

**A REVIEW OF THE GENUS ANATIS MULSANT
(COLEOPTERA: COCCINELLIDAE)¹**

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Abstract

Can. Ent. 108: 935-944 (1976)

The genus *Anatis* is reviewed and six species are recognized: *ocellata* (L.), *mali* (Say), *labiculata* (Say), *halonis* Lewis, *rathvoni* (Lec.), and *lecontei* Casey. Relevant illustrations and a key to the species are given. Neotypes for *mali* and *labiculata* have been selected.

The genus *Anatis* was first proposed by Mulsant in 1846. Since then it has been accepted by most authors, the important exception being LeConte (1852), who attempted to combine *Anatis* with *Myzia* (= *Mysia* LeConte). With *A. ocellata* Linnaeus as the type, the following names have been assigned to various members of the genus: *quindecimpunctata* Say (1824), *mali* Say (1824), *signaticollis* Mulsant (1850), *rathvoni* LeConte (1852), *canadensis* Provancher (1877), *halonis* Lewis (1896), *lecontei* Casey (1899), and *caseyi* Westcott (1912). In addition more than 100 varietal or aberrational names (see Korschefsky, 1932, p. 549 et seq.) have been applied to the various colour phases of *ocellata* that occur throughout its range in Europe and Asia. The name *mobilis* McKenzie (1936) refers to a species of *Synharmonia* and cannot, from the original description, be associated with the genus *Anatis*.

The application of these names has led to some confusion in the ocellate and non-ocellate species of eastern North America. Olivier (1808) described and figured a non-ocellate species as *Coccinella quindecimpunctata* from specimens that came ostensibly from San Domingo (Dominican Republic) and are therefore only doubtfully associated with continental North America. Recent lists (Blackwelder 1945) of the beetles of the West Indies do not include the genus. In any event this name is preoccupied by *Coccinella quindecimpunctata* DeGeer (1775), a synonym of *ocellata* Linnaeus (Mader 1954).

Say (1825) described the species of eastern North America as *Coccinella mali*, and included in his description notes on two varieties, a (ocellate) and b (non-ocellate). Casey (1899) correctly recognized the ocellate variety of Say as a separate species and restricted the name *mali* to it. This usage although unfortunate, because the name was originally applied to the non-ocellate species, has been recognized for over 50 years in the taxonomic and economic literature; it is accepted here.

Prior to his establishment of the name *mali*, Say (1824) used the name *labiculata* under which he briefly described two varieties, α and β , undoubtedly those he described subsequently under the name *mali* (LeConte 1859). Heretofore *labiculata* has been considered a synonym of *quindecimpunctata* Olivier. But, because the latter name is inadmissible, it is proposed that the name *labiculata* Say be accepted and restricted to the non-ocellate species with its pale and dark innominate forms.

Locations of the neotypes of *mali* and *labiculata* were selected because they were close to the centres of distribution of the two species. They are also close to places where Say might have collected, i.e. Little Rapids, Ont., near Sault Ste. Marie, and Simcoe, Ont., west of Niagara Falls. Say is shown to have travelled near these locations in the Fall of 1823 (Barber 1928).

Members of this genus may be characterized by the following anatomical features: body round or slightly longer than wide; margins of elytra variably explanate, and either sub-angulate or simply rounded in front of middle; antennal club with 9th and 10th segments obtriangular in contrast to the cylindrical 8th segment, and more dilated

¹Publication costs were supported partly by a National Research Council of Canada Scientific Publication Grant.

internally than externally; prosternal spine as broad as high, bicarinate along margin between procoxae; anterior margin of mesosternum deeply and broadly emarginate; metacoxal line almost attaining the posterior edge of the first abdominal segment; metacoxal plates without oblique lines; apex of elytral suture with a distinct patch of hairs on each side; tarsal claw with a large, quadrate, basal tooth (Watson 1956).

Size varies greatly within and among the various species (length 8.2 mm to 9.6 mm, width 6.2 mm to 8.0 mm) and is of little value in separating them. The presence of the sutural patch of hairs (Mader 1954) is also of little value in separating species for such patches have been found generally throughout the genus. Characters on the gonocoxite (Abdullah 1969) are variable and cannot be used with any certainty to separate species.

