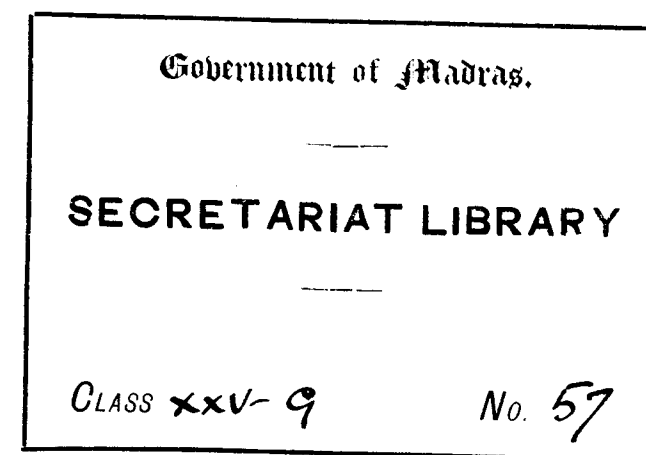




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ON SOME UNDESCRIBED SCOLYTIDAE OF
ECONOMIC IMPORTANCE FROM THE
INDIAN REGION II.

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, VOL. I

FOREST ZOOLOGY SERIES

Part II

THE
INDIAN FOREST
MEMOIRS

On some Undescribed Scolytidae of
Economic Importance from the Indian
Region. II.

By E. P. STEBBING, F.L.S., F.Z.S., F.R.G.S., F.E.S.,
Imperial Forest Zoologist to the Government of India



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List of Principal Works quoted in the Synonymy.

1. *Ass. Sal Ins. Pes.*—On Some Assam Sal Insect Pests.
2. *Bark-boring beetles in Simla Catcht. Area.*—The bark-boring beetle Attack in the Simla Catchment Area.
3. *Bark-boring beetles, Zhob.*—Note on the Bark-boring beetles of the Chilgoza (*Pinus Gerardiana*) Forests of Zhob, Baluchistan.
4. *Dep. Not. Ins. For.*—Departmental Notes on Insects that Affect Forestry.
5. *Ent. Wochenbl.*—Entomologischen Wochenblottes.
6. *For. Bull.*—Indian Forest Bulletins.
7. *For. Pamphl. For. Zool. Ser.*—Indian Forest Pamphlets, Forest Zoology Series.
8. *Fur. Not. Bark. Beet., Zhob.*—A further Note on the Chilgoza bark-boring beetles of Zhob, Baluchistan.
9. *Ind. For. Mem. For. Zool. Ser.*—The Indian Forest Memoirs, Forest Zoology Series.
10. *Inj. Ins. Ind. For.*—Injurious Insects of Indian Forests.
11. *Ind. Mus. Not.*—Indian Museum Notes.
12. ~~*Jour. Roy. Geog. Soc.*~~ *Journal of the Royal Geographical Society of London.*
13. *Eich. Rat. Descr. Tomici.*—Eichhoff. Ratio, Descriptio, Emendatio eorum Tomi-
cinorum.
14. *Synop. des Scolyt.*—Chapuis. Synopsis des Scolytides.
15. *Trans. Ent. Soc. Lond.*—Transactions of the Entomological Society of London.

Correction Slip.

IND. FOR. MEMOIRS—FOREST ZOOLOGY SERIES.

VOL. I, PART I.

Sphaerotrypes querci sp. n.—Page 5, line 27.—For “abdominal segments punctate with sparse”

read “abdominal segments 1 and 5 large
and equal to one another, 2, 3, and 4
narrower, punctate with sparse.”

Pages 11 and 12.—For ‘*Dryocetes*’ read ‘*Dryocætes*.’

THE INDIAN FOREST MEMOIRS

VOL. I.]

1909

[PART II

On some Undescribed Scolytidæ of Economic Importance from the Indian Region.* II.

By E. P. STEBBING, F.L.S., F.Z.S., F.R.G.S., F.E.S.,

Imperial Forest Zoologist to the Government of India.

IN this second paper on Undescribed Scolytidæ of Economic Importance in India I propose to describe some species of the genera **Hylastes**, **Sphærotrypes**, **Phlæosinus**, **Scolytus**, **Tomicus**, and **Pityogenes**.

Of these perhaps the two most interesting genera so far as we know at present are **Scolytus** and **Tomicus** which have of course numerous European affinities. For instance a species of **Scolytus** in the North-West Himalaya has a close relationship to **Scolytus destructor** of the Elm in Europe whilst the **Tomicus** of the Himalayan Blue pine (**Pinus excelsa**) and Spruce (**Picea Morinda**) has equally close affinities with the European **Tomicus typographus**, Linn.

A feature of interest and of great economic importance is the discovery that the genus **Scolytus** in the North-West Himalaya, so far as is at present known, confines itself to coniferous trees, I may say to one conifer, the Deodar (**Cedrus deodara**), whereas in Europe the genus is only known to infest broad-leaved species of trees. The same peculiarity as regards the nature of the food plant has been discovered to occur in America.

I have not found the genus in India outside the limits of the Himalaya.

The genus **Tomicus** is likely to prove of considerable importance since investigations would seem to show that it has a wide distribution throughout the continent and that it contains numerous at present little known and undescribed species infesting a large number of the principal timber trees of the Indian Region.

* The area included in the "Indian Region" of these papers has the same boundaries as laid down for the Series entitled the *Fauna of British India*.

The genus *Sphærotrypes* was fully dealt with in my first paper. I describe another species here.

The little genus *Pityogenes* has the widest distribution of any of the Himalayan genera as yet studied although at present only two members of the genus are known. The one *P. scitus* of Blandford infests the *Pinus Khasya* in the Assam Hills round Shillong and is probably to be found wherever the tree grows in this area. The distribution of the second, which I name *P. coniferæ* owing to the fact that it infests several different species of *Coniferæ*, is much wider. I have taken it in the North-West Himalaya from Kumaun in the East stretching away to the Suliman mountain range in the extreme north-west of the continent. In the Himalaya proper it is to be found in the Deodar (*Cedrus deodara*), Blue pine (*Pinus excelsa*) and spruce (*Picea morinda*). In the Suliman mountains it infests the beautiful silvery barked chilgoza pine (*Pinus Gerardiana*). It is also found in this tree where it grows in the inner Himalaya.

Hylastes, Er.

In his monograph on the Rhynchophorous Coleoptera of Japan* Blandford gives a list of six species of this genus from Japan—*parallelus*, Ch., *ambiguus*, Blandf., *attenuatus*, Er., *plumbeus*, Blandf., *interstitialis*, Ch., and *glabratus*, Zett.

The two species I describe here differ from the known Japanese insects. The one *Hylastes himalayensis*, n. sp., is very common in some of the coniferous trees in the North-West Himalaya, especially the Blue pine and Spruce, and has a considerable range of altitude from some 3,500 ft. to 9,000 ft. in elevation.

