorsal bristles. The hindtibia has 17 to 20 shorter and only 4 long dorsal bristles. The tarsi are very hairy, but the hairs are short. The longest apical bristle of the first and second hindtarsal segments reaches just beyond the centre of the following segment. The proportional lengths of the segments are in the midtarsus 45, 29, 18, 12, 22, and in the hindtarsus 73, 58, 36, 18, 22.

Modified Segments.—♀. The seventh sternite is ventrally produced into a lobe on each side, as shown in the figure (Pl. X. fig. 8). The eighth tergite is completely divided in the dorsal line. It bears about 6 small hairs above the stigma, 2 beneath it, and about 12 bristles on the ventral portion of the sides. Of these latter bristles the most dorsal apical one is much the longest. The stylet is almost cylindrical, and is more than four times as long as it is broad at its base. It bears 1 long apical bristle and 2 minute hairs near this bristle, as in *Macropsylla hercules* Rothsch. (1905).

Length: 3.7 mm.

We have one ♀ off *Akodon olivaceus*, collected at Valparaiso, Chile, by J. A. Wolffsohn.

9. *Ctenophthalmus nivalis* spec. nov. (Pl. XI. figs. 13, 14).

Closely allied to *C. orientalis* Wagn. (1898), but differing in the modified segments of the abdomen.

♂. The eighth sternite is sinuate ventrally and produced at each side into a triangular lobe. The clasper has two non-movable processes. The upper one of them is rounded and bears about 10 bristles, while the lower one (r) is narrow and truncate, as shown in the figure (Pl. XI. fig. 13). The movable process (F) is somewhat longer than it is broad. It is obliquely truncate at the apex, the upper distal angle being produced into a short nose. The ninth sternite (ix. st.) bears numerous slender bristles at the apex.

♀. The seventh abdominal sternite, which in *C. orientalis* is produced into two broad and rounded lobes separated from each other by a narrow sinus, has only one long triangular lobe in the new species, as shown in the figure (Pl. XI. fig. 14). The eighth tergite bears 5 or 6 long bristles at the ventral and apical margins, 1 long one above the ventral margin, and proximally as well as distally a patch of 4 to 6 small hairs.

We have a small series of both sexes from Le Lautaret, Hautes Alpes, taken from a nest of *Arvicola nivalis* in August 1908 by Dr. K. Jordan.

10. *Palaeopsylla sibirica* Wagn. (1898).

Ctenopsylla sibirica Wagn., *Hor. Soc. Ent. Ross.* xxxi. p. 578. t. 8. figs. 13, 14 (1898) (Siberia; Charkow).

A ♀ agreeing with Wagner's description and figures has been received from St. Paul, Basses Alpes (France), where it was found on *Evotomys nageri* on October 26, 1907, by Monsieur Mottaz. The species does not belong to *Ctenopsyllus*, but to *Palaeopsylla*.

Wagner also described as *Typhlopsylla sibirica* (cf. *Hor. Soc. Ent. Ross.* xxxv. p. 26. t. 1. figs. 3, 4 [1900]) a ♀ from Transbaicalia which he placed afterwards in *Palaeopsylla*. If these two *sibirica* are different—as they appear to be—the second will have to receive a new name.



Rothschild, Nathaniel Charles. 1909. "On some American, Australian and Palearctic Siphonaptera." *Novitates zoologicae : a journal of zoology in connection with the Tring Museum* 16, 61–68.

<https://doi.org/10.5962/bhl.part.21960>.

View This Item Online: <https://www.biodiversitylibrary.org/item/21989>

DOI: <https://doi.org/10.5962/bhl.part.21960>

Permalink: <https://www.biodiversitylibrary.org/partpdf/21960>

Holding Institution

Natural History Museum Library, London

Sponsored by

Natural History Museum Library, London

Copyright & Reuse

Copyright Status: Public domain. The BHL considers that this work is no longer under copyright protection.

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at <https://www.biodiversitylibrary.org>.