The genus can be divided into two groups on the basis of elytral shape: *rathvoni* and *lecontei* having subangulate (Figs. 6, 7); and the rest having more or less simply curved elytral margins (Figs. 2-5).

Immature stages of the members of this genus are not well known. The eggs of *labiculata* and *mali* are elongate-oval, bright yellow, and are laid in clusters of from 7 to 15 placed upright on the substrate. Britton (1910) found eggs of *labiculata* (*quindecimpunctata* Olivier) laid on the undersides of larger branches of deciduous trees. *A. mali* lays its eggs on the needles and, occasionally, the smaller branches of coniferous trees.

The larva of *labiculata* (*quindecimpunctata* Olivier) was described by Gage (1920) and that of *ocellata* has been briefly described in keys to coccinellid larvae of various regions (Emden 1949; Savoiskaya 1960; see Hodek, 1973). Generally the larvae are dark brown or black, with white or cream markings on the lower part of the head, the pronotum, and the lateral protuberances of the abdomen (Fig. 1). The legs appear inordinately long, and the body, except for the 9th tergum, bears long branched senti dorsally and laterally.

From its association with various tree species, it seems that *labiculata* is predaceous on insects feeding mainly on deciduous trees, whereas other members of the

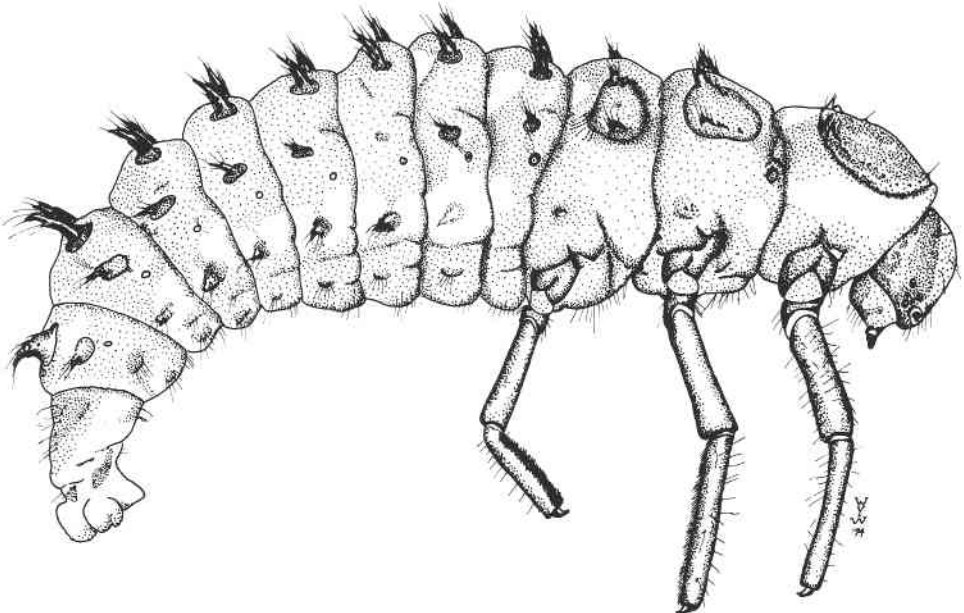
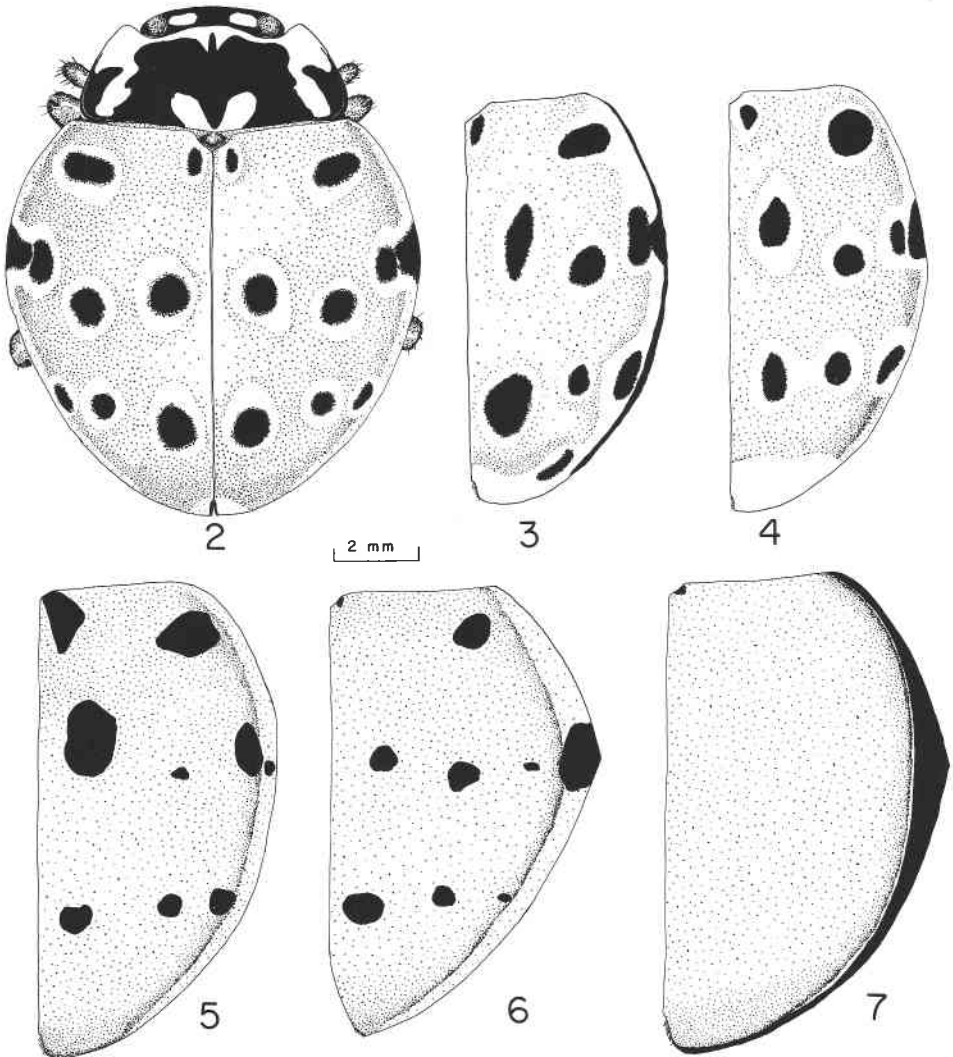


