

U. S. DEPARTMENT OF AGRICULTURE,
BUREAU OF ENTOMOLOGY.

L. O. HOWARD, Entomologist and Chief of Bureau.

TECHNICAL PAPERS ON MISCELLANEOUS
FOREST INSECTS.

III. A REVISION OF THE POWDER-POST BEETLES
OF THE FAMILY LYCTIDÆ OF THE
UNITED STATES AND EUROPE.

BY

E. J. KRAUS,

Expert Preparator, Forest Insect Investigations.

APPENDIX.

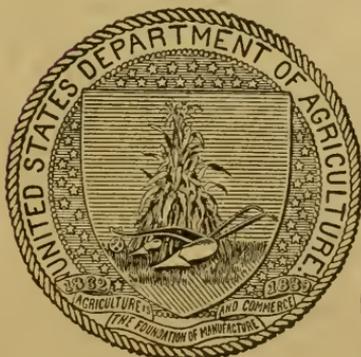
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LIST OF DESCRIBED SPECIES.

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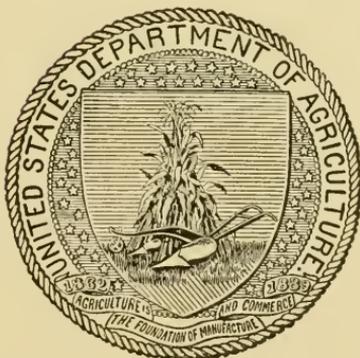
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TECHNICAL PAPERS ON MISCELLANEOUS FOREST INSECTS.

II. A REVISION OF THE POWDER-POST BEETLES OF THE FAMILY LYCTIDÆ OF THE UNITED STATES AND EUROPE.

By E. J. KRAUS,

Expert Preparator, Forest Insect Investigations.

INTRODUCTORY NOTE.

[By A. D. HOPKINS.]

This contribution by Mr. Kraus is based on a study (1) of the material in the forest insect collection and general collections of the Bureau of Entomology and of the United States National Museum and (2) of the types of species described by Doctor Le Conte and Colonel Casey, and of specimens of European species submitted by Mr. Edmund Reitter, of Austria. The family Lyctidæ is represented in North America by certain species which are of special economic importance as causing the injury to seasoned wood products known as "powder post." These species have been the subject of extended investigation by the writer and his associates to determine their habits, seasonal history, and practical methods of control. There has, therefore, been special need of a revision of the group to bring the knowledge of systematic facts up to date and to furnish a reliable basis for working up the biological data.

INTRODUCTION.

Much has been written regarding the members of the family Lyctidæ, especially with respect to their economic importance. There has, however, been considerable doubt as to the correct identity of some of the species, perhaps more especially on account of their enormous variability. In this paper the author has attempted to point out the more prominent specific characters and give something of the range of variation within the species as he has recognized them. For the determination of some of the species he has had occasion to examine a series of several hundred specimens.

Through the courtesy of Col. T. L. Casey, the author has been permitted to examine the types of his species. Mr. Samuel Henshaw, of the Museum of Comparative Zoology at Cambridge, Mass., has kindly permitted him to make a personal examination of the Le Conte types; Dr. Henry Skinner, of the Academy of Natural Sciences, Philadel-

phia, has generously afforded him a like privilege with the Horn collection, and Mr. Edmund Reitter, of Paskau, Austria, has sent him representatives of some of the European species.

In this connection the author desires to express his appreciation of the facilities offered by Mr. E. A. Schwarz, of the Bureau of Entomology, of the valuable assistance rendered by him in the study of the material in the U. S. National Museum, and of his helpful advice in the systematic work, and by Dr. A. D. Hopkins in allowing unlimited use of the large series of specimens and notes of the forest insect collection of the Bureau of Entomology.

HISTORY.

The genus *Lyctus* and allied genera constitute a group which has always been a source of perplexity to systematists, and the opinions as to their relationship have been almost as many and varied as the number of writers who have ventured them, as may in a general way be gained from the following summary:

The first reference to an insect belonging to the present family Lyctidæ was made by Geoffroy (1762), whose description reads thus:

Dermestes oblongus fuscus, elytris striatis. Le dermeste levrier à stries.

The next reference is by Goeze (1777), who described the same insect as *Dermestes linearis*. In 1783 Herbst again described and figured the species as *Dermestoides unipunctatus*. Olivier, first in 1790, and again in 1792, describes it as *Ips oblonga* and gives a very good figure of it. Fabricius (1792) erected the genus *Lyctus* and referred to it 13 species, only one of which, *L. canaliculatus* Fabricius (*linearis* Goeze), belongs to the genus as now recognized. *L. linearis* (Goeze) is therefore the type of the genus. Herbst (1793) erected the genus *Bitoma*, to which he referred his *Dermestoides unipunctatus*, together with three other species. Latreille (1803) placed *Lyctus*, together with *Bostrichus* and several other genera, in the family Xylophages, and in 1807 under the Bostrichini. In 1830 Stephens described another species, *brunneus*, and erected for it the genus *Xylotrogus*, and referred both this genus and *Lyctus* to the Engidæ, to which family Melsheimer (1844) also referred several new species of *Lyctus* and *Xylotrogus* (*Trogoxylon*) described by him. Wollaston (1854), after comparison and dissection, considered *Xylotrogus* as synonymous with *Lyctus* and placed it in the Colydiadæ. Lacordaire (1857) considered *Lyctus*, including *Xylotrogus* Stephens, under the Cissides, but remarked that the forms are in many ways aberrant and not well placed there, especially because of the 5-segmented tarsi. He placed (*Xylotrogus*) *Trogoxylon parallocipedus* Melsheimer in *Pycnomerus* under the Colydiidæ. Mellié (1848), in his monograph of the old genus *Cis*, does not mention *Lyctus*. Thomson (1863), in his sequence

of families, followed the Bostrichidæ with the Lyctidæ, of which he gives the following synopsis:

Caput pone oculos rotundos valde prominulos in collum globosum constrictum; sulcis antennariis nullis; clypeo sutura frontali discreta; mento magno lato. Trochanteres apice fere recta truncato. Antennæ sub tuberculo frontali insertæ, clava 2-3 articulata, compressa, prothoracis basin haud attingentes. Mesopleura coxas intermedias haud attingentia. Coxæ anticæ subglobosæ, parum exsertæ, contiguæ, posticæ marginem elytrorum attingentes, transversæ, parum distantes. Episterna metathoracis linearia, libera. Tibiæ calcari antico uncinato. Tarsi 5-articulati, compressi, articulo 1:0 obsoleto, 5:0 reliquis simul sumtis longiore.

He divided the family into two tribes, Dinoderina and Lyctina, the latter of which he diagnosed thus:

Antennæ 11-articulatæ, clava biarticulata. Labrum transversum, apice emarginato, libero. Coxæ anteriores rotundæ parum, posticæ, latius distantes. Tibiæ externe haud denticulatæ. Acetabula antica oclusa.

