

The North American Species in Groups IV and V of *Ips* De Geer (Coleoptera : Scolytidae)¹

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Abstract

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Group IV of North American *Ips* (Hopping 1963a) contains *I. avulsus* (Eichhoff), *I. bonansea* (Hopkins) and *I. pini* (Say), which breed mainly in pines. They have four spines on each side of the elytral declivity and the elytral interspaces are impunctate except *I. bonansea* which occasionally has interspace punctures. A key to the species is given and *Ips oregoni* (Eichhoff) is made a synonym of *Ips pini* (Say). Group V has only one species, *I. perroti* Swaine, the only North American *Ips* with straight sutures on the antennal club. Data on hosts and distributions are given.

This article is the third in a series describing the species in the natural groups of North America *Ips* (Hopping 1963a, b, c). Group IV contains *I. avulsus* (Eichhoff), *I. bonansea* (Hopkins) and *I. pini* (Say). They are 2.3-4.2 mm. long and there are 4 spines on each side of the elytral declivity. The elytral interspaces are impunctate on the disc except occasional specimens of *I. bonansea* which have widely separated interspace punctures. Mention of this variation was inadvertently omitted in the key to the *Ips* groups (Hopping 1963a). The males of Group IV usually have a small tubercle on the front of the head, replaced in the females by a short median longitudinal carina. The large capitate or subcapitate third declivital spine in males of *I. bonansea* and *I. pini* distinguish them from the females which have the third spine conical like the second and about the same size. The declivital spines in the male of *I. avulsus* are similar to those of the female and resemble the declivital spines of *I. bonansea* and *I. pini* females. Group V has only one species, *I. perroti* Swaine. The straight sutures on the anterior face of the antennal club distinguish it from other North American *Ips*.

GROUP IV

Key to the Species

1. Caudal margin of elytral declivity narrowly explanate (Fig. 1); second and third declivital spines of the male conical (Fig. 3); about equal in size, similar to those of the female (Fig. 2); body length less than 3 mm. *I. avulsus* (Eichhoff)

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- Caudal margin of elytral declivity broadly explanate (Figs. 6, 9); third declivital spine in the male the largest and capitate or sub-capitate (Figs. 5, 8); body length more than 3 mm. 2
2. Disc of pronotum behind the summit densely punctured, the distance between punctures often less than the diameter of a puncture; elytral interspaces occasionally with a few punctures (Fig. 6); average body length 3.5 mm. *I. bonansea* (Hopkins)
- Disc of pronotum behind the summit less densely punctured, the distance between punctures more than the diameter of a puncture; elytral interspaces on the disc impunctate (Fig. 9); average body length 3.9 mm. *I. pini* (Say)

Ips avulsus (Eichhoff)

Tomicus avulsus Eichhoff, 1867, *Berl. ent. Zeit.*: 402; Eichhoff, 1879, *Ratio Descr. Emend. Tomic.*, *Mem. Soc. roy. Sci. Liège*: 255; Schwarz, 1878, *Proc. Amer. phil. Soc.* 17: 469; Leconte, 1876, *Proc. Amer. phil. Soc.* 15: 363.

Bostrichus avulsus, Zimmerman, 1868, *Trans. Amer. ent. Soc.* 2: 147.

Ips avulsus, Swaine, 1909, *Bull. N.Y. St. Mus.* 134: 119; Swaine, 1918, *Bull. Can. Dep. Agric.* 14: 109, 115; Beal and Massey, 1945, *Bull. Duke Univ. School For.* 10: 140; Chamberlin, 1939, *Bark and Timber Beetles of N.A.*: 413, 425; Hopping 1963, *Canad. Ent.* 95: 508.

I. avulsus (Eichhoff) is 2.3-2.9 mm. long (front margin of pronotum to hind margin of declivity) and 0.9-1.0 mm. wide (mid-way on elytra). The head and thorax are usually black and the rest of the body dark brown with the antennae and tarsi lighter brown. *I. avulsus* is the smallest of the North American *Ips* (Fig. 1).