FIG. 1. Larva, *Anatis mali* (Say).

genus are predaceous on insects associated with coniferous hosts (McKenzie 1936; Reitter 1911; Struble 1957). Strouhal (1926) states that, although mainly on coniferous hosts, *ocellata* has been observed on several different genera of deciduous plants. This multiplicity of hosts may be accidental, as it appears to be with *mali*, which only occasionally occurs on deciduous plants; or it may suggest that *ocellata* is a complex of morphologically similar but biologically distinct species.

Material used in this study was provided by the following institutions and individuals: Dr. H. B. Leech, California Academy of Sciences; U.S. National Museum; W. J. Brown, Biosystematics Research Institute, Agriculture Canada; Forest Insect Laboratories, Environment Canada (Forestry); H. Fulton, Chilliwack, B.C.; Kyushu University, Fukuoka, Japan; British Museum (Natural History); and Dr. G. B. Wiggins, the Royal Ontario Museum, Toronto. The use of this material is hereby gratefully



FIGS. 2-7. 2, adult, *Anatis mali* (Say). 3-7, elytra; 3, *ocellata* (L.); 4, *halonis* Lewis; 5, *labiculata* (Say); 6, *rathvoni* (Lec.); 7, *lecontei* Casey.

acknowledged. The writer thanks Mr. W. J. Brown (Biosystematics Research Institute, now retired) for assisting with the synonymy and generally commenting on the various stages of the manuscript. Thanks are also due to the officers of the Environment Canada (Forestry), Forest Laboratory, Sault Ste. Marie, where much of this work was done.

Anatis mali (Say)

Coccinella labiculata Say, 1824, p. 288 (LeConte ed., vol. 1, p. 192, 1859) (in part, var. α).

Coccinella mali Say, 1825, p. 93 (LeConte ed., vol. 2, p. 232, 1859) (in part, var. α).

Anatis quindecimpunctata var. *mali* (Say), Mulsant 1850, p. 134; Leng 1903, p. 208; Blatchley 1910, p. 517.

Anatis signaticollis Mulsant, 1850, p. 134; Mader 1954, p. 125.