Pascoe (1863) described the genus *Minthea* and remarked that in Erichson's arrangement this genus, owing to the position of the coxæ and the large basal abdominal segment, would be placed with *Bothrideres* and *Sosylus* in the Colydiidæ. Redtenbacher (1874) placed *Lyctus* in the Cryptophagides. In 1877 Kiesenwetter, in his revision of the Anobiadæ, divides the family into the Bostrichini, Anobiini, and Ptinini, and again divides the Bostrichini into five groups, Psoini, Sphindini, Lyctini, Bostrichini veri, and Hendecatomini. *Lyctus*, in which he included *Xylotrogus* Stephens, was the only representative of the Lyctini. He further remarked that while this group is related to the Bostrichini it might well be considered as a connection between the Anobiadæ and the Colydii, but that it was widely separated from *Cis* by its mouthparts and the antennal and tarsal structure, and that eventually a separate family might well be erected for it. He probably had not seen Thomson's work. The following year (1878) Reitter published an article, "Beitrag zur Kenntniss der Lyctidæ." He assigned no characters to the family, but referred to it *Lyctus* Fabricius, *Trogoxylon* Le Conte, *Lyctoxyton* Reitter, new genus, and *Lyctopholis* Reitter, new genus (*Minthea* Pascoe), and described several new species. Le Conte and Horn (1883) divided the Ptinidæ into four subfamilies, Ptininae, Anobiinae, Bostrichinae, and Lyctinae. To the Lyctinae are assigned *Lyctus* Fabricius and *Trogoxylon* Le Conte. In 1885 Reitter again gave a synopsis of the European species of *Lyctus* and *Trogoxylon* and assigns them as before to the family Lyctidæ. Casey (1890) described several new species of *Lyctus* under the Ptinidæ, but in the appendix of the same paper referred the genus to his more broadly conceived Cucujidæ, and gave a discussion on its apparent relationship to other families and genera. Lesne (1896-1898), in his revision of the Bostrichidæ, divided that family into four tribes—

Psoinæ, Polycaoninæ, Dinoderinæ, and Bostrychinæ, but made no mention of *Lyctus*. Kolbe (1901) has retained the Lyctidæ as a family and placed it in his Heterorrhabden under the suborder Heterophaga; and Ganglbauer (1903) placed the family between the Anobiidæ and Sphindidæ in his Diversicornia under the suborder Polyphaga. Reitter, in 1906, has the family between the Bostrychidæ and the Anobiidæ.

Without doubt the family Lyctidæ is a valid one, its members possessing characters which will not readily admit of their being placed in any other family. The family Ptinidæ of Le Conte and Horn is a composite one, and the subfamilies Ptininæ, Anobiinæ, Bostrichinæ, and Lyctinæ are deserving of family rank and in fact have already been so treated by European coleopterists. While it is not intended to treat extensively on the exact position of the Lyctidæ, it may be said that the family is apparently most closely allied to the Bostrychidæ, especially by the pentamerous tarsi with the first segment very short, the method and point of insertion of the antennæ, and the only too well-known destructive habits of the larvæ, which bore into the solid wood. The larva possesses three pairs of well-developed prothoracic legs, and in form and structure is scarcely to be distinguished from the bostrychid larva, but is totally different from any scolytid larva to which it has been likened, the resemblance being scarcely even superficial. The mouthparts of the adult *Lyctus* are very similar to those of *Dinoderus*, especially in the structure of the labium, maxillæ, and the broad mentum. The family has very little in common with the Cucujidæ. As pointed out above, the larva is of a wholly different character in form and habits, and the adults, while agreeing in one character or another with those found in certain other genera included by Colonel Casey in his broadly conceived Cucujidæ, have probably derived those characters independently of any real connection with them. The family seems best placed as in the latest (1906) edition of the *Catalogus Coleopterorum Europæ*, i. e., immediately after the Bostrychidæ and preceding the Ptinidæ.

THE PRINCIPAL CHARACTERS OF THE FAMILY LYCTIDÆ.

Mentum large, transverse, corneous; glossa coriaceous, ciliated; palpi with 3 flexible segments.

Maxillæ not exposed at base; galea subchitinous, densely ciliate at apex, more strongly chitinized at base; lacinia subchitinous, fringed with long ciliæ; palpi moderately short, with four rather stout segments.

Antennæ at the sides of the head beneath the produced frontal angles and before the eyes, eleven-segmented, clavate, the club two-segmented and without porous sensitive areas.

Head prominent, constricted behind the eyes; oral organs small; epistoma distinct, labrum distinct.

Prothorax with the episterna and epimera fused; lateral margin distinct or obsolete; coxal cavities rounded, closed behind.

Mesosternum small, surrounding the coxæ anteriorly and at the sides; mesepisternum and mesepimeron not attaining the coxa.

Metasternum long.

Elytra entire, completely covering the abdomen, epipleuræ narrow.

Abdomen with five visible ventral segments, the first ^a always longer than the second.

Anterior coxæ subcontiguous or widely separated, subglobose, moderately prominent; middle coxæ similar to anterior; posterior coxæ widely separated, transverse, subprominent internally, externally grooved for the reception of the thighs.

Legs not contractile, slender; tibiæ slender; tarsi five-segmented, the first segment very short.

SYNOPSIS OF GENERA.

At present but three distinct genera belonging to this family are recognized. They may be separated as follows:

Antennal club with both segments subequal, neither decidedly elongated; pronotum varying in shape from subquadrate with all angles acute to cordate with the angles rounded; elytra punctate, the punctures confused or distinctly seriate; pubescence confused or seriate; anterior tibiæ slender, acutely produced externally; tarsi slender.....*Lyctus* Fabricius.

Antennal club with both segments very strongly elongated, the segments much longer than broad, the terminal one very much narrower than the preceding; sides of head with three hooklike teeth; the prothorax as in *Lyctus* (*Trogoxylon*), the margins, however, clothed with bristles; elytra punctured in not very regular rows, the pubescence, however, scarcely in rows; anterior tibiæ on either side strongly widened into a tooth externally, with a large tooth, straight at the base and hooklike at the apex; tarsi rather slender; claw-segment simple.....*Lyctoxyton* Reitter.

Antennal club with terminal segment elongate, sides of head with three weak teeth at either side; margins of pronotum denticulated and, like the margins of the body, with bristles; elytra striately punctured, with rows of erect bristles. Tibiæ at the outer angle unequal, curved, the anterior widened into a tooth at the apex, with a somewhat large curved spine; tarsal segments short, claw segment strongly clavately thickened, claws simple, rather small; form of body and prothorax as in *Lyctus*.....*Minthea* Pascoe.

REVISIONAL NOTES.

In the foregoing generic synopsis *Trogoxylon* Le Conte has been placed with *Lyctus*, as has been done by Colonel Casey (1891). Le Conte, in separating the genera, did so on the ground that *Trogoxylon* did not have the anterior tibiæ prolonged at the outer apical

^a The first visible ventral segment in the Lyctidæ is the third abdominal sternite. (See Hopkins, Tech. Ser. 17, Pt. I, Bur. Ent., U. S. Dept. Agr., p. 55, fig. 38, 1909.)

angle. As stated by Reitter, later by Casey, and as is easily seen, they are produced and in some species as strongly as in any true *Lyctus*. Reitter in his synopsis states that in *Trogoxylon* the sides of the head are provided with *three* hooklike teeth, that the pronotum has all its angles sharp, and that the elytra are without rows of punctures or hairs, but that these are irregularly disposed. As a matter of fact, *Lyctus (Trogoxylon) impressus* Comolli does have the three elevations mentioned, but in all the species so far recognized in the United States not only the tooth over the eye is obsolete, but the posterior angles and margin of the epistoma are closely joined to the angles of the front, so that the epistoma is but slightly depressed below the level of the front, and the two elevations seen in many species of *Lyctus* are not traceable—a character also observable in *L. (Xylotrogus) politus* n. sp. The shape of the pronotum is of little value; in *L. brunneus* Stephens all the angles are acute. The elytral punctures in *L. (Trogoxylon) californicus* Casey are decidedly striate and there is a tendency to the same thing in *L. curtulus* Casey.

The first visible ventral segment in most species which would fall in *Trogoxylon* is as long as the second and third combined, but in others it is not longer than the second and one-half of the third.

Xylotrogus has long since been shown by Wollaston (1854) and other writers to be synonymous with *Lyctus*, and *Trogoxylon* must also be so considered, though it might well be regarded as representing a well-marked subgenus.