The second species infests the wood of the long leaved pine *Pinus longifolia* and is described here as *H. longifolia*.

My present observations tend to show that the known Indian species are wood borers, tunnelling down into the sap wood and even in to the heart wood of the tree to lay their eggs, the male and female beetles being found together at the bottom of the tunnel in the tree.

Hylastes himalayensis, sp. n.

Elongate, shining, dark red brown to black, punctate. The third tarsal joint wider than the preceding joints.

Head smooth, shining with scattered rather large punctures on vertex; a transverse median depression below vertex not reaching the sides; rostrum somewhat constricted, widest at base, not carinate; front roughly rugose punctate, the punctures finer medianly and the rugosities more prominent on the rostrum.

Prothorax constricted at apex, the sides angulate and sinuate; punctate, the punctures of two kinds: large squamulose and confluent on sides, finer and not confluent on disc and anterior median portion.

* Trans. Ent. Soc. Lond., Pt. I, 56 (1894).

Elytra wider than thorax and twice as long, widest at apex, sides very slightly rounded to basal fourth and thence slightly sinuate to base; striae punctate, the striae prominent and punctured, the interstices rugose with short fine hairs.

Under surface black, covered with scattered fine white hairs; middle coxæ fairly wide apart. Legs dark reddish black. Antennæ yellow, tibiæ red brown. Long. 3 to 3.5 millim.

The male beetle is of smaller size than the female.

This species would seem to come near Chapuis' *interstitialis* from Japan.

This insect was alluded to in my 'Departmental Notes', I, 201, under *Hylastes* sp.

Patria.—North-West Himalaya between 3,500 and 8,000 ft.

Life History.—The beetle infests the wood of the Spruce (*Picea morinda*) and Blue pine (*Pinus excelsa*) in the North-West Himalaya. The first generation of the insect appears about the middle of May and from that date the beetles may be found egg laying in the trees. The female tunnels into the tree, going in either horizontally or at an angle. On reaching the wood the tunnel is taken in at an angle to the entrance one and may proceed straight or may wind. The male joins the female in the tunnel and pairing takes place. The female then eats out short side branches and lays her eggs in them. There are at least two generations in the year.

Hylastes longifolia, sp. n.

Elongate cylindrical. Black, shining, uniformly punctate. Smaller than *himalayensis*.

Head with vertex smooth with a few scattered fine punctures; the transverse depression below vertex more prominent than in *himalayensis*; rostrum wide, scarcely constricted and not carinate; front uniformly pitted with small punctures more prominent than on vertex.

Prothorax shape as in *himalayensis*; the punctation is however quite different, the punctures being uniform in size and arranged in symmetrical longitudinal parallel equidistant rows save near apex where the punctures are closer together; on anterior margin a smooth area finely punctate, broadest medianly thinning out laterally on either side.

Elytra with a slightly reddish tinge, slightly wider than thorax and nearly $\frac{3}{4}$ ths as long again, as wide at apex as at base, somewhat constricted in basal third, apex bluntly rounded. Striate punctate, striae deep, punctures small and very uniform, interstices prominent, smooth, shining. Both upper and under surface are distinguished by an absence of hairs.

Under surface black, uniformly punctate, punctures large save on abdominal segments which are finely pitted. Middle coxæ closer together than in *himalayensis*. Long. 2.6 to 3.05 millim.

Easily distinguished from *himalayensis* by the different shape of rostrum, the differences in the punctation of head, thorax and elytra; by the median coxæ being placed close together and the smaller size.

Patria.—*Pinus longifolia* tracts in Jaunsar, Tehri Garhwal, Kumaun and Chamba in the North-West Himalaya.

Life History.—This insect confines itself to the *Pinus longifolia*. It infests the tree in a similar manner to *H. himalayensis* in the Blue pine, &c. It is at times very plentiful and infests still living or newly felled or dying trees, the beetles generally tunnelling into the tree for egg laying purposes at the period when a generation of *Tomicus longifolia* and *Polygraphus longifolia* are leaving it.

The beetle after boring through the bark carries its tunnel in a zig-zag manner for a varying distance between the bark and sap wood. It then tunnels down into the sap wood at an angle, the eggs being laid in this tunnel. A generation of the beetle has been taken tunnelling into trees in the middle of May in Kumaun, in the middle of June at Chamba on the Ravi River, and another towards the end of October in the Tons Valley in Tehri Garhwal.

There are probably other generations in the year.

Sphærotrypes, Blandf.

I have described in my first paper in these Memoirs four species of this genus from the Indian Region. Blandford in *Rhynchophorous Coleoptera from Japan* described a species *S. globulus* taken by Mr. H. F. Andrewes at Belgaum. For convenience' sake I reproduce Blandford's description of *globulus* below. I add here a sixth species taken in the North Zhob Mountains near the Takt-i-Suliman on the borders of Zhob and Derajat.

[The following is Blandford's description of *globulus*:—

Sphærotrypes globulus, Blandford.

Brevissime ovatus, niger, elytris piceis, antennis et tarsis rufescentibus; capite reticulato, punctato, fronte squamulosa, sub-tuberculata, obsolete carinata; prothorace transverso, anterie fortiter angustato, basi postice acutius producta, marginata, post apicem constricto, dense et rugose punctato, linea media elevata obsolescente, opaco, densius squamoso; elytris striato-punctatis, interstitiis planis, rugosis, squamis fuscis passim obscure dilutioribus obtectis. Long. 2.4—3 millim.

Differs from the Japanese *pila* as follows:—

Front of head tuberculate, more strongly covered with short scales with a few longer ones at sides, and usually distinctly carinate over the mouth, sometimes throughout less impressed in the male. The carina is variable, and a trace of it exists in *S. pila*. Prothorax more strongly angulate behind, its central line nearly obsolete, the surface quite dull with closer punctures and more scales. Scales of the elytra brown, occasionally a little lighter, but not evidently pale and cinereous, as in *S. pila*, except a few at the apex of the suture.]

Sphærotrypes MacMahoni, sp. n.

Elongate, globular, very convex above. Dull black or brownish black. Easily distinguished by the presence of what appears to the naked eye as an X-shaped

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marking of whitish grey pubescence, the upper and lower arms of the X being short and the vertical portion of the letter elongate. The flat front of the head, the under side of the thorax and the abdominal segments thickly clothed with a short dense grey pubescence.

Prothorax punctate, the longitudinal median line fairly prominent and ending in a raised elevation behind. Rather densely covered with longish grey hairs shorter and less dense on disc; the posterior margin thickly set with a short very dense greyish pubescence which forms the upper arms of the letter X.