Anatis quindecimpunctata Olivier, Crotch 1873a, p. 50; 1873b, p. 371; 1874, p. 124 (in part); Provancher 1877, p. 696; Henshaw 1885, p. 47 (in part); Wickham, 1894, p. 303 (in part).

Anatis mali (Say), Casey 1899, p. 98; Abdullah 1969, p. 319.

Anatis ocellata (L.), Hamilton 1894, p. 379 (in part).

Anatis ocellata mali (Say), McKenzie 1936, p. 266; Wingo 1952, pp. 24, 46

Mysia 15-punctata Olivier, Melsheimer Cat. 1853, p. 130 (in part).

Myzia 15-punctata Olivier, LeConte 1859, p. 192 (in part); Reed 1871, p. 169 (in part).

Halyzia 15-punctata Olivier, Gemminger & Harold 1876, p. 3760 (in part).

Form rounded (Fig. 2); sides of elytra only slightly explanate. Epipleura nearly flat, narrowing posteriorly in the apical third.

Head black, with 2 ivory or white markings, which may occasionally fuse, between the eyes. Pronotum with a large black, M-shaped mark on disc; narrow anterior margin white; black projection into wide white lateral margins from posterior lateral angles; white or ivory central basal markings which may be either fused or unfused basally, and either obliquely truncate or irregular in front. Scutellum black. Elytra, including lateral and scutellar margins, varying from light to dark reddish brown; each elytron with nine black spots distributed in three transverse rows, each spot ocellated with white or ivory; apex of elytra pale.

Shining black or testaceous beneath (Fig. 8), except for white promera in the anterior three-quarters and the mesepimera.

MALE GENITALIA. Aedeagus (Fig. 13) 3 times as long as wide from the articulation of the paramera; sides in the basal third distinctly parallel or slightly undulate, in the middle third inflated, and in the apical third abruptly narrowed to a rounded, slightly constricted apex. Paramera almost as long as aedeagus, setaceous $\frac{2}{3}$ of length to base of the ventral and $\frac{1}{2}$ of length to the base on the dorsal surface.

FEMALE GENITALIA. Spermatheca (Fig. 10) with cornu slender, broadly arcuate; ramus short and inflated; nodus very short, conical, indistinct. Gonocoxite (Fig. 18) nearly as broad as long, with an arcuate margin on inner edge; surface densely pitted.

DISTRIBUTION (Fig. 20). Generally distributed over the coniferous areas of the northern half of North America, from Nebraska and Virginia in the United States to southern Yukon and the MacKenzie District in Canada.

LOCATION OF TYPES. Say's type material no longer exists, and the type or types of *signaticollis* were apparently destroyed during the 1939–1945 conflict. Therefore a neotype for *Anatis mali* has been selected and placed in the Canadian National Collection of Insects, No. 13902. The data of the neotype is Little Rapids, Ont., 27-VI-58, ex *Pinus sylvestris*.

REMARKS. This species is closely allied to *ocellata* Linnaeus from which it can be distinguished by being usually less elongate, by having the spots rounded rather than elongate, and by the reddish-brown elytra with pale apices. *A. mali* appears to be much less variable than *ocellata*. Some of the spots may be lacking; the most extreme variant seen had the anterior scutellar spot and the middle sutural spot missing and the white areas fused.

***Anatis ocellata* (Linnaeus)**

Coccinella ocellata Linnaeus, Syst. Nat. X ed. p. 336, 1758.