The front of the head is convex, densely punctured on the vertex, except on a small median polished area, becoming granulate-punctate on the lower part with a median tubercle above the finely dentate front margin. The sutures on the anterior face of the antennal club are bi-sinuate and obtusely angled at the middle.

The pronotum is 1.2 times longer than wide, with the sides sub-parallel to the apical fourth where they are slightly obtusely angled; the anterior margin is broadly rounded. The lunar rugosities are rather uniform in size and extend half way back on the pronotum medially and considerably beyond the middle on the sides; the caudal portion is moderately densely punctate with the distance between punctures usually greater than the diameter of a puncture. There is an impunctate, median strip extending from the summit to the basal margin.

The elytra are 1.4 times longer than wide with the sides slightly and evenly arcuate to the caudal fifth where they curve strongly inward towards the declivity. The striae are moderately impressed, the stria punctures being about 0.03 mm. in diameter and separated by less than this distance; the interspaces are impunctate on the disc. The declivity is armed on each side with four conical spines (Figs. 2, 3); the first one, on the second interspace, is the smallest and is acute at the tip; the second and third are about twice the size of the first, are less sharply pointed and arise from a tumescence which forms an arcuate ridge between them; the fourth spine is about the same size as the third and is sub-acute at the tip. The declivital armature of the male (Fig. 3) is similar to that of the female (Fig. 2) but is generally a little coarser. There is no reliable way to distinguish the sexes from external characters alone.

I. avulsus occurs in the eastern United States from **Pennsylvania** to **Florida** and westward to eastern **Texas** (Fig. 15). Eichhoff gave the type locality as "Amer. bor." in the original description. The type was probably destroyed in the second world war.

Specimens have been examined from Fulton Co. and Philadelphia in **Pennsylvania**; College Pk. in **Maryland**; Washington, **District of Columbia**; Green-

vale Farm and Roosevelt in **West Virginia**; Flat Rock, Boardman, Mt. Mitchell, and Southern Pines in **North Carolina**; Chicora in **South Carolina**; Hattiesburg in **Mississippi**; Enterprise, Lake Co., Orlando, Punta Gorda, St. Augustine, and Tampa in **Florida**; Tallulah in **Louisiana**; Beaumont, Nacadoches, Kirbyville, and Anahuac in **Texas**.

Hosts of the specimens seen were *Pinus echinata* Mill., *P. caribaea* Morelet, *P. strobus* L. and *P. palustris* Mill. Beal and Massey (1945) gave the following host data for North Carolina: "This species attacks all southern pines, but during this study it was taken only from *Pinus echinata*, *P. taeda*, *P. virginiana* and from planted *P. resinosa* at Durham; also from *Pinus strobus*, *Pinus rigida* and *Pinus pungens* near Marion and Asheville in the western part of the State and from *P. palustris* at Morehead City in the eastern part."

One to five long and winding egg galleries are excavated from a nuptial chamber, similar to those of *Ips pini* (Fig. 13). The larval galleries are short compared to those of most *Ips* and the pupal cells are constructed in the phloem next to the wood (Beal and Massey 1945).

Ips bonanseai (Hopkins)

Tomicus bonanseai Hopkins, 1905, *Proc. ent. Soc. Wash.* 7: 76.

Ips bonanseai, Hagedorn, 1910, *Coleopterorum Catalogus*: 50; Schedl, 1939, *An. Esc. nac. Cienc. biol., Méx.* 1: 349; Schedl, 1956, *Zeit. angew. Ent.* 39: 51; Hopping, 1963, *Canad. Ent.* 95: 508.

I. bonanseai is 3.2-3.5 mm. long and 1.2-1.4 mm. wide (Fig. 6). Adults are black when fully pigmented with brown tarsi and antennae.