The species of the family Lyctidæ are very variable, especially in size. Well-developed individuals are frequently four or five times larger than others, the difference in size perhaps depending largely on food supply; for the offspring of those individuals which have bred in the same piece of wood for four, five, or six generations are very much smaller and quite different in some of the structural details from the first individuals reared. Accompanying the decrease in size are found such changes as in the shape and punctation of the pronotum and the punctation and pubescence of the elytra. As a result, one must allow for much variation within the limits of the species, and characters which might be of specific importance in groups more constant in character can only be held to be individual.

SYNOPSIS OF SPECIES OF THE GENUS LYCTUS.

- Elytral pubescence confused over the entire surface or sometimes in single rows, never in double series separated by wide intervals; apical angles of the prothorax usually decidedly prominent—if not, at least subprominent and the sides of pronotum decidedly convergent posteriorly..... Division I, pages 117–119.
- Elytral pubescence always arranged in distinct series, the series at the sides at least separated by a double row of fine, deep punctures or a single row of large, shallow, circular punctures..... Division II, pages 119–120.

DIVISION I.

- Elytral punctures confused, or somewhat striate, but if so, the series never impressed.
 Subdivision A, pages 117-118.
- Elytral punctures distinctly seriate, the series distinctly impressed.
 Subdivision B, pages 118-119.

SUBDIVISION A. (*Trogoxylon* Le Conte.)

- Head with a distinct tubercle over the eye; pronotum quadrate, with the sides not convergent posteriorly Section a1, page 117.
- Head without tubercle over the eye: pronotum with the sides more or less convergent posteriorly Section a2, page 117.

Section a1.

Length 3 to 4.5 mm.; ferruginous. Pronotum opaque, very densely, evenly punctured; anterior margin slightly trisinate; sides sinuate, scarcely convergent posteriorly; anterior and posterior angles very prominent, right, not at all rounded; median impression narrow, deep near the center of the disk, broadly expanded toward anterior and posterior margins. Elytra subparallel, just visibly wider at base than prothorax, extremely finely, densely, confusedly punctured; pubescence fine, decumbent, confused. Head with front subconvex, densely, evenly punctured; frontal angles very prominent, narrowly rounded; side margins of epistoma forming an acute, slightly reflexed tooth; antennæ slender, club feeble, ovate. Abdomen slightly shiny below, excessively minutely punctured.

Section a2.

impressus Comolli, page 121.

- Pronotum broader than long, the vestiture very short, coarse, and bristling; prosternum distinctly punctured throughout Subsection b1, page 117.
- Prothorax as long or longer than wide anteriorly, the pubescence rather long, fine, and decumbent or subdecumbent; prosternum not punctured or but very feebly so near its side margins Subsection b2, page 117.

Subsection b1.

Length 3 mm.; body nigro-piceous, short, broad, stout, subconvex, densely clothed with short, stiff bristles. Prothorax feebly shiny; side margins strongly convergent posteriorly; anterior margin broadly rounded; punctures large, deep, more dense posteriorly; median impression shallow, broad; pro-episternal area coarsely, distinctly punctured. Elytra broad, shiny, subparallel, densely, coarsely punctured, the punctures feebly seriate. Head with front subconvex, densely, evenly punctured; epistoma slightly depressed, side margins scarcely reflexed, with a dense fringe of coarse bristles, which also occur on the angles of the front; antennæ stout. Abdomen subopaque below.

punctatus Le Conte, page 121.

Subsection b2.

- Elytral punctures in distinct series; epistoma with side margins strongly reflexed.
 Series c1, page 117.
- Elytral punctures confused, without distinct serial arrangement; epistoma not reflexed at sides Series c2, page 118.

Series c1.

Length 2.2 to 2.5 mm.; very slender, parallel, compressed, castaneous throughout, strongly shining. Prothorax with side margins rather strongly convergent posteriorly; anterior margin strongly arcuate; anterior angles strongly rounded,

posterior obtusely rounded; median impression very broad and shallow; punctures coarse, rather dense, sparser and finer anteriorly. Elytra elongate, the punctures small and arranged in distinct series, becoming confused toward suture and base, the pubescence sparse and recumbent. Head with front scarcely convex, densely, finely punctured; epistoma depressed, side margins strongly reflexed; antennæ slender. Abdomen shiny below, densely, exceedingly finely punctured..... *californicus* Casey, page 121.

Series c2.

Length 2 to 4 mm.; elongate, rather slender, ferruginous to nigro-piceous. Prothorax with side margins strongly convergent posteriorly; anterior margin strongly trisinate; anterior angles acutely rounded; posterior right, not at all rounded; median impression very shallow, broad, deeper posteriorly; punctures fine and dense. Elytra subparallel, slightly narrowed posteriorly; punctures very fine, dense, confused; pubescence yellowish, fine, and dense. Head with front subconvex, finely, densely punctured, the pubescence very short, reflexed at the sides; antennæ slender, the club large and prominent. Abdomen subopaque below, densely, coarsely punctured..... *parallelopipedus* Melsheimer, page 121.

Length 2.7 to 3.3 mm.; stout, comparatively broad, castaneous to nigro-piceous. Prothorax with the sides slightly convergent posteriorly; anterior margin broadly rounded or faintly trisinate; anterior angles acutely rounded; posterior obtuse and blunt; median impression broad, rather deep, more so posteriorly; punctures coarse and dense, less so anteriorly. Elytra stout, slightly narrowed toward the base; punctures coarse, dense, faintly, subseriately arranged toward sides; pubescence rather coarse, sparse, decumbent, and arranged in faint series. Head with front convex, densely, subrugosely punctured, the pubescence short and fine; epistoma nearly flat, coarsely punctured, side margins very faintly reflexed; antennæ stout, the club robust, small, oval. Abdomen polished below, extremely finely and sparsely punctured..... *cutulus* Casey, page 122.

SUBDIVISION B. (*Xylotrogus* Stephens.)

Length 2.5 to 3.5 mm.; castaneous throughout. Pronotum shiny, strongly punctured posteriorly, the punctures becoming very small or obsolete anteriorly; side margins strongly sinuate; anterior angles very broadly rounded. Elytra with the sides nearly parallel; stria punctures fine, close-set, confused near suture; interspaces flat; pubescence fine, decumbent, sparse. Head with front densely, evenly punctured, feebly shiny, scarcely impressed before the eyes; epistoma convex, finely punctured, not at all elevated at lateral margins.

politus n. sp., page 122.

Length 3 to 5 mm.; rufo-fuscous throughout. Pronotum subopaque; side margins nearly straight, densely, finely serrulate and strongly convergent posteriorly; anterior angles acute, slightly prominent, blunt, but scarcely rounded; punctures more dense posteriorly, finer, not becoming obsolete anteriorly. Elytra with the sides nearly parallel; stria punctures fine, impressed; interspaces, especially toward sides, subconvex; pubescence fine, decumbent. Head with front densely, rather coarsely punctured, convex, strongly impressed at the sides before the eyes; epistoma subconvex, its anterior angles distinctly elevated.

brunneus Stephens, page 123.

Length 4.5 to 5 mm.; rufo-testaceous, head and prothorax piceous. Pronotum opaque, punctato-scabrous; anterior margin very broadly curved; side margins feebly sinuate, rather strongly convergent posteriorly; anterior angles subprominent, obtuse, very broadly rounded, posterior obtuse, not rounded; median impression merely a narrow, feebly impressed furrow extending from near anterior

margin to posterior margin. Elytra shiny, subparallel, a little broader than prothorax; punctures large, distinct, deep, circular, strongly seriate, the series impressed; interspaces slightly convex; pubescence fine, sparse, seriate. Head with front convex, opaque, densely, rugosely punctate; epistoma strongly depressed, not at all elevated at the sides; antennæ stout, the club large, elongate oval..... *pubescens* Panzer, page 123.

DIVISION II.

Elytral striæ composed of a double or sometimes a single row of fine, elongate, deeply impressed punctures.....Subdivision C, pages 119-120.