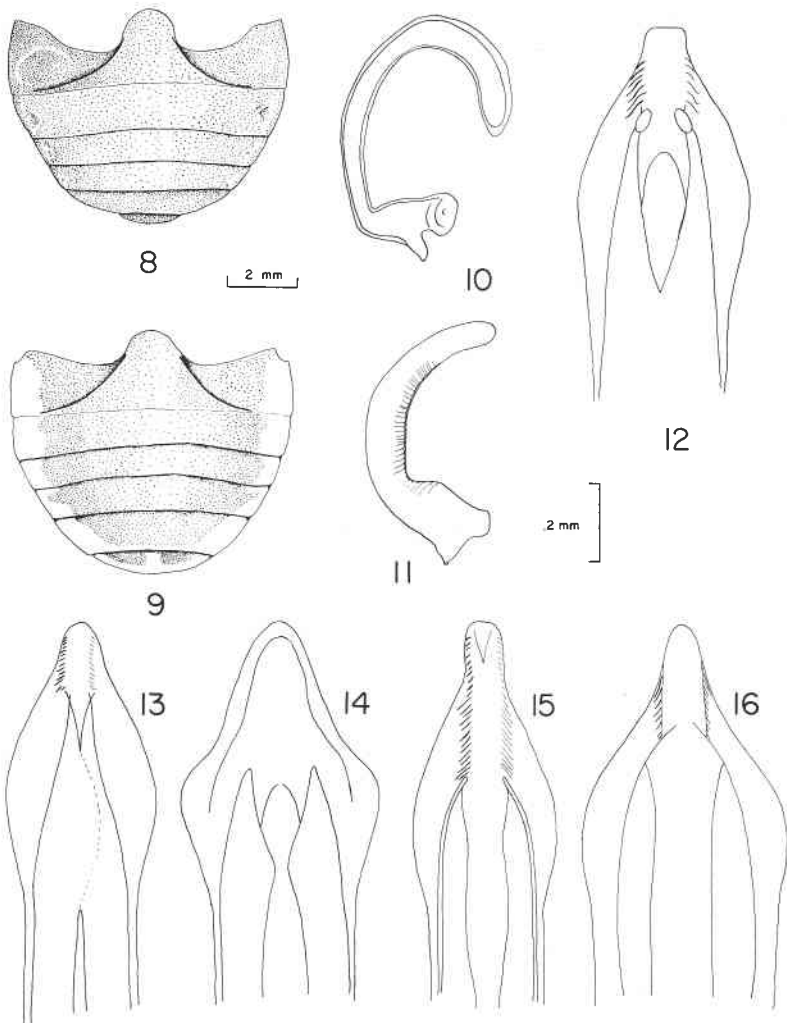
Coccinella quindecimpunctata DeGeer, 1775, p. 376, XI, figs. 1-9.

Anatis ocellata (Linnaeus), Mulsant 1846, p. 133; Crotch 1874, p. 124; McKenzie 1936, p. 264.

Halyzia ocellata (Linnaeus), Redtenbacher 1874, p. 532.

Form much as in *mali* with many specimens more elongate.

Pale spots on head not at all fused. Pronotum as in *mali* except that the basal white markings have a greater tendency to be truncated anteriorly. Scutellum black. Elytra ochreous with a distinct black lateral margin (Fig. 3). Each elytron with typically 10 black spots which may or may not be distinctly ocellated; humeral spot usually larger than in *mali*, scutellar and middle sutural spots more elongate; subapical spot, when present, in the form of an oblique fascia, when absent its position marked by a pale area.



FIGS. 8-16. 8-9, abdomen, ventral: 8, *mali* (Say); 9, *labiculata* (Say). 10-11, spermatheca: 10, *mali* (Say); 11, *labiculata* (Say). 12-16, apical portion of aedeagus: 12, *ocellata* (L.); 13, *mali* (Say); 14, *labiculata* (Say); 15, *rathvoni* (Lec.); 16, *lecontei* Casey.

Throughout the range of this species these elytral markings vary from a complete absence of spots (var. *bicolor*) to heavy striping longitudinally (var. *Tigrina*, *hebraea*).

Ventrally like *mali* but with the metepimera ivory or brownish.

MALE GENITALIA. Aedeagus (Fig. 12) $2\frac{1}{2}$ times as long as wide; wider than in *mali*, tapering to a short distinctly truncate apex; at the proximal end of the apical portion are 2 small oval areas. Paramera very little longer than aedeagus, slightly less setaceous than in *mali*.

FEMALE GENITALIA. Spermatheca as in *mali*. Infundibulum sclerotized, slender, with an enlarged, semimembranous base where it joins the bursa. Gonocoxite (Fig. 17) similar to *mali*; pits fewer and scattered.

DISTRIBUTION (Fig. 20). Widespread throughout continental Europe, the British Isles, and northern Asia to the Pacific coast. Specimens have been seen from Austria, Caucasus Region (U.S.S.R.), China, England, Finland, Germany, Hungary, Manchuria, Transbaikai Region (U.S.S.R.), Spain, and Sweden.