Elytra slightly wider than thorax, not twice as long. Easily distinguishable from the other four Indian species I have described by the finer striæ, the interstitial spaces much more finely rugose and covered with a fine short stiff grey brown or black pubescence. The basal third of the suture is set with a very dense short grey pubescence which curves outwards and downwards from a point about a third up the suture from the base forming a grey band which reaches the outer margins two-thirds up from the base (forming the vertical portion and the lower arms of the X). The outer shoulders as also the apical portion of the elytra are also set with this grey pubescence.

Under surface covered with a dense yellow grey pubescence.

Antennæ and legs reddish brown, moderately clothed with a greyish pubescence.

Long. 2.75—3.20 millim.

I name this Scolytid after Sir Henry A. MacMahon, K.C.I.E., Agent to the Governor General in Baluchistan, who in 1886 in company with the late Major MacIvor made the first recorded ascent by Europeans of the Takt-i-Suliman mountain.*

Larva.—Elongate, convex and corrugated above, oval, flat beneath, but slightly curved and yellowish pink in colour.

Patria.—Suliman mountains, Baluchistan, and Dera Ismail Khan. I took the only specimens I have seen of this insect at Sangar Scallon (Elevation about 7,000 feet) close to the famous Takt-i-Suliman mountain in November 1905.

Life History.—This beetle infests the Olive (*Olea cuspidata*) in North Baluchistan and possibly neighbouring tracts. I found a living tree badly infested by the insects on November 9th, the females being engaged in eating out elongate vertical egg galleries some 2 inches in length transversely across the tree instead of parallel to the longitudinal axis as is the general rule of the Indian species and laying the eggs in small indentations on either side all the way up. The larvæ eat out wavy galleries some 2½ inches in length making the usual *Sphærotrypes* pattern in the wood. I know nothing further about the life history of this insect.

Phlæosinus, Chap.

Chapuis in his Synopsis gives two species of this genus from the Indian Region: *detersus* Eichh. from Ceylon and *squamulatus* Eichh. from the Himalaya. I have not yet taken this latter species. Blandford in his *Coleoptera of Japan*† mentions seven Japanese species of which he describes 5 as new.

* Jour. Roy. Geo. Soc., Lond.

† Chapuis, F.—Synopsis des Scolytides, 38, 39 (1869).

‡ Blandford.—The Rhynchophorous Coleoptera of Japan, Pt. III, Scolytidæ, Trans. Ent. Soc., Lond., Pt. I, 68 (1894).

A peculiarity of the genus as noted by Blandford is that in some species, European (and one American), the third tarsal joint is simple. In others (most American and all the Japanese species according to Blandford) it is bilobed.

As far as present investigation goes the Indian members of the genus would appear to contain species in which both the simple and bilobed 3rd tarsal joint is present. The species here described, 3 in number, vary considerably in size. It appears probable that the genus may have some considerable abundance within the region.

Phlæosinus Zhobi, sp. n.

♀.—Oblong, cylindrical, black, the thorax and elytra with at times a reddish tinge.

Head black finely and closely punctate, sparsely covered with a few fine short white hairs. Front shining and punctate. Eyes reniform with the anterior margins straight. Antennæ yellow, club with four articulations. Prothorax constricted in front at upper third, finely and densely punctate; a fine longitudinal median raised line; clothed with a sparse white pubescence.

Elytra striate—punctate with a row of deep punctures down the striæ the interspaces being convex and finely punctate; in apical fourth the large punctures disappear and the striæ are very faint the whole being finely pitted; the apex is set with spiky protuberances or teeth which extend laterally up the sides; the elytra are covered with a scattered white pubescence denser at sides and in apical portion. Under surface black, with long stiff sparse hairs; finely pitted. Abdominal segments narrow. Legs reddish brown, covered with sparse yellow hairs; tarsi yellow; tibiae armed with four teeth on outer edge and terminating in a longer tooth on inner upper edge. Long. 1.9 millim.

♂.—Smaller than ♀, elytra reddish, the white pubescence being absent. Front slightly tuberculate. Apex of elytra with fewer teeth. Long. 1.5 millim.

The above description amplifies that given in my Monograph on the Zhub Chilgoza Bark-boring beetles.*

Egg.—Blunt, elliptical in shape, white and translucent, 0.7 millim. in length.

Patria.—North Zhub and Takt-i-Suliman mountains.

Life History.—This small bark beetle accompanies the bark borer *Polygraphus Trenchi* Steb.† in its attacks on the Chilgoza pine (*Pinus Gerardiana*) in the North Zhub and Takt-i-Suliman forests.

The insect apparently prefers the bark and phloem of the tree in a slightly drier condition than its companion since a generation of the *Phlæosinus* was found commonly in the third week in June egg laying in trees from which a generation of the *Polygraphus* was just issuing. It is not here intended to say that the insect infests dry dead trees; neither insect will touch a dead tree. The generation of the insect taken in the third week in June is probably the first generation of the year laying the eggs of the second generation. Only mature beetles, eggs, and newly hatched larvæ

* For. Bull. No. 3, p. 7 (1905).

† Op. Cit. p. 9; Ind. For. Mem., I. 1, p. 9 (1908).

were taken from the trees during the last fortnight of June. The male beetle tunnels into the tree and hollows out a pairing chamber which grooves more or less deeply the sap wood. He is soon followed by a female and this latter by others until as many as four female beetles may have joined the male, all five being found together at this stage in what is apparently an enlarged pairing chamber. From this central chamber the four females after pairing with the male each eat out a separate long clean irregularly curving egg gallery laying 10 to 12 rather large eggs in depressions at fairly wide intervals apart in the walls of the gallery, half being laid on each side. These galleries for the main part groove the bark only. The larvæ hatch out in a few days and bore away at right angles to the egg gallery. The figure thus formed in the bark of the tree is more or less circular in shape and is easily distinguishable from the *Polygraphus* plan of galleries. The beetles when mature issue from the tree in a swarm. The number of generations in the year would seem to be identical with those of *Polygraphus Trenchi*.

Phlæosinus major, sp. n.

Robust and thick; moderately shining. Prothorax reddish. Elytra dark reddish brown.

Head large, vertical, dark brown; punctate, with a weak median line and a fringe of yellow hairs at base of mandibles.

Prothorax but slightly broader than long, very convex, culminating in a prominent peak on centre of disc; thickly punctate on anterior half, the posterior portion smooth and shining on disc slightly punctate on sides. Sparsely covered with long yellow hairs anteriorly.

Elytra wider than thorax, not quite twice as long, convex and constricted posteriorly, longitudinally striate and squamulose, the declivous portion clothed with longish yellow hairs.

Under surface punctate with a scanty pubescence. Antennæ and legs yellowish brown. Length 5.4 millim.

This amplifies the description given in my monograph on *Some Assam Sál Insect Pests*.*

Larva.—Short, thick, white, but slightly curved, legless. Body corrugated. Length 6 millim.

Pupa.—Short, thick, whitish-yellow, resembling beetle in form.