Elytral striæ each composed of a single row of large, shallow, circular punctures.

Subdivision D, page 120.

SUBDIVISION C.

Prothorax anteriorly distinctly narrower than the elytra at base.

Section a3, pages 119-120.

Prothorax fully as wide anteriorly as the elytra at their base....Section a4, page 120.

Section a3.

Pronotum distinctly longer than wide, its anterior angles not at all prominent, very broadly rounded; median impression merely a narrow, faintly impressed groove from anterior to posterior margins; elytral interspaces frequently subconvex, especially toward sides.....Subsection b1, page 119.

Pronotum quadrate or subquadrate; anterior angles distinct, subprominent but not acute; median impression large, broadly oval, deep; elytral interspaces not at all or but feebly convex.....Subsection b2, pages 119-120.

Subsection b1.

Length 2.1 to 4 mm.; castaneous. Pronotum opaque, punctato-scabrous; anterior margin broadly rounded; side margins straight or slightly sinuate and convergent posteriorly; anterior angles subobsolete; posterior sharp, everted. Elytra slightly narrowed toward base; interspaces toward the sides feebly to rather strongly elevated; punctures coarse, elongate, and in double series between the interspaces; pubescence fine, short, dense, decumbent. Head with front strongly convex, densely punctured and granulose; epistoma narrow, depressed, side margins strongly divergent posteriorly, anterior deeply emarginate, its anterior angles not elevated; antennæ slender, the club stout, narrowly oval. Abdomen subopaque below, densely, finely, granulately punctured.

opaculus Le Conte, pages 123-124.

Subsection b2.

Length 3 to 5 mm.; ferruginous, head and prothorax slightly darker. Pronotum opaque, punctate, scabrous; anterior margin broadly rounded; side margins nearly straight, finely denticulate, acute, parallel or very faintly convergent posteriorly; anterior angles subprominent, obtuse, blunt; posterior angles right, prominent, not rounded; median impression broadly oval, deep. Elytra subparallel, scarcely narrower anteriorly, convex but not more noticeably so at their middle; stria punctures very fine, elongate, arranged in single or sometimes in double series, especially toward sides; pubescence seriate, fine, sparse, decumbent. Head with front strongly convex, opaque, densely punctato-granulate, sides slightly elevated over the eye; epistoma strongly depressed, narrow, its anterior angles not elevated; antennæ stout, the club strong, oval. Abdomen subopaque below, densely, finely punctured...*suturalis* Faldermann, page 124.

Length, 3.5 to 4.5 mm.; ferruginous. Pronotum shiny, rather densely, but not at all scabrous or rugosely punctured, the punctures smaller and less dense anteriorly; median impression broadly oval, deep, not approaching anterior margin; anterior margin broadly rounded, sides parallel, straight or faintly sinuate; anterior angles obtusely rounded; posterior angles right, prominent, not at all or very feebly rounded. Elytra broad, distinctly narrowed toward base, more strongly convex at about their middle; interspaces not at all elevated; punctures very fine, elongate, seriate as in *opaculus*; pubescence of medium length, fine, decumbent, strongly seriate in arrangement. Head with front strongly convex, smooth, shiny, evenly but not densely punctured; epistoma depressed, its anterior margin broadly emarginate, the anterior angles elevated and with coarse pubescence; antennæ very slender, the club weak, narrowly oval. Abdomen feebly shiny below, exceedingly finely, densely punctured.

caricollis Le Conte, page 124.

Section 44.

Length, 2.5 to 5.5 mm.; black. Pronotum shiny, rather densely but not at all rugosely punctured, median impression broad, shallow, narrow from posterior margin to middle, where it becomes broadly, gradually expanded to the anterior margin, rarely deep, suboval and scarcely expanded anteriorly; anterior margin broadly rounded; side margins strongly arcuate and convergent posteriorly or nearly straight and subparallel; anterior angles broadly rounded, not at all prominent, posterior obtuse and feebly rounded or subrectangular and sharp. Elytra elongate, convergent toward base, the interspaces flat or just visibly convex; punctures very fine, seriate as in *opaculus*; pubescence fine, sparse, decumbent, distinctly seriate. Head with front strongly convex, densely, subrugosely punctured; epistoma depressed, anterior margin broadly emarginate, anterior angles not elevated; antennæ stout, club prominent; abdomen shiny below, densely, finely punctured. *planicollis* Le Conte, pages 124-125.

Length, 2.4 to 4.7 mm.; black. Pronotum opaque, punctato-scabrous; median impression reduced to a shallow, narrow line from anterior to posterior margin; anterior margin very strongly, broadly arcuate; side margins strongly curved and convergent posteriorly; anterior angles very broadly, obtusely rounded; posterior angles obtuse, not rounded. Elytra narrowed toward base; interspaces noticeably convex; punctures coarse, narrow, elongate, deep, seriate; pubescence fine, sparse, seriate. Head with front strongly convex, scabrous; epistoma small, depressed; anterior margin broadly emarginate; antennæ slender, club strong, compact, oval. Abdomen subopaque below, very densely, finely punctured.

parvulus Casey, page 125.

SUBDIVISION D.

Length 2.5 to 5 mm.; ferruginous. Pronotum opaque; surface very finely granulate and pubescent; median impression oval, deep, extending from anterior fourth to posterior fourth and thence very narrowly to posterior margin; anterior margin strongly arcuate, sides straight or feebly sinuate, not at all or but scarcely narrowed behind; anterior angles obtuse, broadly rounded; posterior angles right, not at all rounded. Elytra just visibly narrowed toward base; interspaces flat; punctures shallow, circular, arranged in single series except at costal border, where they are in double series; pubescence sparse, fine, decidedly seriate in arrangement. Head with front strongly convex, side margins distinctly elevated over the eye, densely, finely granulate-punctate; epistoma narrow, its anterior margin broadly, deeply emarginate; anterior angles not elevated; antennæ slender, noticeably pubescent, club large and prominent. Abdomen feebly shiny below, densely, finely punctate. *linearis* Goeze, pages 125-126.

SYSTEMATIC NOTES.

Genus LYCTUS Fabricius.

Lyctus Fabricius, 1792, p. 502.

Xylotrogus Stephens, 1830, pp. 116-117.

Trogoxylon Le Conte, 1861, p. 209.

***Lyctus impressus* Comolli.**

Lyctus impressus Comolli, 1837, pp. 40-85; Seidlitz, 1875, p. 160; Erichson, 1877, p. 17.

Trogoxylon impressus (Comolli) Reitter, 1885, p. 100.

This species is the largest of the *Trogoxylon* group which the author has seen. It is very distinct in the quadrate prothorax and in the possession of the three elevations at the sides of the head, one over the eye, another just before it at the frontal angle, and another at the lateral angle of the epistoma.

Material examined.—A series of 5 specimens, very constant in character, except in size. The species occurs in southern Europe, but has not as yet been recorded from the United States.

***Lyctus punctatus* (Le Conte).**

Trogoxylon punctatum Le Conte, 1866, p. 104.

Lyctus punctatus (Le Conte) Casey, 1891, pp. 13, 16.

This species is easily known by its short, broad form, coarse punctation of the pronotum and elytra, and the stiff, short, almost squamose pubescence.

Material examined.—A single specimen from Santa Rosa, Lower California, and Le Conte's type, which is from Cape San Lucas, Lower California.

***Lyctus californicus* Casey.**

Lyctus californicus Casey, 1891, p. 14.

This species is readily recognized by its elongate, highly polished body, and by the finely but definitely striated punctures of the elytra, the pubescence of which is fine and sparse. It is easily distinguished from *L. curtulus*, to which it is probably most closely allied, by its more slender, parallel, elongate form, finer elytral punctures, and other minor details. There is some variation in size and density of color, but other characters are quite constant.