LOCATION OF TYPES. Linnaean Collections, Linnaean Society, London, England.

REMARKS. *A. ocellata* can be distinguished from *mali* by its ochreous colour, its narrow black lateral border of the elytra, its tendency to have a subapical spot or pale area. Mader's (1954) use of the sutural patch of setae is not valid since such patches can be found in all species of the genus.

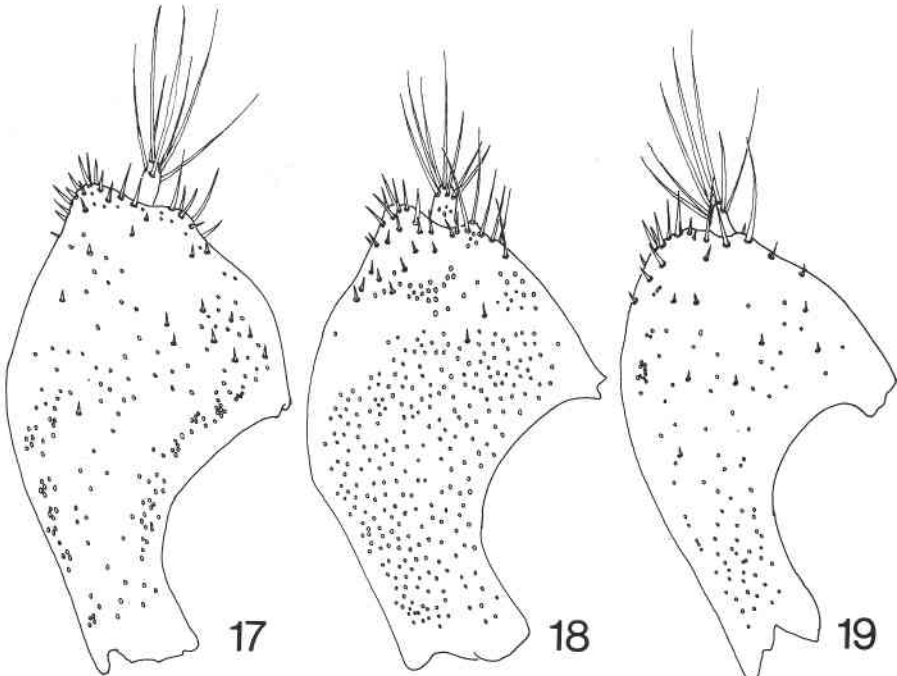
Anatis halonis Lewis

Anatis halonis Lewis, 1896, p. 28; Yokoyama and Kano 1927, p. 28.

Anatis ocellata halonis (Lewis), McKenzie 1936, p. 265.

Form as in *mali*, without the impression of elongation seen in *ocellata*.

Pale spots on head large but unfused. Pronotum with black discal markings reduced, side branches of M-shaped mark broken or almost broken into confluent spots.



FIGS. 17-19. Gonocoxites. 17, *ocellata* (L.); 18, *mali* (Say); 19, *labiculata* (Say).

Elytra (Fig. 4) ochreous red throughout; spots as in *ocellata* or less elongate; sub-apical region pale, without black spot. Scutellum yellowish with dark margins.

Ventrally thorax as in *ocellata*; abdomen orange-brown except black lateral areas of segment I, and parts of the anterior borders of segments II to IV.

MALE GENITALIA. Like *ocellata*; aedeagus slightly broader.

FEMALE GENITALIA. Like those of *mali* and *ocellata*.

DISTRIBUTION. Apparently confined to the islands of Japan in the higher altitudes. Specimens have been seen from Mt. Takao, Mt. Kasuga, Honshu; Nikko, Honshu; Mt. Kirishima Kyushu, Mt. Daisetsu. Lewis (1896) records the species from Niichosan and Tsukubayama.

LOCATION OF TYPE. Co-type series in the British Museum (N.H.), London.

REMARKS. *Halonis* appears to be an intermediate between *mali* and *ocellata*, but is sufficiently distinct from either to be considered here a separate species. These three species form a group that is quite distinct from *rathvoni* and *lecontei*.

Anatis labiculata (Say)

Coccinella labiculata Say 1824, p. 288 (LeConte ed. 1859, vol. 1, p. 192) (in part var. β).