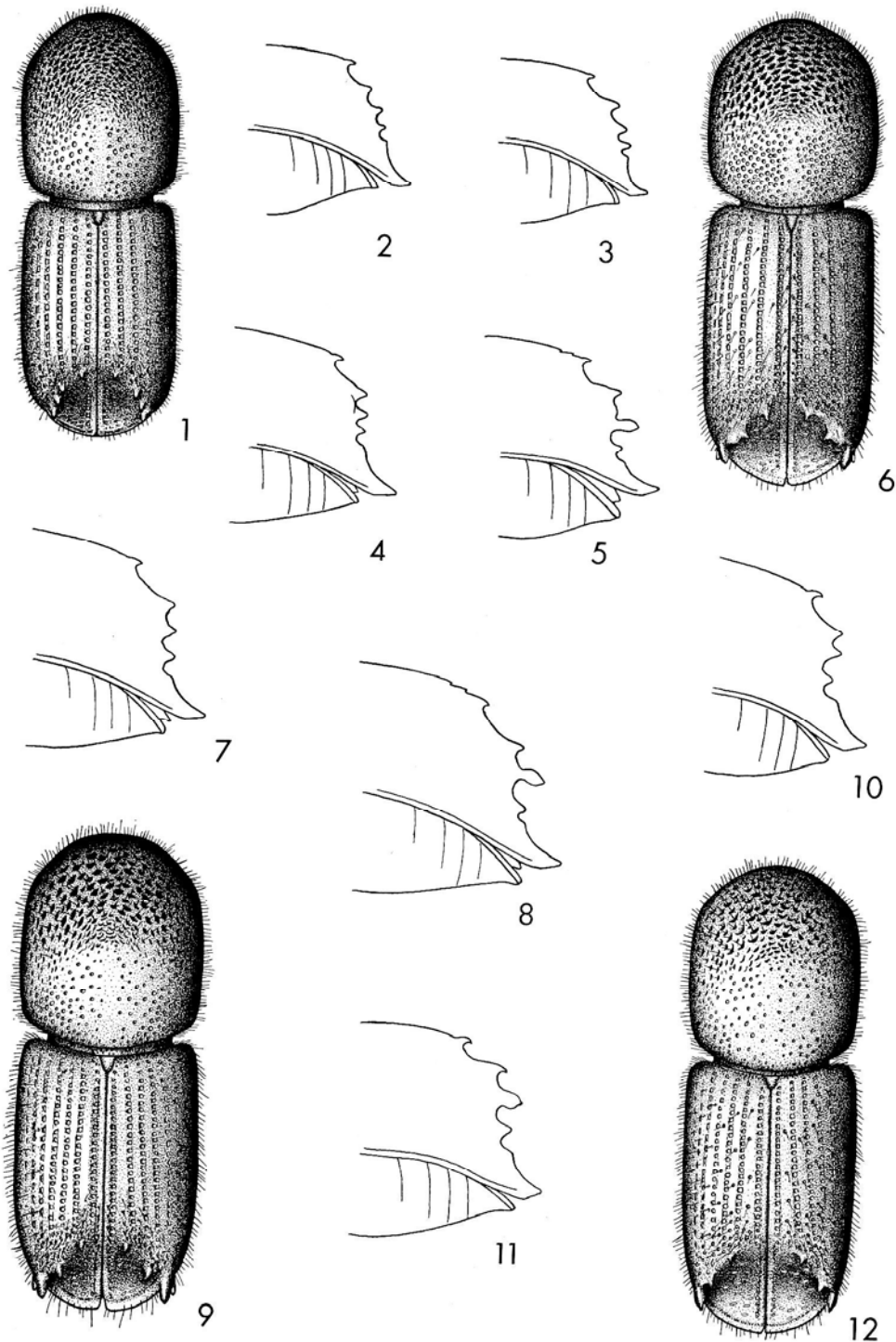
The front of the head is evenly convex, rugose-punctate on the vertex, densely granulate below; the males have a small median tubercle slightly above the front margin while the females have a short longitudinal carina in the same place but this is sometimes missing. The antennae are characteristic of the group, the club having bisinuate sutures which are obtusely angled at the middle.