Material examined.—A series of 5 specimens from Santa Rosa, Lower California. Colonel Casey's specimens are from Fort Yuma, Cal.

***Lyctus parallelopedus* (Melsheimer).**

Xylotrogus parallelopedus Melsheimer, 1844, p. 112.

Trogoxylon parallelopedum (Melsheimer) Le Conte, 1861, p. 209; Le Conte and Horn, 1883, p. 229.

Lyctus parallelopedus (Melsheimer) Casey, 1891, p. 13.

Most readily recognized by the very finely, densely, confusedly punctured elytra, with the pubescence long, dense, fine, and decumbent, and the margin of the prothorax strongly trisinate.

There is great variation in size, as usual. The side margins of the prothorax are generally straight, sometimes slightly curved inward, and the prothoracic punctures are generally fine.

Material examined.—A series of more than 100 specimens. Distributed throughout the eastern and southeastern United States.

***Lyctus curtulus* Casey.**

Lyctus curtulus Casey, 1891, p. 15.

One of the smaller species, easily separated from *parallelopipedus* Melsheimer by its coarse elytral punctation, average smaller size, and prothoracic structure, and from *californicus* Casey by its much shorter, robust form, denser elytral pubescence, coarser and less sinuate arrangement of elytral punctures, and in being much less shiny.

There is considerable variation, more especially in size and coloration, and likewise in the density and size of the prothoracic and elytral punctures, in the convergence of the sides of pronotum, in the situation of its anterior margin (the latter sometimes becoming feebly trisinate), and in the degree of depression of the epistoma. A single specimen from Bonner, Mont., differs quite noticeably in several respects from the more typical examples of *curtulus*, and may represent an undescribed species. However, it is placed here until more specimens show it to be distinct.

Material examined.—A series of more than 300 specimens. Distributed throughout the southwestern United States.

***Lyctus politus* n. sp.**

Type.—Cat. No. 7432, United States National Museum; U. S. Department of Agriculture, No. 7414; one of 21 specimens collected and reared by Dr. F. H. Clittenden from licorice at Washington, D. C.

This species is readily separated from *brunneus* Stephens by its much shorter, broader form, more shiny, finely and less densely punctured prothorax, and by the structure of the front as outlined in the synopsis (p. 118).

There is considerable variation in size, and to a less extent in the convergence of the sides of the prothorax posteriorly, and in the pronotal punctation.

It is possible that this species has been already described, but the author has been unable to place it in any of the species of which he has had specimens or descriptions and has, in consequence, described it as being new.

Lyctus brunneus (Stephens).

Lyctus parasiticus Stephens, 1829, p. 94.

Xylotrogus brunneus Stephens, 1830, p. 116, pl. 18, fig. 4; Seidlitz, 1875, p. 160.

Lyctus glycyrrhizæ Chevrolat, 1829-1838, pp. 191-192, pl. 41, fig. 3.

Lyctus rugulosus Montrouzier, 1861, p. 266.

Lyctus brunneus (Stephens) Wollaston, 1854, p. 152; Erichson, 1877, p. 17; Reitter, 1885, p. 100; Reitter, 1906, p. 423.

Lyctus carolinæ Casey, 1891, pp. 13-14.

This species, while allied to *L. politus* n. sp., is readily distinguished by its larger size and coarser structure throughout and more acute anterior angles of prothorax; the epistoma also is more depressed, its posterior angles as in *planicollis* Le Conte. The series of specimens is very constant, except that there is the usual variation in size and color. A single specimen from Philadelphia, Pa., is more slender, the prothorax narrower and more constricted behind, with the sides straight, and the anterior margin more strongly arcuate. It is probably best placed here for the present. A series of 3 specimens from Mr. Reitter shows considerable variations, more especially in the shape of the prothorax, and one individual has the pronotum much more coarsely punctured.

Material examined.—A series of 14 specimens. The species is widely distributed throughout the world.

Lyctus pubescens Panzer.

Lyctus pubescens Panzer, 1793, fasc. 4, fig. 17; Erichson, 1877, p. 16; Reitter, 1878, p. 196; Reitter, 1885, p. 99.

Lyctus bicolor Comolli, 1837, p. 41; Seidlitz, 1875, p. 160.

Lyctus caucasicus Tournier, 1874, p. 412; Reitter, 1878, p. 196; Reitter, 1885, p. 99.

Lyctus pubescens v. *caucasicus* (Tournier) Reitter, 1906, p. 423.

The species is very distinct. It is perhaps more closely allied to *brunneus* Stephens than any other, both in elytral and prothoracic structure, though very distinct from it. It is remarkable in having the prothorax very much darker than the elytra, a character seldom met with in this family.

Material examined.—Two specimens from Mr. Reitter are labeled "Silesia, on Willow." One of them has the prothorax strongly narrowed posteriorly, the other much less, although distinctly so. The species occurs in Europe, but up to the present time it has not been recorded from the United States.

Lyctus opaculus Le Conte.

Lyctus opaculus Le Conte, 1866, p. 103; Casey, 1890, p. 324; Casey, 1891, p. 13.

This species is remarkably distinct and easily separated by the narrow, convex prothorax, the anterior angles being very broadly rounded, the side margins strongly convergent posteriorly, the surface opaque and very densely subrugosely punctured, the median

impression long, shallow, and narrow, and the stria punctures of the elytra deep and coarse.

There is considerable variation, more especially in size, in the acuteness of the posterior angles of the prothorax, in the convergence of its side margins posteriorly, and in the elevation of the elytral interspaces.

Material examined.—A series of 60 specimens. The species is distributed throughout the eastern United States.

***Lyctus suturalis* Faldermann.**

Lyctus suturalis Faldermann, 1837, p. 225; Reitter, 1878, p. 196; Reitter, 1885, p. 99; Reitter, 1906, p. 423.

Lyctus deyrollei Tournier, 1874, p. 411.

This species is related to *linearis* Goeze in prothoracic structure, but is wholly different in elytral structure, resembling, in this respect, *planicollis* Le Conte, though quite different in that for the most part the striae are made up of but a single row of exceedingly fine punctures.

The specimens are quite constant in character, though there is considerable variation in the prominence and roundness of the anterior angles of the prothorax.

Material examined.—A series of four specimens from Mr. Reitter. The species occurs in the Caucasus. Up to the present time it has not been recorded from the United States.

***Lyctus cavicollis* Le Conte.**

Lyctus cavicollis Le Conte, 1866, p. 103; Casey, 1890, p. 324; Casey, 1891, p. 13.

This species is very distinct, and is readily separated from the other species by the shining, narrow, subquadrate, subconvex prothorax with the sides parallel, the posterior angles sharply rectangular, and the form generally stout. It is not closely allied to any other species. It resembles *planicollis* Le Conte in elytral structure, but the prothorax is totally different. There is some variation in size, but the structural details are quite constant.

Material examined.—A series of 25 specimens, all from California.

***Lyctus planicollis* Le Conte.**

Lyctus planicollis Le Conte, 1858, p. 74; Le Conte, 1866, p. 103; Dugès, 1883, pp. 54-58; Casey, 1890, p. 324; Casey, 1891, p. 13.

(?) *Lyctus carbonarius* Waltl, 1832, p. 167.

This species is extremely variable; perhaps more so than any others of the genus. Individuals range in length from 2.5 to 5.5 mm. The prothorax varies from broader than long, with the side margins strongly sinuate and convergent posteriorly, to subquadrate and the sides parallel; it is, however, always as wide anteriorly as the elytra at base, the anterior angles always rounded, the posterior never so.

The pronotum may be densely, evenly punctured over the entire surface, or have the punctures less dense and the surface polished anteriorly, but is never scabrous; the median impression varies from very deep and becoming broadly expanded anteriorly, with a small circular impression at either side, to subobsolete in the smaller specimens.