Patria.—Goalpara Sál Forests, Assam.

Life History.—This is the largest of the Scolytids I have yet taken infesting the Sál (*Shorea robusta*) tree in the Indian Region. The beetle, probably the male, bores a single tunnel about $\frac{1}{2}$ inch in length down to the sap wood. At the end this tunnel is enlarged into a pairing chamber. Two or at times three females pair here with the male. Each female after fertilization tunnels away at an angle from the pairing chamber either to the right or left or in the case of three females pairing with the male the third directly downwards. These tunnels are situated entirely in the wood and may be 2" or more in length.

* For. Bulletin No. 11, 36 (1908). (Superintendent, Government of India Press, Calcutta).

The eggs are laid at the bottom of these tunnels, the grubs on hatching out apparently feeding upon fungi on the walls or on the sap in the tunnel since they make no off shoots in the wood. On May 20th I took 2 pupæ and 3 nearly matured beetles in one such tunnel. At this period the beetle was also taken on the wing in the forest and found tunnelling into large green sál trees which had been felled only four days previously. There are two and perhaps more generations in the year.

Phloeosinus minor, sp. n.

Smaller than **major**. Short, compact, convex, dull brown, with a largely developed hood-like reddish brown prothorax.

Head small, dull brown, hidden beneath prothorax, punctate.

Prothorax convex, slightly wider than long, closely squamose punctate behind, more open in front.

Elytra black, convex, rounded, truncate behind; a little more than $1\frac{1}{2}$ time as long as thorax; longitudinally striate-punctate, punctures few. Under surface black, shining; legs brownish. Length 3.9 millim.

Differs from **major** in smaller size, different shaped thorax with no diskal peak and the squamose surface of thorax.

This amplifies the description given of this insect in *Some Assam Sál Insect Pests*.*

Patria.—Goalpara Sál Forests, Assam.

Life History.—This small Scolytid infests newly felled green sál trees and probably standing sickly ones. A generation of the beetles is to be found on the wing in the Sál forest in the middle of May. Beetles were taken at this period tunnelling down into the sap wood of sál trees felled but three days previously, the little cylinders of saw dust ejected from the entrance hole in the bark indicating the presence of the insect in the tree and easily distinguishable from their smaller size from those ejected by **major**. I have no further notes upon the life history of this insect.

Scolytus, Geoff.

Although this is a very widely distributed genus I cannot find that any members of it have been described from the Indian Region. The genus is well known to the Forester in Europe where **Scolytus destructor** of the Elm form a classical example of the damage done by individuals of the group. Species have also been described from North and South America, Java, Cuba, Siberia and Japan. In his **Synopsis**† Chapuis deals with 22 species from various parts of the world but none of them are from the Indian Region. From Japan some seven species have been described, one by Chapuis, five by Blandford‡ and a seventh recently by Strohmeyer.§

In *Departmental Notes*|| I have popularly described three species from the North-West Himalayan Coniferous Forests. These descriptions will be amplified here. The

* Op. Cit. p. 37.

† Synop. des Scolyt. (1869).

‡ The Rhynchophorous Coleoptera of Japan, Pt. III, Scolytidae. Trans. Ent. Soc., Lond., Pt. I, 77 (1894).

§ Neue Borkenkäfer (Ipidæ) aus dem westlichen Himalaya, Japan und Sumatra. Ent. Wochenbl. XXV, 69, Jahrgang (1908).

|| Depart. Not. Ins. For., pp. 45, 207, 220 (1902-05). (Superintendent, Government Printing, Calcutta).

genus would not appear to be widely distributed in the Indian Region. In spite of careful investigation during extensive tours throughout the length and breadth of the Region I have only taken the three species here described, all infesting the Deodar. This latter point alone is of great interest since the Japanese species (as also of course the European) appear to only infest broad leaved trees. In the Western Himalaya the genus therefore resembles its North American confrères as regards its food plant, since many of the latter infest conifers.

Scolytus major, sp. n.

Black, shining, elytra dark red brown.

Front of head flat, impressed over mouth; a faint median elevate longitudinal line on front, which does not reach the mouth or vertex, bounded on either side by an area very finely longitudinally striate; rest punctate, punctures finer on vertex; a shallow depression medianly on vertex just above basal margin.

Prothorax constricted and impressed on anterior lateral margin; very smooth and shining except for a rather thickly punctate and slightly rugose area behind anterior margin, this punctured area stretching down diagonally on either side and being intercepted medianly by a narrow longitudinal smooth space, a prolongation from the smooth area on disc. The whole of the latter finely pitted the punctures rather scattered and more abundant laterally; a few longish scattered hairs laterally in anterior portion.

Elytra impressed medianly at base, slightly narrowed behind, the outer margins of apical fourth finely serrate, apices separately rounded; striate punctate, the striæ not prominent and punctures shallow not very conspicuous and confluent at apices; covered with irregular scattered hairs, most abundant laterally.

Abdomen with anterior margin of 1st segment prominent and produced forwards and thickened, rugose, shining, 2nd segment concave, 3rd and 4th with a small lateral tubercle on posterior margin, 5th flat, apical edge incurved medianly. Legs brown to blackish. Antennæ and tarsi rufous brown.

Long. 4.25 to 4.5 millim.

I place this species near Blandford's Japanese **esuriens**.

This Scolytid is very briefly described under **Scolytus** sp. in my *Departmental Notes*, I., p. 45.

Egg.—Spherical, yellow and shining, 0.8 millim. in size.

Larva.—A curved white legless corrugated grub with a yellow head; body segments taper posteriorly. Length 5.1 millim. On first hatching out it is a minute white dot. The curved shape is recognisable by the time it has bored about $\frac{1}{4}$ th inch of its gallery.

Pupa.—White, of ordinary Scolytus beetle shape.

Patria.—North-West Himalaya. I have taken this insect plentifully in the deodar areas in Tehri Garhwal, Jaunsar, Simla District and in the Bashahr and Chamba States.

Life History.—The insect passes the winter either as a larva at the end of its gallery in the tree or as a mature beetle in the thicker bark of deodar trees.

The first generation of beetles appears usually about the end of April (in years of warm winters it may appear at the end of 1st week in April). The beetles apparently pair outside the tree. The female then bores down through the bark until she reaches the sap wood and then eats out a zig-zag egg gallery in the bast parallel to the long axis of the tree; this gallery is from 2 to 3 inches in length and takes about 5 days to make. On either side of this egg gallery she eats out small indentations and lays an egg in each, the number being approximately the same on either side and totalling 70 to 80. The young larvæ hatch out in about 2 days, those from the eggs laid first hatching out whilst the female is still at work on the construction of the upper part of the tunnel, and at once commence to bore out a gallery which trends away from the egg gallery, the direction being at right angles about centre of the egg gallery and up or down according as the larvæ are from eggs laid in the upper or lower part of the egg gallery. These larval galleries serpentine, groove both bast and sap wood, and are about $2\frac{1}{2}$ to $3\frac{1}{4}$ inches in length. When full grown the larvæ enlarge the end of the tunnel and pupate. On maturing the beetles bore through the bark and escape.