The pronotum is nearly as wide as long with the sides faintly arcuate, obtusely angled at the apical fourth and then nearly straight to the rather narrowly rounded anterior margin. The lunar rugosities on the front portion are fairly uniform in size, closely spaced, overlapping at the bases, extending a little behind the middle on the disc and well behind the middle on the sides. The caudal part of the disc is densely and medium coarsely punctate, the average diameter of a puncture being 0.03 mm.; the punctures are coarser and denser on the sides.

The elytra are 1.5 times longer than wide; the striae are moderately impressed with large punctures, the diameter of a puncture being about 0.05 mm.; the interspaces are either impunctate on the disc or with widely separated punctures more commonly occurring in the males. Elytral punctures are more confused and granulate near the declivity. The first declivital spine is very small, conical and acute at the tip; the second and third spines in the female are twice the size of the first and are conical and sub-acute at the tip; they arise from a tumescence which forms an arcuate ridge between them; the fourth spine is as long as the first but a little stouter and blunt at the tip (Fig. 4). The male has the third spine considerably the largest; it is capitate or sub-capitate and sometimes bent slightly ventrad (Fig. 5). The declivity is densely punctate with the punctures smaller than those of the elytral striae.

I. bonanseai occurs from **Arizona** southward through **Mexico** into **Guatemala** (Fig. 15). The types, No. 7514 in the U.S. National Museum, have been studied. The type locality is Tacubaya, Mexico.

Specimens have been examined from Safford, Santa Rita Mts. and Graham Mts. in **Arizona**; in Mexico from Sierra Marta Rayones in **Nuevo Leon**; El Salto



Figs. 1-12. The *Ips* of Groups IV and V. 1, *I. avulsus* (δ) (Eichhoff) 2, *I. avulsus*, side view of declivital spines (\varnothing); 3, same (δ); 4, *I. bonanseai* (Hopkins), side view of declivital spines (\varnothing); 5, same (δ); 6, *I. bonanseai*; 7, *I. pini* (Say), side view of declivital spines (\varnothing); 8, same (δ); 9, *I. pini* (δ); 10, *I. perroti* Swaine, side view of declivital spines (\varnothing); 11, same (δ); 12, *I. perroti* (δ).

in **Durango**; 61 mi. W. of Fresnillo in **Zacatecas**; Cuernavaca in **Morelos**; 14 mi. W. of Texmelucan in **Puebla**; road from Apizaco to Zacatlan in **Tlaxcala**; road from Mexico City to Tuxpan and from Pachuca to Huauchinango in **Hidalgo**; Lagunas de Zempoala, Tlalmanalco and Amecameca in the State of **Mexico**; and Oaxaca in the State of **Oaxaca**; over 200 specimens were seen.

Schedl (1955) gave the following localities in Mexico; Tacubaya, D.F.; San Marcos (uncertain which one); boundary between Distrito Federal and Morelos; road from Mexico City to Cuernavaca; Rio Frio in the State of Mexico; Jonacatepec in Morelos; near the cities of Tlalmanalco, San Rafael and Amecameca; in Guatemala: Montanas de las Nubes, Quetzaltenango and Poptún.

The hosts recorded on the specimens examined are *Pinus flexilis* James, *P. hartwegii* Lindl., *P. ponderosa* Dougl. and *P. leiophylla* Schlecht and Cham. Schedl (1955) gave the following hosts: "*Pinus hartwegii*, *P. hondurensis*, *P. leiophylla*, *P. montezumae* var. *rudis*, *P. pseudostrobus*, *P. rudis* and *P. tenuifolia*."

The egg galleries of *I. bonanseai* are similar to those of *I. pini* (Fig. 13) but are slightly narrower. Schwerdtfeger (1956) described and photographed the galleries in Guatemala and outlined the biology.