Coccinella mali Say, 1825, p. 93 (LeConte ed. 1859, Vol. 2, p. 232) (in part var. b).

Coccinella quindecimpunctata Olivier (nec DeGeer 1775), 1808, p. 1027, pl. 6, Fig. 83.

Anatis quindecimpunctata (Olivier), Mulsant 1850, p. 133; Crotch 1874, p. 124 (in part); Crotch 1973a, p. 50; Casey 1899, p. 97; Leng 1903, p. 207; Wingo 1952, p. 24, 46; Mader 1954, p. 125.

Mysia quindecimpunctata (Olivier), Melsheimer 1853, p. 130 (in part).

Myzia quindecimpunctata (DeGeer), LeConte 1859, p. 192 (in part).

Halyzia quindecimpunctata (Olivier), Gemminger and Harold 1876, p. 3760 (in part).

Anatis Canadensis Provancher, 1877, p. 696 (see Horn, 1880, p. xii).

Anatis ocellata (Linnaeus), Hamilton 1894, p. 379 (in part).

Anatis caseyi Westcott, 1912, p. 422.

Anatis quindecimpunctata Say, McKenzie 1936, p. 268.

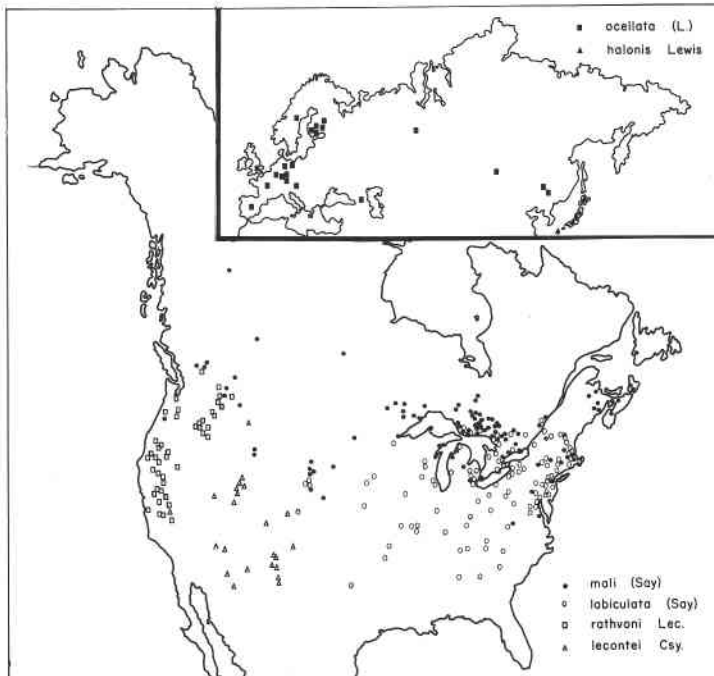


FIG. 20. Distribution of the genus *Anatis*.

Form as in *mali*.

Pronotum with pale basal markings not united basally, rarely joined laterally with the pale lateral margins, dividing the black discal area into three parts. Elytra either dark reddish brown (*caseyi* Westcott) or ivory white (*Canadensis* Prov.). Each elytron with 8 or 9 black, non-ocellated spots (Fig. 5); marginal spot of middle row sometimes missing or fused with the submarginal spot; scutellar, and sutural spot of middle row large and sub-equal.

Ventrally similar to *mali* except for the testaceous lateral areas of the abdominal segments (Fig. 9).

MALE GENITALIA. Aedeagus (Fig. 14) less than one-third as wide as long from the articulation of the paramera, subapical shoulders more distinct than in *mali*. Paramera shorter than aedeagus, setaceous nearly to base on ventral and not more than one-third of the distance to base on the dorsal edge.

FEMALE GENITALIA. Spermatheca (Fig. 11) with cornu thick, sharply angulate, pointed. Infundibulum thick and conical with globular base where it joins the bursa. Gonocoxite (Fig. 19) with inner emargination somewhat recurved to give a sharper angle than in *mali*; surface with scattered pits.

DISTRIBUTION (Fig. 20). Throughout eastern North America in the St. Lawrence and Great Lakes basin, southward into Virginia, and westward into Texas and Nebraska.