The method of egg laying and the feeding of the larvæ result in the plan of the galleries of this insect forming a very regular ellipse in the bark and sap wood from which the presence of the beetle is easily recognized.

The insect passes through about four and in favourable years a partial fifth generation in the year, the period from egg to mature beetle being approximately two months.*

Scolytus minor, sp. n.

Smaller than **major** which it greatly resembles, the elytra usually darker in colour to nearly black.

The front of head presents differences. In the female there is no median longitudinal line or striate area or median depression near basal margin on vertex; the front is uniformly and rather coarsely rugose (at times almost tuberculate), except on vertex which is punctate; a few yellowish hairs over mouth.

Prothorax constricted and rounded anteriorly, the thickly rugose and punctate area on the anterior margin broader than in **major** and not interrupted by a longitudinal median smooth area, the disc less shining than in **major** and the punctures finer and more numerous. Elytra differ from **major** in having the punctations not confluent and very much smaller; they are more regularly spaced but wider apart in the rows, becoming finer apically; the serrate margins of apical fourth are more marked.

The 1st segment of abdomen less rugose punctate than in **major**, the posterior margins of 3rd and 4th segments thickened throughout their entire length without a median or posterior tubercle. Long. 2.5 to 3 millim.

Save in size and the appearance of the front of the head and the disposition of the punctures on the thorax this species is scarcely distinguishable from **major**. The difference in size and the other points of divergence appear however to be constant.

This insect was briefly described in Departmental Notes, Vol. I, page 207.

* For fuller description vide my Departmental Notes, I, pp. 45, 203.
Also, the Bark-boring beetle attack in Simla Catchment Area, For. Pamphlet No. 2, For. Zool. Series No. 1. Superintendent, Government Printing, Calcutta (1908).

Larva and Pupa.—Only differ in size from those of **major**.

Patria.—North-West Himalaya. The distribution so far as at present known is the same as that of **major**.

• **Life History.**—The observations so far carried out on the life history of this insect would seem to show that its habits are very similar to its larger confrère **major** with whom it is often found in the Deodar, the only conifer it is known to infest in the Indian Region. It is apparent however that it more readily attacks young seedlings and saplings and the upper parts only of larger poles and old trees. The egg and larval galleries are shorter and the number of eggs laid from 40 to 50.

Scolytus deodara, sp. n.

Intermediate in size between **major** and **minor**. Black, moderately shining elytra and legs tinged with rufous brown. Antennæ yellowish brown, tarsi yellow.

Head differs from **minor** in being thickly striate behind the eye with close set vertical striæ which are produced down on to the ventral surface.

Prothorax not longer than broad, not so thickly punctured as on head, the punctures lighter and fewer posteriorly.

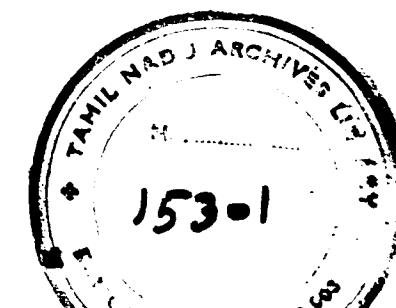
Elytra rather thickly striate punctate and sparsely covered with golden-yellow hairs more especially on their lateral portions as are also thorax and head. Under surface moderately shining. Long. 3.2 to 3.5 millim.

This species was briefly described in my Departmental Notes, Vol. I, page 220.

Larva.—When newly hatched the larva is a minute white circular ball.

Patria.—North-West Himalaya. I have taken this insect in the same areas as **S. major** and **S. minor**.

Life History.—Although careful examination is required to separate this species from its two confrères above described its life history indicates that it is an entirely distinct species. It infests the deodar (*Cedrus deodara*) but in a totally dissimilar manner to the other two insects. Instead of tunnelling into the bast of the tree to eat out an egg gallery the female beetle girdles a green branch, which may have a diameter of as much as $\frac{3}{4}$ inch and may be the leader of a young sapling or a side branch of the latter or of a large tree, and lays her eggs in that portion of the branch close above the girdle. There are two generations of the insect in the year the females first appearing about the middle to third week of June. The girdle is carried round the branch in a wonderful symmetrical manner so that the two ends eventually almost exactly meet and it is eaten down deep through the bark and bast till it grooves the sap wood all round, the object being that the branch should slowly wither and die and thus afford a supply of slowly drying bast for the young grubs to live upon. Little nicks are eaten out in the upper edge of the girdle, as many as eight in number, and an egg laid in each. I have not ascertained whether this number is the maximum laid by the beetle but it is not unlikely that the female may girdle more than one branch in her egg laying operations. The larvæ on hatching eat out small serpentine galleries, each separate and distinct, straight up the branch away from the girdle about $1\frac{1}{2}$ to 2 inches in length and pupate in the sap wood when full grown; the beetles on maturing eat their way through the now dead bark of the branch and escape from the tree. The attack is easily distinguished as owing to the deep groove cut by the beetle



the branch soon bends over from its own weight and hangs down, the needles slowly turning yellow.

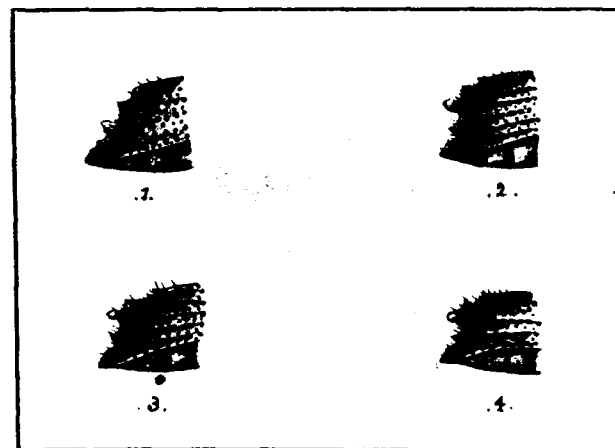
Another generation of the females girdles the branches in October.

Tomicus, Latr.

Blandford records* the fact that this genus appears to be poorly represented in Japan but admits that there may perhaps be other species to be discovered. Although the genus may not prove to be rich in species in the Himalayan Ranges in the Indian Region it would appear to be widely and I think abundantly spread throughout the rest of the area. The two species taken by Lewis in Japan from the larch and *Pinus massomana* respectively were identified by Blandford as the European *Tomicus cembrae* and *T. angulatus*. In his *Tomicinorum*† Eichhoff describes no species of the family from India.