Ips pini (Say)

- Bostrichus pini* Say, 1826, *J. Acad. Nat. Sci. Philad.* 5: 257.
Tomicus dentatus Sturm, 1826, *Cat. Mein. Ins. Samm.*: 76.
Tomicus pallipes Sturm, 1826, *Cat. Mein. Ins. Samm.*: 76.
Bostrichus pini, Zimmerman, 1868, *Trans. Amer. ent. Soc.* 2: 147.
Tomicus oregonis Eichhoff, 1868, *Berl. ent. Z.* 12: 274. New Synonymy.
Tomicus pini, Leconte, 1876, *Proc. Amer. phil. Soc.* 15: 363, 365.
Tomicus rectus Leconte, 1876, *Proc. Amer. phil. Soc.* 15: 365.
Ips pini, Smith, 1904, *Cat. of Ins. of N.J.*: 363; Swaine, 1909, *Bull. N.Y. St. Mus.* 134: 125; Blatchley & Leng, 1916, *Rhynch. of N.E. Amer.*: 639; Clemens, 1916, *Bull. Cornell Univ. Agric. Exp. Sta.* 383; Swaine, 1918, *Bull. Can. Dep. Agric.* 14: 110, 115; Dodge, 1938, *Bull. Univ. of Minn. Agric. Exp. Sta.* 132: 48, 50; Chamberlin, 1939, *Bark and Timber Beetles of N.A.*: 413, 425; Hopping, 1963a, *Canad. Ent.* 95: 508.
Ips oregoni, Swaine, 1909, *Bull. N.Y. St. Mus.* 134: 125; Swaine, 1918, *Bull. Can. Dep. Agric.* 14: 110, 117; Chamberlin, 1939, *Bark and Timber Beetles of N.A.*: 413, 427; Chamberlin, 1958, *Scolytoidea of the N.W.*: 164, 171.
Ips laticollis Swaine, 1918, *Bull. Can. Dep. Agric.* 14: 116.

I. pini is 3.5-4.2 mm. long and 1.3-1.6 mm. wide (Fig. 9). Adults are black when fully pigmented with brown tarsi and antennae.

The front of the head is evenly convex, densely and coarsely punctate on the vertex becoming finely and densely granulate below with a row of minute denticles along the front margin. The male usually has a median tubercle slightly above the front margin. The female has a short, fine longitudinal carina in the same location. The sutures of the antennal club are bi-sinuate and obtusely angled at the middle.

The pronotum is nearly as wide as long, with the front margin broadly rounded; the sides are faintly and evenly arcuate to the apical fifth where they are obtusely angled. The lunar rugosities are fairly uniform in size and rather dense with the bases usually overlapping. The punctures on the caudal third are fine near the median impunctate strip, the diameter of the puncture being about 0.02 mm.; they are coarser and closer together on the sides.

The elytra are 1.3 times longer than wide; the striae are scarcely impressed, with flat interspaces in some specimens while in others the striae are quite strongly impressed with convex interspaces; the interspaces are impunctate on the disc. The striae punctures are about 0.05 mm. in diameter. The declivity is deeply excavated, coarsely and densely punctate with the punctures only slightly



Fig. 13. Galleries of *Ips pini* (Say), typical of Group IV.
 Fig. 14. Galleries of *Ips perroti* Swaine (after Reid), typical of Group V.

smaller than those of the striae. The caudal margin of the declivity is distinctly explanate. The first declivital spine is 0.06 mm. long, conical and acute at the tip. The second and third spines in the female are about equal in size and are similar in shape to the first spine but about twice the size (Fig. 7). They arise from a tumescence which forms an arcuate ridge between them. The fourth spine is the same size and shape as the second and third. The third spine in the male is the largest and is capitate or sub-capitate, often with the distal portion bent slightly ventrad (Fig. 8).

I. pini occurs throughout the boreal forest of North America and is found as far south as Tennessee in the east and northern Mexico in the west (Fig. 15). The type locality and location of the type are unknown to me. There is considerable variation between series of *I. pini* from different localities and different hosts but the distribution is continuous from east to west and the variations intergrade one into the other. Some eastern series, especially from *Pinus resinosa*, are smoother, more shining and have flatter elytral interspaces than most from the west. The punctation of the pronotum also varies from fine to rather coarse. The third declivital spine in the male varies from strongly capitate and straight to sub-capitate and bent ventrad.