Whether this species and *carbonarius* Waltl are synonymous the author can not say, since he has not seen Waltl's description. However, he has 2 specimens which Mr. E. A. Schwarz tells him are from Mexico, received through Dr. E. Dugès from Guanajuato. These specimens are probably from among the series on which Doctor Dugès based his "Metamorphoses du *Lyctus planicollis*." They differ in some of the minor details from *planicollis*, more especially in having the pronotal punctures coarser and less dense; and the median impression is deep, oval, and not broadly expanded anteriorly. Should these characters prove constant in a larger series they might well be considered as representing a distinct species, probably *carbonarius* Waltl, very closely allied to *planicollis*.

Material examined.—A series of over 500 specimens. The species is found widely distributed throughout the entire United States at least.

***Lyctus parvulus* Casey.**

Lyctus parvulus Casey, 1884, p. 175; Casey, 1890, p. 325; Casey, 1891, p. 13.

This species is remarkably distinct and is separated at once from the other species by the broad cordate prothorax and its dense, coarse, subrugose punctation.

There is great variation in size and to a less degree in the shape of the prothorax and in the acuteness of the posterior angles. In general form it resembles *planicollis* Le Conte, but in structural details resembles *opaculus* Le Conte. It is readily separated from either, and is far removed from *linearis* Goeze, with which species it has very little in common.

Material examined.—A series of about 50 specimens. Distributed throughout the western and southwestern United States.

***Lyctus linearis* (Goeze).**

Dermestes oblongus fuscus, clytris striatis, Geoffroy, 1762, p. 103.

Dermestes linearis Goeze, 1777, p. 148; Thunberg, 1784, p. 4, no. 4.

Lyctus linearis (Goeze) Reitter, 1906, p. 423.

Dermestes oblongus (Olivier) Fourcroy, 1785, p. 19, no. 9.

Ips oblonga Olivier, 1790, vol. 2, no. 18, sp. 8, pl. 1, fig. 5, *a, b*; 1792, p. 405, no. 9.

Lyctus oblongus (Olivier) Latreille, 1804, p. 241; Latreille, 1807, p. 16, sp. 1; Stephens, 1830, p. 117.

Dermestoides unipunctatus Herbst, 1783, p. 40, pl. 21, fig. *H, h*.

Bitoma unipunctata Herbst, 1793, p. 26, pl. 46, fig. 3.

Lyctus unipunctatus (Herbst) Kiesenwetter, 1877, p. 15; Reitter, 1885, p. 99.

Lyctus canaliculatus Fabricius, 1792, p. 504, no. 11; Panzer, 1793, fasc. 4, fig. 16; Paykull, 1800, p. 332, no. 9; Fabricius, 1801, vol. 2, p. 562, no. 13; Gyllenhal, 1813, vol. 1, pt. 3, pp. 408-409, no. 1; Thomson, 1863, vol. 5, p. 204; Tournier, 1874, vol. 6, p. 411, no. 103.

Synchita canaliculata (Fabricius) Hellwig, 1792, vol. 4, p. 405, no. 8.

Lyctus striatus Melsheimer, 1844, vol. 2, p. 112; Casey, 1890, vol. 5, p. 324; Casey, 1891, vol. 6, p. 13.

Lyctus axillaris Melsheimer, 1844, vol. 2, p. 113.

Lyctus pubescens Duitschmid, 1825, vol. 3, p. 148.

Lyctus fuscus Scidlitz, 1875, p. 16.

This species is at once and easily recognized by its peculiar, large, shallow, circular punctures of the elytral striæ, not observable in any other of our species. There is considerable variation in size, but in other respects the species is quite constant.

Material examined.—A series of several hundred specimens. Occurs throughout the United States, Europe, and probably the entire world.

Genus **LYCTOXYLON** Reitter.

Lyctoxyton Reitter, 1878.

Lyctoxyton japonum Reitter.

Lyctoxyton japonum Reitter, 1878, p. 199.

Subdepressed, ferruginous, feebly shiny, rather densely clothed with very short subsquamose bristles. Segments 1-4 of the antennæ subelongate, 5-9 subtransverse, club strongly elongate, cylindrical, segments nearly three times as long as broad, the terminal one a little narrower than the preceding. Head and prothorax densely confusedly punctured, the punctures subpapillate. Prothorax a little broader than long, more narrow toward the base, anterior angles obtuse, posterior right, the sides setulose-ciliate, at the middle of the dorsum longitudinally foveately impressed and with a short, strongly excavate line before the scutellum. Elytra a little broader than prothorax, parallel, more than twice as long as wide, either elytron seriatly, near the suture irregularly punctured, with short, dense, just visibly seriate, subsetulose scales. Length 1.5 to 2 mm. [Reitter.]

Material examined.—A series of 4 specimens from New Jersey, reared from Japanese cane. The species was described from specimens from Japan and China.

Genus **MINTHEA** Pascoe.

Minthea Pascoe, 1863, p. 97; Reitter, 1906, p. 423.

Lyctopholis Reitter, 1878, p. 196; Everts, 1899, p. 565.

***Minthea rugicollis* (Walker).**

Ditoma rugicollis Walker, 1858, p. 206.

Minthea similata Pascoe, 1863, p. 141.

Minthea rugicollis (Walker) Waterhouse, 1894, p. 68; Arrow, 1904, pp. 35-36; Reitter, 1906, p. 423.

Eulachus hispidus Blackburn, 1885, p. 141.

Lycopholis foveicollis Reitter, 1878, p. 199.

Prothorax at the middle of the dorsum with an oblong-oval, deeply impressed foveola. Subcylindrical, ferruginous, feebly shiny, somewhat densely clothed with erect, white, subsquamose bristles thickened at the apex. First segment of club of antennæ subquadrately transverse, the terminal half again as long as it, elongate oval. Prothorax somewhat densely punctate, the punctures scarcely separated, not at all deeply impressed; clytra a little wider than prothorax, parallel, lightly seriatly punctured, the punctures very feebly impressed, interspaces just visibly rugose, feebly shining, the alternate ones with erect seriate bristles. Length about 2 mm. [Translated from Reitter's original description of *foveicollis*.]

***Minthea stichothrix* (Reitter).**

Lycopholis stichothrix Reitter, 1878, p. 199.

Thorax with the dorsum scarcely excavated, but with an almost obsolete longitudinal line at the middle, becoming less anteriorly at the apex. Subcylindrical, ferruginous, rather densely clothed with long, white, erect setæ thickened at the apex. First segment of antennal club transverse, the terminal segment three times as long as the former, subcylindrical. Head and thorax confusedly, rugosely punctured, opaque, the sides of the latter evidently denticulate and ciliate; clytra seriatly punctate, interspaces densely, rather strongly, rugosely punctured, the alternate ones with seriate erect setæ. Length 2.7 mm. [Reitter.]

Described from specimen from Bogota, Colombia. The species occurs also in Europe.

Material examined.—One specimen from Mr. Reitter, labeled "Styria;" another in the Horn collection, without name, labeled "N. Y.," and with light-green square.

Representatives of the genus occur throughout the world, *M. rugicollis* Walker being recorded from the West Indies, Ceylon, Malay Archipelago, Hawaiian Islands, and Europe. The single specimen in the Horn collection, mentioned above, is, so far as the author is aware, the only record of the genus in the United States.

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APPENDIX.

NOTES ON HABITS AND DISTRIBUTION, WITH LIST OF DESCRIBED SPECIES.^a

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HABITS.

So far as known, the species of the family Lyctidæ live in dead and dry wood of natural growth, in the seasoned sapwood of commercial products, and in the pith of vines and the dried roots of herbaceous plants, but do not infest the wood of coniferous trees.

Some of the species appear to prefer the dead and dry wood of standing trees, shrubs, and vines under natural conditions, and therefore are rarely found in the commercial articles; for this reason they are not subject to temporary or permanent removal from the natural range of the species. The other species, which infest commercial products, are subject to wide distribution over the world.