LOCATION OF TYPE MATERIAL. Say's original specimens have been lost or destroyed. A neotype has therefore been selected and placed in the Canadian National Collection of Insects, No. 7017. The data of the neotype are as follows: Simcoe, Ont., 21-V-58, ex *Quercus alba* (Survey No. S58-0345-01).

REMARKS. The non-ocellated spots and the shape of the spermatheca will separate this species easily from *mali*. The shape and pitting of the gonocoxite are sufficiently variable that its value in separating the species is limited.

Anatis rathvoni (LeConte)

Anatis rathvoni LeConte, 1852, p. 132; Crotch 1873*b*, p. 374; Crotch 1874, p. 124; Wickham 1894, p. 306; Casey 1899, p. 98; Leng 1903, p. 208; McKenzie 1936, p. 266.
Halyzia rathvoni LeConte, Gemminger and Harold 1876, p. 3760.

Elytra broadly explanate, especially in the basal half, and angulate; epipleura very wide, sloping, narrowing towards the apex.

Head as in *mali*. Pronotum as in *mali*, frequently with more black on the posterior corners, median basal spots variable. Scutellum black. Elytra light to dark brown (Fig. 6) with 9 black spots that are frequently reduced.

Ventral surface black with testaceous lateral areas on the abdominal segments.

MALE GENITALIA. Aedeagus (Fig. 15) similar to *mali* but with the inflated portion slightly more towards the base, and a longer, more truncate apex. Paramera as long as aedeagus, dorsal margin setaceous three-quarters of the distance from apex to base and the ventral margin setaceous for one-third this distance.

FEMALE GENITALIA. As in *mali*.

DISTRIBUTION (Fig. 20). Western North America. Specimens have been seen from British Columbia (Trail, Vernon) and from California, Idaho, Nevada, Oregon, and Washington State.

LOCATION OF TYPE MATERIAL. Seven specimens in the collection of the Museum of Comparative Zoology, Harvard University. Type locality: Sacramento, Calif.

REMARKS. The strongly explanate elytra separates this species from all but *lecontei* from which it can be distinguished by the spots on the elytra.

***Anatis lecontei* Casey**

Anatis lecontei Casey, 1899, p. 98; 1908, p. 406.

Anatis rathvoni lecontei Casey, Leng 1903, p. 208; McKenzie 1936, p. 268.

Form as in *rathvoni*.

Head as in *mali*. Pronotum black with wide, white sublateral stripes from anterior corners to outer third posterior edge, and with small pale basal spots. Elytra brown, with narrow black lateral margins, disc immaculate (Fig. 7). Scutellum black or testaceous.

Ventrally as in *rathvoni* and *labiculata*.

MALE GENITALIA. Aedeagus (Fig. 16) much wider in relation to its length than the other species; apex more narrowly rounded than in *mali*. Paramera shorter than aedeagus, setae as in *rathvoni*.

FEMALE GENITALIA. As in *mali*.

DISTRIBUTION (Fig. 20). Western North America. Specimens have been seen from Alberta (Lethbridge), Arizona, California, Colorado, Montana, Nevada, New Mexico, and Utah.

LOCATION OF TYPE MATERIAL. Holotype (Ft. Wingate, New Mexico) and two paratypes (New Mexico) in the Casey Collection at the U.S. National Museum, Washington.

Key to the Species of *Anatis*

1. Elytra with margins broadly explanate and distinctly angulate in front of middle; western North America 2
1. Elytra with margins weakly if at all explanate, not angulate; Canada, Eastern and Central United States, Eurasia 3
2. Elytra without spots; pronotum and elytra with black lateral margins *lecontei* Casey
2. Elytra with spots, without black margins; pronotum with lateral margins white or ivory *rathvoni* (LeConte)
3. Spots always ringed with white, sometimes faintly so; elytra varying from yellow to reddish brown 4
3. Spots never ringed; colour ivory or deep reddish brown; northern and eastern North America *labiculata* (Say)
4. Elytra with very narrow black lateral margins; spots elongate not distinctly ringed; Eurasia *ocellata* (Linnaeus)
4. Elytra without black lateral margins; spots round, distinctly ocellate 5
5. Principal colour above ochreous, beneath brownish; Japan *halonis* Lewis
5. Principal colour above reddish brown, beneath shining black; North America, mainly east of the Rocky Mts. *mali* (Say)

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(Received 1 May 1975)