Specimens have been examined from Johnson Co. in **Tennessee**; Mineral Springs in **Indiana**; Roscommon in **Michigan**; Littlestown, Holiday and Pocono Lk. in **Pennsylvania**; Berkely, Lynn, Brookline, Natick, Petersham and Framingham in **Massachusetts**; Cornwall in **Connecticut**; Ithaca, Cranberry Lake and Syracuse in **New York**; Orono and Monmouth in **Maine**; Laniel, St. Annes, Isle Perrot, Ft. Cologne, Aylmer, and Wakefield in **Quebec**; Thessalon, Chapleau, Algonquin Park, Quetico, Thor Lake, Frater, Black Sturgeon Lake and Ottawa in **Ontario**; Sandilands, Renwer, Star Lake, Wasagaming, Morden and Aweme in

Manitoba; Prince Albert, Round Lake, and McAuley Lake in **Saskatchewan;** Jasper, Ft. Vermilion, Edmonton, Wembly, Strachan, Entrance, Banff, Mt. Eisenhower, Peers, Big Horn Ranger Sta., Morley, Waterton, Chief Mt., and Blairmore in **Alberta;** Louise Falls and mi. 53 Yellowknife Road in the **Northwest Territories;** Ft. Yukon in **Alaska;** Carcross, Whitehorse, McClintock R. and Watson L. in **Yukon Territory;** Stanley, Aspen Grove, Midday Val., Princeton, Vernon, Westbridge, Salmon R., Damfino Cr., Buck Ridge, Lucerne, Ft. St. James, Dead Dog Cr., Big Bend Hwy., Lumberton, Invermere and Yoho National Pk. in **British Columbia;** Spokane, Cle Elum, Yakima, Cheney, and Northport in **Washington;** Moscow Mt., Pierce, Potlatch, Nez Perce and Deary in **Idaho;** Deer Lodge, Barber Cr., Nezperce Co., Lamedeer, Lolo, Gallatin Gateway and Sula in **Montana;** Ochoco N.F., Klamath Falls, Pringle Falls, Sparta, Freemont N.F. and Kirk in **Oregon;** Longs Peak Inn and Pike Nat. For. in **Colorado;** Yellowstone Park in **Wyoming;** Custer, Deadwood, Spearfish, Lead, Black Hills, Camp Crook and Rosebud Indian Agency in **South Dakota;** Nenzel and Chadron in **Nebraska;** Lake Mead in **Nevada;** Grassy Lake, Duck Lake, Norval Flats, Lassen Nat'l. Park, Pinecrest, Sierraville, Quincy, Yosemite, Shasta Co., Carville, McCloud, Descanso, Kaweah, Gray Mdw., Summit, Deer Lake, Oriental, Cannel Mdws., Mt. Wilson, Mammoth, San Gabriel R. and San Bernadino in **California;** Williams, Young, Alpine, and San Francisco Pk. in **Arizona;** Bandelier Mon. and Los Alamos in **New Mexico;** San Pedro Martir Mts. in Baja California, **Mexico;** more than 1200 specimens were seen.

The known hosts are *Pinus strobus* L., *P. resinosa* Ait., *P. banksiana* Lamb., *P. contorta* Dougl. var. *latifolia* Engelm., *P. ponderosa* Laws, *P. flexilis* James, *P. jeffreyi* Vasey; *Picea rubens* Sarg., *Picea glauca* (Moench) Voss, *Picea engelmanni* Parry. It probably attacks all pines within its range. Attacks on spruce are infrequent.

The number of females per gallery is usually 3 but varies from 1 to 5. The angle formed by the arms of the gallery (Fig. 13) is considerably wider than in galleries of most *Ips* groups.

GROUP V

Ips perroti Swaine

Ips perroti Swaine, 1915, *Canad. Ent.* 47: 356; Swaine, 1918, *Bull. Can. Dep. Agric.* 14: 110, 117; Dodge, 1938, *Bull. Univ. Minn. Agric. Exp. Sta.* 132: 48, 50; Reid, 1955, *Canad. Ent.* 87: 312-314; Hopping, 1963, *Canad. Ent.* 95: 508.