The following notes relate to species represented in the collections of the United States National Museum and United States Department of Agriculture, the habits of which have been observed by the writer or recorded in connection with the specimens.^b

THE GENUS LYCTUS

DIVISION I.

SUBDIVISION A.

SECTION a1.

L. impressus Comolli.—This species has been found in an umbrella handle, in which it was evidently introduced into Mississippi.

SECTION a2.

Subsection b1.

L. punctatus (Le Conte).—Habits not recorded.

^a This portion of the paper was prepared some months after Mr. Kraus submitted his manuscript and includes data on additional specimens.

^b The primary and secondary divisions, sections, and genus are included under "habits" and "distribution" in order to aid in the comparison of facts concerning allied groups and species.

Subsection b2.

Series c1.

L. californicus Casey.—Recorded as breeding in adobe wall.

L. præustus Erichson.—Habits not recorded.

Series c2.

L. parallelopipedus (Melsheimer).—Extensive observations have been made on the habits of this species. It infests the seasoned sapwood of commercial products made from persimmon, hickory, ash, oak, and bamboo; it also lives in the dead wood or natural growth of osage orange, sassafras, and fig.

L. curtulus Casey.—Common in dead wood or natural growth of mesquite, *Parkinsonia*, mimosa, hackberry, cotton stems, and fig.

SUBDIVISION B.

L. politus Kraus.—Found in dried licorice roots.

L. brunneus (Stephens).—In seasoned wood and dried herbaceous roots.

L. pubescens Panzer.—Habits not recorded in connection with specimen.

SUBDIVISION C.

SECTION a3.

Subsection b1.

L. opaculus Le Conte.—In pith of dead grapevines.

Subsection b2.

L. suturalis Faldermann.—Habits not recorded.

L. cavicollis Le Conte.—In commercial products, seasoned orange wood and hickory, tanbark oak, and cordwood of live oak.

SECTION a4.

L. cinerius Blanchard.—Habits not recorded.

L. planicollis Le Conte.—Extensive observations have been made on the habits of this species. It is common in commercial products of seasoned ash, oak, hickory, persimmon, and sycamore. Rearing records show that it may breed continually in the same wood during a period of at least six years, or until all the wood tissue has been converted into powder.

L. carbonarius Waltl.—In seasoned oak and bamboo, in natural growth and in commercial products.

L. parvulus Casey.—In dead and dry wood of locust (*Robinia neomexicana*), according to Schwarz.

DIVISION II.

SUBDIVISION D.

L. linearis (Goeze).—Extensive observations have been made on the habits of this species. It is common in commercial products of seasoned hickory, oak, walnut, and ash, and occasionally in poplar, wild cherry, and locust. It is not recorded from natural growth in this country, but is said to infest such growth, as well as commercial products, in Europe.

THE GENUS LYCTOXYLON.

L. japonum Reitter.—Found in walking stick from Japan and in commercial articles made from bamboo in China.

THE GENUS MINTHEA.

M. rugicollis (Walker).—Habits not recorded in specimens in the national collection.

M. stichothrix (Reitter).—Habits not recorded.

DISTRIBUTION.

The distribution of the species of the family Lyctidæ presents some interesting features, especially in regard to the natural habitat and the temporary and permanent introductions.

The habits of some of the species which infest commercial products make it possible for them to be widely distributed outside of their natural range, but it does not necessarily follow that a species introduced to another country in commercial products will become established in its new environment. Therefore we find many records in literature of localities in which specimens of a species have been collected, some of which evidently represent accidental or temporary introductions. Some other records may be held in doubt as to permanent introduction until they are verified by observations which would indicate that the localities are either within the natural range of the species or that the species has become established.

It would appear that the most reliable guide to the natural distribution of the species is their habit of living in natural growth and under natural conditions of exposure to climatic influences at all seasons of the year.

In a study of the records represented by specimens in the national collection and of the evidently authentic records in literature, it would appear that the distribution of the species of the family Lyctidæ in the western continent is between about the forty-eighth parallel north and the thirtieth parallel south, and in the eastern continent

and Australia, from about the fifty-fifth parallel north to the fortieth parallel south. The genus *Lyctus* has practically the same range as the family; the genus *Lyctoxylon* seems to have its natural distribution in eastern India and Asia between the twentieth and fortieth parallels north; while in the genus *Minthea* one species is from Rodriguez Island and the Philippines, with a record from southern Europe, and the other species is from Bogota, Colombia, South America.

It appears that the center of distribution of the greatest number of species of the family is between the twentieth and fortieth parallels north in both continents.

The available evidence would indicate that the natural distributions of the species studied by the writer are approximately as follows:

THE GENUS LYCTUS

DIVISION I.

SUBDIVISION A.

SECTION a1.

L. impressus Comolli.—Northern Africa, southern Italy, Greece, Spain, and the Caucasus. Probably temporarily introduced into central Europe and southern North America.

SECTION a2.

Subsection b1.

L. punctatus (Le Conte).—Lower California.

Subsection b2.

Series c1.

L. californicus Casey.—Lower California.

L. præustus Erichson.—Peru and Brazil.

Series c2.

L. parallelopipedus (Melsheimer).—Florida, Texas, Louisiana, Georgia, South Carolina, Virginia, West Virginia, District of Columbia, Long Island, N. Y., Ohio, and Missouri. The natural distribution of the species is evidently in the South Atlantic and Gulf States, and in part of the Mississippi and Ohio valleys, from which it has been temporarily introduced into other States.

L. curtulus Casey.—California, Arizona, Texas, and Guatemala. This evidently represents its natural distribution. One record from Montana indicates temporary introduction, and a record from the Sandwich Islands may represent a permanent introduction.

SUBDIVISION B.

L. politus Kraus.—Temporarily introduced into the District of Columbia, probably from northern Spain or Italy, from which the commercial product of licorice is exported.

L. brunneus (Stephens).—Paraguay, Brazil, Cuba, and Mexico. This evidently indicates the natural range of the species, from which it has probably been introduced and become established in Europe, Asia, Africa, and Australia. It has been recorded from South Carolina, from Philadelphia, Pa., and from Chicago, Ill., which probably represent temporary introductions, although it is not at all improbable that it may become permanently established in the Gulf States, especially in Florida and Texas.

L. pubescens Panzer.—Recorded as common in southern and middle Europe, which may be its natural distribution.

SUBDIVISION C.

SECTION a3.

Subsection b1.

L. opaculus Le Conte.—Michigan, Iowa, Nebraska, Ohio, Long Island and Staten Island, N. Y., District of Columbia, and North Carolina. This probably represents the natural distribution, and since the species lives in natural growth it is not likely to be distributed out of its natural range.

Subsection b2.

L. suturalis Faldermann.—Caucasus, southern Russia.

L. cavicollis Le Conte.—California, several localities, with doubtful record from Oregon.

SECTION a4.

L. cinereus Blanchard.—Chile.

L. planicollis Le Conte.—Arizona, Nevada, Texas, and the Gulf and South Atlantic States. This range probably represents the natural distribution of the species, but it is frequently introduced temporarily into the Northern and Middle States and evidently into other countries, since there is a definite record from Capetown, South Africa, in lumber from the southern United States. This species is evidently derived from one or more subtropical forms, of which *L. carbonarius* is a representative.

L. carbonarius Waltl.—Mexico and Florida. This species is evidently distinct from *L. planicollis*, as indicated by a large series not observed by Mr. Kraus, which had been reared by Mr. H. G. Hubbard from winter-killed bamboo in Florida. The specimens from Florida and Mexico are readily distinguished from average specimens of *planicollis* by their more reddish color but otherwise agree

with characters mentioned by Mr. Kraus. It is probable that there is some overlapping of the ranges of these two allied species in Florida and from Texas to California, and that in such localities occasional specimens will be found which occupy an intermediate position.