I have already published‡ accounts of the life histories of four new species from the Indian Region with rough popular descriptions of the insects themselves. The insects alluded to are *Tomicus* sp. (here described as *T. Ribbentropi*) from the blue pine and spruce, *Tomicus longifolia*, from the *Pinus longifolia*, *Tomicus shoreæ* and *Tomicus* sp. (here described as *T. assamensis*) from the sál tree *Shorea robusta*. I give here technical descriptions of these four species and add another *T. Blandfordi* taken from the chilgoza pine (*Pinus Gerardiana*) by Captain James, I.A., in Zhob.

The genus is a difficult one to deal with since the species have a most remarkable superficial resemblance to one another. The 3 larger species described here are very like *typographus*. Well marked differences are however present in the elytral teeth as shown in the figures 1 to 4.



Side views of the declivous portion of the elytra of several species of *Tomicus* showing the differences in the size and position of the teeth.

FIG. 1.—*Tomicus typographus*, Linn.

FIG. 2.—*Tomicus Ribbentropi* sp. n.

FIG. 3.—*T. longifolia* sp. n.

FIG. 4.—*T. Blandfordi* sp. n.

* Op. Cit. 89 (1894).

† Eich. Rat. Descr. Tomici (1878).

‡ Depart. Not. Ins. 225, 232. *Ass. Sal. Ins. Pes.*, For. Bull. No. 11, 39 (1908).

Tomicus Ribbentropi, sp. n.

(Fig. 2).

♀.—Oblong, shining, black. Antennæ and legs piceous brown.

Head smooth, shining on vertex with a few scattered fine punctures. Front flat, roughly granulate punctate, usually without tubercle, in some cases with a small median pit or depression or with two very small tubercles placed transversely and medianly, the tubercles either minute and sharp or merely slightly raised rounded elevations; a few long yellow hairs on the lower lateral margin.

Prothorax rounded in front, slightly wider behind than in front, one-fifth less wide than long; strongly rugose punctate in anterior two-thirds; posterior third smooth and shining with a few very scattered and fine punctures, or the punctures very fine but more numerous; rather densely set with long stiff yellow hairs anteriorly and laterally.

Elytra slightly longer than thorax, striate-punctate, the punctures rather shallow, the interspaces broad and shining, the striæ near the suture most prominent, finer towards the declivity. Truncate posteriorly, the declivous portion concave, dull, sometimes slightly shining and finely punctate towards bottom; the sides furnished with four teeth of which 1 (upper one) is very small and set at a distance from 2, 2 close to 3, larger than 1, 3 largest with a swollen head to it, the swelling not constant as in some specimens, 2 more nearly approximates in size to 3, 4 prominent and sharp, smaller than 3 and set further from 3 than 3 is from 2 on the one side and closer to the lower margin than to 3; the declivity more abrupt than in *typographus* (cf. figs. 1, 2). Elytra laterally and edges of declivity fringed with long yellow spiny hairs.

Under surface black, but slightly shining, punctate, with a scattered longish yellow pubescence.

♂.—Smaller than ♀. Red brown in colour and more pubescent.

The prothorax is less convex medianly, more highly granulate anteriorly.

Elytra with punctures more prominent and apical declivity more sloping.

♀.—Long. 5—5.5; ♂.—4.5 to 4.9 millim.

The absence of the prominent tubercle on the front and the different nature of the teeth on the elytral declivity and its more abrupt slope in ♀ sufficiently distinguished this species from *T. typographus* to which it has close affinities. Its life history and plan of galleries are also different.

A rough description of this insect was published in my Departmental Notes, Vol. I, page 225.

I name this insect after Mr. Berthold Ribbentrop, C.I.E., a former Inspector General of Forests to the Government of India, in recognition of his great interest in the study of Forest Zoology.

Larva.—White, curved, legless, with a yellow head and greatly developed thoracic segments.

Pupa.—White with ordinary beetle shape.

Patria.—North-West Himalaya Forests (Jaunsar, Tehri Garhwal, Simla, Bashahr and Chamba States).

Life History.—This beetle is one of the chief Scolytid pests of the blue pine (*Pinus excelsa*) and Spruce (*Picea morinda*) in the North-West Himalaya. Trees from the pole stage upwards are attacked, the main trunk and thicker branches being the parts affected.

The male beetle tunnels into the tree early in April and eats out a pairing chamber in the phloem and sap wood. Female beetles from two to five but most usually three in number enter the pairing chamber and after fertilisation eat out egg galleries away from the pairing chamber. Each female makes one such gallery the first taking her gallery upwards parallel to the long axis of the tree, the second downwards, the third upwards and so on. These egg galleries are elongate, from $2\frac{1}{2}$ to 3 inches in length and contain one aeration hole eaten through the bark to aerate the gallery. On the right and left of the gallery but chiefly to right the female eats out small notches and lays an egg in each, 20 to 30 being laid by each female.

The first larvæ hatch out before the female has finished egg laying and commence to eat out winding galleries which have a general direction at right angles to the egg gallery. The larvæ feed in the phloem only although the egg galleries groove deeply the sap wood. The period of each generation from egg to fully developed beetle is about two months, the first generation of beetles appearing some time in June, a second towards end of August, a third in October and there will be a partial 4th generation.

***Tomicus longifolia*, sp. n.**

(Fig. 3.)

♀.—Smaller than *Ribbentropi*. Vary dark ferruginous brown to black with rufous brown longish hairs scattered irregularly over thorax and elytra.

Head smooth moderately shining, finely punctate, the punctures becoming confluent as they approach front. Two short raised longitudinal lines enclosing a narrow elliptical area on vertex medianly, the lines joining and running down front in a single narrow serpentine channel which broadens out into a longitudinal depression occupying most of lower part of front but not meeting anterior margin. A prominent tubercle surmounted by a tuft of hair on the inner side of the eye and two smaller ones, 1 placed on outer upper edge of median channel, 2 slightly posteriorly and laterally to 1. Front roughly rugose punctate. A fringe of yellow hairs above and below mouth.

Prothorax strongly rugose punctate in anterior half the rugosities merging into transverse striæ medianly. Basal half of disc smooth and shining medianly with scattered moderately large punctures laterally. Sides of thorax clothed with stiff yellow hairs.

Elytra smooth shining, striate punctate, the punctures larger than in *Ribbentropi*, evenly arranged in parallel rows from base to commencement of declivity; interspaces broad smooth and shining. Declivity concave, dull, the lateral edges and base lighter brown shining and finely punctate; the lateral margins armed with four teeth which differ in size and position from those of *Ribbentropi* as follows:—1

[26]

small sharp and prominent and set at a greater distance from 2 than in *Ribbentropi*, 2 and 3 placed close together on a bulging prominence of the margin, of nearly equal size, save that 3 has its apex enlarged into a spade-shaped club with a constriction at its base, 4 smaller than 2 or 3, prominent, sharp, and set midway between 3 and the lower margin (fig. 3). Elytra clothed with stout spiny yellow hairs.