I. perroti is 2.8-3.8 mm. long and 1.0-1.4 mm. wide (Fig. 12). It is dark brown to black with the antennae and legs lighter brown.

The front of the head is evenly convex, quite finely rugose-punctate on the vertex around a small, median impunctate patch; the front below the vertex is more finely granulate than in *I. pini* and the median tubercle is nearly on the front margin which bears a row of denticles. The antennal club has straight sutures although occasional specimens have them bi-sinuate.

The pronotum is 1.2 times longer than wide with the sides nearly parallel, the front margin broadly rounded and the caudal margin strongly arcuate. The lunar rugosities vary in size with large and small ones intermixed; they do not extend more than half way back on the pronotum medially but extend farther back on the sides; the caudal half of the pronotum is rather finely and sparsely punctate with a median impunctate strip extending from the summit to the base.

The elytra are 1.4 times longer than wide; the striae are slightly impressed with the stria punctures about 0.04 mm. in diameter and separated by less than this distance; the elytral interspaces are sparsely, uniseriately punctate with about one puncture to every four of the stria punctures. The declivity is irregularly

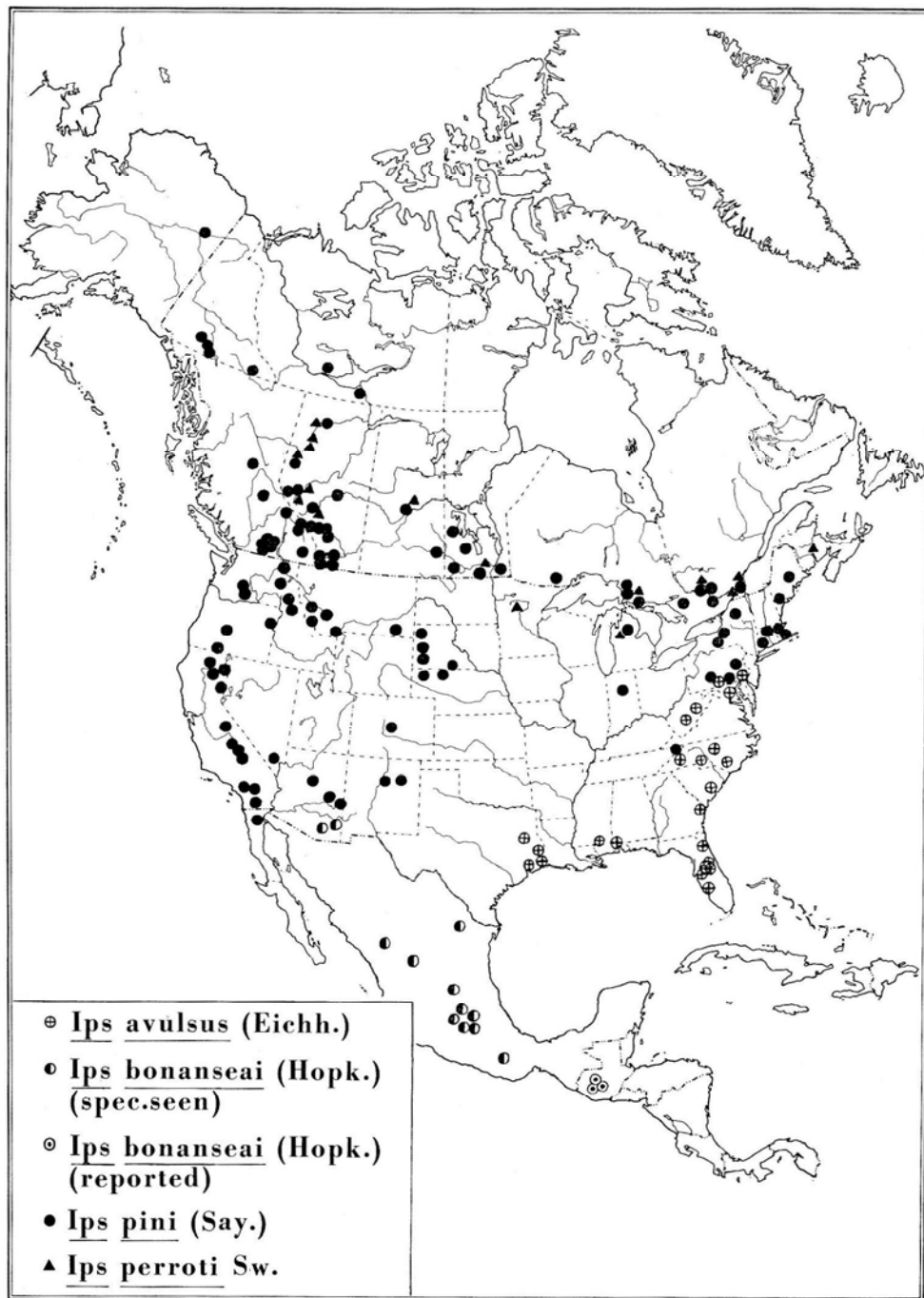


Fig. 15. Distribution of *Ips* of Groups IV and V.

punctate, with the punctures as large as those of the striae but usually separated by more than the diameter of a puncture; the caudal margin of the declivity is strongly explanate. The first declivital spine is 0.06 mm. long; it is conical and slightly hooked and acute at the tip; the second and third spines in the female are about twice the size of the first, conical, acute or sub-acute at the tip and with a basal tumescence which forms an arcuate ridge between them, the fourth spine is the same size or a little larger than the second or third and is conical with a sub-acute tip (Fig. 10). The third spine in the male is about 0.14 mm. long, capitate, acute at the tip and is sometimes bent slightly ventrad (Fig. 11).