L. parvulus Casey.—Arizona, California, and Utah. This evidently indicates the natural distribution of the species.

DIVISION II.

SUBDIVISION D.

L. linearis (Goeze).—This species is recorded in literature as extending over Europe, and especially England, France, and Germany, where it lives in natural growth, cordwood, etc. This evidently represents its natural habitat, from which it has been introduced in commercial wood products to many other countries of the world, but it would appear from observations and records in the United States that it becomes permanently established only in those countries with climates similar to that of central and northern Europe. The species appears to be permanently established in the States north of North Carolina, Tennessee, and Arkansas. There are a great many records from this area, including Maine, Massachusetts, New York, Pennsylvania, Virginia, West Virginia, Ohio, Indiana, Michigan, Illinois, Missouri, Iowa, and Minnesota. The specimens in the national collection show but a single record from the South Atlantic and Gulf States, and that is evidently a temporary introduction. Undoubtedly the species is frequently carried into the southern region, but evidently does not survive there.

THE GENUS LYCTOXYLON.

L. japonum Reitter.—Japan, China, and India. This probably represents the natural range of the species, from which it has been introduced into Europe, America, and other countries, possibly becoming established in those with climatic conditions similar to that of its original habitat. The recorded introductions into the United States are from China into California and Massachusetts, and probably from Japan into New Jersey.

THE GENUS MINTHEA.

M. rugicollis (Walker).—Philippine Islands, Siam, China, Ceylon, and the Malay Archipelago. This probably represents the natural habitat, from which it may have been introduced into Europe, the West Indies, and the Hawaiian Islands.

M. stichothrix (Reitter).—Bogota, Colombia, South America.

THE LYCTIDÆ REPRESENTED IN THE COLLECTIONS EXAMINED
BY KRAUS AND HOPKINS.

(Classification according to Kraus.)

Genus **LYCTUS** Fabricius.

Division I.

Subdivision A (*Trogoxylon*).

Section a1.

impressus Comolli.

Section a2.

Subsection b1.

punctatus Le Conte.

Subsection b2.

Series c1.

californicus Casey.

præustus Erichson.

Series c2.

parallelopiædus Melsheimer.

curtilus Casey.

Subdivision B (*Xylotrogus*).

politus Kraus.

brunneus Stephens.

pubescens Panzer.

Subdivision C (*Lyctus*).

Section a3.

Subsection b1.

opaculus Le Conte.

Subsection b2.

suturalis Faldermann.

cavicornis Le Conte.

Section a4.

cinereus Blanchard.

planicollis Le Conte.

carbonarius Waltl.

parvulus Casey.

Division II.

Subdivision D.

linearis Goeze.

Genus **LYCTOXYLON** Reitter.

japonum Reitter.

Genus **MINTHEA** Pascoe.

rugicollis Walker.

stichothrix Reitter.

LIST OF DESCRIBED SPECIES, WITH SYNONYMY ACCORDING TO THE LITERATURE AND RECENT STUDIES BY THE AUTHORS.

Genus **LYCTUS** Fabricius.

- æqualis* Wollaston. S. Jago.
africanus Lesne. Africa.
brunneus (Xylotrogus) Stephens. England; Australia; Japan; Paraguay; Brazil; Cuba; Mexico; Philadelphia, Pa.
carolinæ Casey. South Carolina.
colydioides Dejean. France.
glycyrrhizæ Chevrolat.
parasiticus Stephens.
rugulosus Montrouzier. Woodlark Islands (near Australia).
californicus Casey. Lower California.
carbonarius Waltl. Mexico; Florida.
caucasicus Tournier. Caucasus (Russia).
cavicollis Le Conte. California; Missouri; Oregon.
cinereus Blanchard. Chile.
cornifrons Lesne. Obock, Africa (Red Sea).
costatus Blackburn. Australia.
curtulus Casey. Arizona; California; Montana; Texas; Guatemala; Sandwich Islands.
depressicatus White. New Zealand.
discedens Blackburn. Australia.
disputans Walker. Ceylon.
fœricollis Reitter. Santo Domingo, West Indies.
griseus Gorham. Guatemala.
hispidus Kiesenwetter.
serie-hispidus Kiesenwetter. Japan.
impressus Comolli. Cordova, Mex.; Corinth, Greece; Gallia; Meridian, Miss.
 var. *capitalis* Schauf. Algeria, Africa; Mallorca (Mediterranean).
castaneus Perroud. Middle Europe.
glabriatus Villa. Lombardia, Italy.
larei Galeazzi. Lombardia, Italy.
laxipennis Faldermann. Caucasus; Greece.
leococianus Wollaston. Madeira.
linearis Goeze. Canada; District of Columbia; Illinois; Iowa; Indiana; Massachusetts; Maine; Michigan; Minnesota; Missouri; New York; Ohio; Pennsylvania; Texas; West Virginia; Virginia; Middle Europe.
 var. *axellarius* Melsheimer. Pennsylvania.
canaliculatus Fabricius. Lampa, South America (Chile).
duftschmidti Des Grozes.
fuscus Seidlitz.
 var. *fuscus* Melsheimer. Pennsylvania.
linearis Thunberg.
 var. *nitidus* Dahl. Hungaria, Austria.
oblongus (*Dermestes*) Olivier.
pubescens Duftschmid.
striatus Melsheimer. Pennsylvania.
unipunctatus (*Dermestoides*) Herbst. Austria?
longicornis Reitter. Bogota, South America.
nitidicollis Reitter. Bogota, Colombia; Chile.

- obsetus** Wollaston. S. Jago.
- opaculus** Le Conte. District of Columbia; Iowa; Long Island; Michigan; North Carolina; Nebraska; Ohio; Pennsylvania; Texas; West Virginia.
- parallelocollis** Blackburn. Australia
- parallelopipedus** (Xylotrogus) Melsheimer. District of Columbia; Florida; Georgia; Louisiana; Missouri; Ohio; South Carolina; Texas; West Virginia; Virginia; New York.
- parvulus** Casey. Arizona; California; Utah.
- planicollis** Le Conte. Arizona; California; Colorado; District of Columbia; Florida; Georgia; Illinois; Iowa; Mexico; Michigan; Minnesota; Missouri; Nevada; Ohio; Oregon; South Carolina; Tennessee; Texas; Cape Town, Africa.
- politus** Kraus. (Reared at Washington, D. C.)
- præustus** Erichson. Brazil; Peru.
- prostomoides** Gorham. Guatemala; Panama.
- pubescens** Panzer.
bicolor Comolli. Middle Europe.
caucasicus Tournier.
subarmatus Megerle. Austria.
- punctatus** (Trogoxylon) LeConte. Cape San Lucas and Santa Rosa, Lower California.
- punctipennis** Fauvel. Caen; New Caledonia; Sumatra.
- recticollis** (Trogoxylon) Reitter. La Plata.
- retractus** Walker. Ceylon.
- simplex** Reitter. Colombia.
- suturalis** Faldermann. Caucasus.
deyrollei Tournier. Mingrelia (Russia).
- tomentosus** Reitter. Mexico.

Genus **LYCTOXYLON** Reitter.

- japonum** Reitter. Hindostan; Europe; China; California; Massachusetts; New Jersey; New York.
- jalnophæ** Wollaston. San Antao.

Genus **MINTHEA** Pascoe.

- rugicollis** Walker. Philippine Islands.
Lyctopholis færicollis Reitter. Santo Domingo.
Eulachus hispitus Le Conte.
Ditoma rugicollis Walker. Rodrigues Is.; Missouri; Madagascar.
Minthea similata Pascoe. Styria Marhunaland, near Austria.
- stichothrix** Reitter.
Lyctopholis stichothrix Reitter. Bogota (Colombia); Africa; South Germany; Austria.