Under surface smooth shining punctate, fairly thickly clothed with long yellow hairs save on metathorax medianly.

♂.—Smaller than female, yellowish brown. Head more constricted anteriorly than in female, vertex smooth, shining, punctate; a transverse depression across upper part of front below which the surface is irregularly raised into tubercular projections which are punctate. The rugosities on the prothorax are finer in the male than in the female and the elytral declivity has a broader lighter coloured and more shining margin than in ♀. The position of teeth and pubescence is the same as in female.

Long. ♀ 4.95 to 5.2; ♂ 4.35 to 4.6 millim.

This insect is easily distinguishable from *Ribbentropi* by its smaller size, the difference in the apical teeth and punctation of elytra and the different appearance of front of head.

Larva and Pupa—Are very similar to those of *Ribbentropi*.

Patria.—The *Pinus longifolia* tracts of the North-West Himalaya. I have taken the insect in Kumaun, Tehri Garhwal, Jaunsar and Chamba.

Life History.—The life history of this insect resembles to some extent that of *Ribbentropi* but varies in important particulars. In the pairing chamber made by the male four females are normally fertilised, two taking their tunnels in an upward direction parallel to the long axis of the tree whilst the other two bore downwards.

The egg galleries are aerated by aeration holes bored through the bark which may be 3 in number but are normally two.

These holes do not pierce quite through the bark but leave a thin lamella of bark between the tunnel and the outside. Twenty to thirty eggs are laid on either side of the egg gallery, the majority apparently on the side remote from the adjacent egg gallery of the other female. It is probable that the insect passes through four complete generations in the year and a partial fifth or even a complete fifth at the lower elevations at which the broad leaved pine is found. At the upper limit of the tree's growth where it is found in mixture with blue pine, here at its lowest limit, it is possible that the number of generations passed through during the year by these two tomicids are approximately the same.

***Tomicus Blandfordi*, sp. n.**

(Fig. 4.)

Oblong, shining. Head and prothorax black; elytra rufous brown.

Head uniformly rugose punctate on front with two small tubercles placed close together transversely just below the middle and on either side of a short narrow longitudinal depression; a thick fringe of yellow hairs above and below the mouth

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and clothing more sparsely the front. Vertex striate with largish shallow confluent punctures, which become finer and more numerous on the sides.

Prothorax widest in front, convex, most convex medianly; one-fourth less wide than long; coarsely rugose punctate on anterior half, the rugosities transversely acutely lozenge shaped medianly and being replaced by finer punctures on the lateral edges. Posterior half smooth and shining medianly with fine scattered punctures which are closer and thicker on sides. Densely set with fine yellow hairs laterally.

Elytra red-brown, shining, striate-punctate, the punctures large and shallow, becoming confluent medianly just above the declivity, smaller and less well-marked laterally; interspaces broad, smooth, but feebly convex, shining, set with scattered hairs, thicker laterally. Declivity deeply concave, slightly shining, punctate, with a fringe of stiff yellow hairs bordering the suture and an edging of long and short yellow hairs encircling the declivous portion. The teeth are four in number, 1 is very small and far removed from 2 and 3 which are close together and of nearly equal size save that 3 is slightly knobbed, the knob depressed, 4 is quite close to the lower margin instead of being equidistant from 3 and the lower margin as in *longifolia* (fig. 4).

Under surface shining, finely punctate, clothed with long whitish yellow hairs. The front coxæ large, globose and placed close together. Long. 4.75 millim.

The difference in the size and position of the apical teeth is sufficient to distinguish this species from *Ribbentropi* and *longifolia*.

I name this *Tomicus* after Mr. Walter F. H. Blandford, the well-known authority on the family, and to whom, as my Instructor in the Science of Forest Entomology at the Royal Indian Engineering College, Cooper's Hill, I owe a deep debt.

Patria.—Shingar Chilgoza (*Pinus Gerardiana*) forests, North Zhob, Baluchistan.

Life History.—Little is known about the life history of this species. It was taken from beneath the bark of dying Chilgoza trees at Shingar in July by Captain James, I.A., Political Agent, Zhob.

Tomicus shoreæ, sp. n.

Elongate, rather slender with an elongate convex reddish prothorax and dark piceous elytra.

Prothorax 1/5 longer than broad. Moderately strongly rugose punctate anteriorly with a few scattered yellow hairs; finely pitted on posterior portion with irregular, fine, transverse lines and striations.

Elytra irregularly punctate with an ill-defined stria not reaching base and the suture prominent. The apical declivity of elytra furnished with 3 prominent teeth on each side and 3 smaller ones. Some scattered hairs on the surface.

Under surface slightly punctate and sparsely pubescent. Legs and antennæ yellowish-red. Length 3.1 millim.

This amplifies the description given of this insect in *Some Assam Sál Insects*.*

Patria.—Goalpara Sál Forest tracts, Assam.

* For. Bulletin No. 11 p. 39.

Life History.—I have only taken this insect sparingly. Specimens were found on May 16th tunnelling down through the thick bark into the sap wood of the main trunk of a large green Sál tree felled three days previously.

I have no further information on the life history of this tomicid.

Tomicus assamensis, sp. n.

Dark brownish-black. Chief characteristic is the prominent median tooth of the armature of the elytral declivity.

Prothorax longer than broad but shorter than in *T. shoreæ*. Set with transverse scales anteriorly these decreasing in size to centre of disc. Posterior portion finely pitted, the fine irregular lines and striations being absent.

Elytra very irregularly punctate with no prominent striæ. Elytral declivity with the median tooth very prominent curved inwards and larger than the others. Length 2.5 millim.

This amplifies the description given in *Some Assam Sál Insect Pests*.*

Patria.—Goalpara Sál Forest tracts, Assam.

Life History.—I only took one specimen of this insect. It was found on May 16th tunnelling in the bark towards the sap wood of the main stem of a large Sál tree felled three days previously.

I have no further notes on the life history of this insect.

Pityogenes, Bedel.

A well known example of this genus is the European *Tomicus* (*Pityogenes*) *chalcographus*. The genus has some well marked characteristics which definitely distinguish it from *Tomicus*; the prosternum having no intercoxal process, the anterior tibiæ being sublinear and the apical depression of the elytra impunctate.

In 1896 Blandford described† a species from Assam which he named *scitus*. The food plant of this species is considered probably to be the *Pinus khasya*.

Blandford in a later monograph on *Some Oriental Scolytidæ of Economic Importance*‡ alluded to under *Polygraphus* in my first paper on the *Scolytidæ* published in these Memoirs§ has the following note referring to a second species of *Pityogenes*:—

“North-Western Provinces. In bark of dead *Pinus excelsa*. Jaunsar and Deoban (Ind. Mus.)”. “The species sent with the above note belong to the genera *Polygraphus* and *Pityogenes*. The single example of *Pityogenes* is an example of a black species allied to *P. chalcographus* and unknown to me; it is not *P. scitus*, Blandf. The material is however insufficient for a description.”