I. perroti occurs in the boreal forest from New Brunswick westward to the Rocky Mountains. East of the Dakotas it occurs as far south as Minnesota and Michigan. Farther west it is not known to occur south of the Canada-U. S. border (Fig. 15). The type locality is Isle Perrot, Quebec. The male and female types in the Canadian National Collection have been studied.

Specimens have been examined from Salmon River in **New Brunswick**; Isle Perrot, Ft. Cologne, and St. Annes in **Quebec**; Black Sturgeon Lake and Chapleau in **Ontario**; Aweme in **Manitoba**; Prince Albert in **Saskatchewan**; Ft. Vermilion, Robb, Deadwood, Grande Prairie, Watino, Edson, Peace River, Hotchkiss, and Strachan in **Alberta**; Roscommon in **Michigan**; Lake Itasca and Itasca Park in **Minnesota**.

Hosts are *Pinus resinosa* Ait., *P. banksiana* Lamb., *P. contorta* var. *latifolia* Engelm. and probably other pines within its range. The larvae have the unique habit of feeding out for a short distance from the egg niches and then returning to pupate near the main gallery (Fig. 14).

Acknowledgments

Assistance in this revision of the Genus *Ips* from many people throughout the world will be acknowledged in the final paper on Group X.

References

- Beal, J. A., and C. L. Massey. 1945. Bark beetles and ambrosia beetles (Coleoptera : Scolytidae) with special reference to species occurring in North Carolina. *Bull. Duke Univ. School For.* 10, 178 pp.
- Hopping, G. R. 1963a. The natural groups of species in the genus *Ips* de Geer (Coleoptera: Scolytidae). *Canad. Ent.* 95: 508-516.
- Hopping, G. R. 1963b. The North American species in Group I of *Ips* De Geer (Coleoptera : Scolytidae). *Canad. Ent.* 95: 1091-1096.
- Hopping, G. R. 1963c. The North American species in Groups II and III of *Ips* De Geer (Coleoptera : Scolytidae). *Canad. Ent.* 95: 1202-1210.
- Schedl, Karl E. 1955. Die Kiefern-Borkenkäfer Guatemalas. *Z. angew. Ent.* 38: 1-48.
- Schwerdtfeger, F. 1956. Scolytidae (Col.) an *Pinus*-Arten in Mittelamerika. *Z. angew. Ent.* 39: 34-57.

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