I have since taken this smaller species very commonly throughout the North-West Himalaya region and also in Zhob in Baluchistan.

I attach to it the specific name *coniferæ* in deference to the fact that the insect infests impartially several of the more important conifers growing in this area such as

* Op. Cit. p. 39.

† Ind. Mus. Not. III, No. I, 63 (1896).

‡ Blandf. On Some Oriental Scolytidæ of Economic Importance. Trans. Ent. Soc. Lond., Pt. IV, 423 (1898).

§ Ind. For. Memr. For. Zool. Ser. I, p. 6.

the Deodar (*Cedrus deodara*), Blue pine (*Pinus excelsa*), Spruce (*Picea Morinda*), Chilgoza pine (*P. Gerardiana*). I have dealt with the life history of this insect in several published monographs.*

It will be noted that the two species of the genus at present known in the Indian Region come from the great mountainous Ranges which from east to west form the northern boundaries and bulwark of the country and that they both infest conifers only.

[The following is Blandford's description of *P. scitus*:—

***Pityogenes scitus*, Blandf.**

Ind. Mus. Not. III. I, 63 (1893).

Blandford states that this species is very closely allied to *Tomicus* (*Pityogenes*) *chalcographus* from which it can be separated only by careful comparison. The chief points of difference as given by Blandford are:—

“The forehead in the female has three strong foveæ with a central space raised, smooth and dull, whereas in *P. chalcographus* the fovea is single and is much nearer the mouth, and the lateral foveæ do not occur.

“The prothorax is generally similar to that of *P. chalcographus* except that it is very slightly narrower anteriorly; the punctures on the posterior half are stronger, closer, and more rugose.

“The interspaces are filled with excessively fine punctures, only visible under a high power, and much closer than the similar scattered punctures in *P. chalcographus*.

“The elytra in the male are testaceous, strongly infusate along the lateral margin, and for the whole of the apical declivity they are slightly narrower and flatter, the apical depression is shorter and more vertical, and the teeth are situated farther back, and closer to each other, and the anterior pair point directly backward instead of obliquely inwards, and their base is longer.

“In the female the elytra are more testaceous yellow (in spirit specimens), sometimes with a distinct dark lateral border; they are slightly flatter and less shining, and the rows of the punctures are not so distinct and regular as in *P. chalcographus*. Antennæ and legs as in the latter species.”]

***Pityogenes coniferæ*, sp. n.**

♀.—Sub-elongate. Black, shining; the elytra often orange or red brown with black basal and lateral edging. Head black with a strongly marked deep square depression on upper part of forehead and two small posterior ones on either side of a post median raised space which is moderately shining and finely punctate.

Prothorax constricted and rounded anteriorly; rugose punctate, the rugosities strongest in the anterior half and increasing in size to a raised central point; from the latter a median, narrow longitudinal smooth shining space runs to base; the rugosities and punctures finer on either side of this smooth space than in the anterior half.

* Stebbing. Dept. Not. Ins. For. Ins., p. 242.
Chilgoz. Bark Beet. Zhob. For. Bulletin No. 3, pp. 8, 14 (1905).

Elytra shining orange brown, base, basal half of suture and lateral edges black; rather flat, the punctures fine and not very close together; the apical depression set with three longitudinally placed blunt teeth the upper ones nearer suture than the outer margin; upper one small and inconspicuous, the next but slightly larger, the apical one more prominent, pointed and placed medianly.

Under surface black with scattered yellowish pubescence; antennæ and legs rufous brown. Long. 2.75 millim.

♂.—The front of head is smooth, flat, without depressions with a transverse raised ridge, thickest medianly, on posterior margin; punctures slightly rugose.

Prothorax slightly shorter and broader than in the female, the rugosities slightly stronger anteriorly and the punctures finer in the basal half.

Elytra dark red-brown or black more shining and more convex than in ♀, the punctures finer and rather scattered, the apical depression longer and less vertical and deeper than in ♀; the three longitudinally placed teeth much longer and sharper, the uppermost smallest, turned inwards; the median one longest set upwards and inwards, the apical one sharp, curved inwards, smaller than the median one. Long. 2 millim.

The size of both males and females varies to a slight extent.

This amplifies the description given of this insect in *Departmental Notes*, Vol. I, p. 242.

Larva.—A minute curved rather corrugated white legless grub with a canary yellow head.

Pupa.—White having the shape of the beetle.

Patria.—North-West Himalaya. Zhob (Baluchistan) and Suliman mountain Chilgoza (*Pinus Gerardiana*) Forest tracts.

Life History.—This little bark beetle infests the Deodar (*Cedrus deodara*), Blue pine (*Pinus excelsa*), Spruce (*Picea Morinda*) and the Chilgoza pine (*Pinus Gerardiana*) in the North-West Himalaya. It also attacks the latter pine in Zhob and neighbouring mountainous Ranges where the Chilgoza pine flourishes as pure forests. I have taken it plentifully in both these regions.

The insect infests young seedlings in every part and the upper branches and tops of larger saplings, poles and old trees.

The male beetle tunnels down through the thin bark and eats out in the sap wood a pairing chamber of about 3 millimeters across. To him enter successively as many as five female beetles. After fertilisation each commences to bore a separate egg gallery which curves away in one direction from the pairing chamber and grooves both bast and sap wood. These five curving egg galleries (at times there is a sixth) give a stellate appearance to the plan of the galleries made by this insect which is readily recognizable and invariably constant. The length of these egg galleries varies, being as much as 13 millimeters in length. The female eats out on the outside curve of the egg gallery small depressions in each of which an egg is laid, usually from 10 to 14 eggs being laid. The larvæ on hatching out usually feed entirely in the bast of the bark and do not groove the sap wood.

The grubs on reaching full growth eat out a small pupating chamber in the sap wood and pupate in this. When the beetle has matured it bores its way out straight through the bark. The plan left in the wood thus consists of the pairing chamber,

the curved egg galleries 5 or 6 in number and a number of small round holes at varying distances from the outside curves of the egg galleries which are the pupating chambers of the grubs.

An examination of small twigs and branches on the ground in a forest will often show that this insect is present in the forest before any examination is made of the standing trees.

The beetle passes through 3 complete and a partial fourth generation in the year. The first generation appears in May and matures about the end of June, a second matures about 3rd week in August, a third about 3rd week in October. The grubs of the fourth either hibernate through the winter or in favourable years the beetles may reach full development and hibernate as such in the tree.*

* For a full history of this insect *vide* Depart. Notes I, p. 243; The Chilgoza Bark borers of Zhob. For. Bulletin No. 3, page 14 (1905).

