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VARIATION AND HOMOLOGY IN ELYTRAL MACULATION IN THE *ANOPLOPHORA MALASIACA/MACULARIA* SPECIES COMPLEX (COLEOPTERA: CERAMBYCIDAE) OF JAPAN AND TAIWAN

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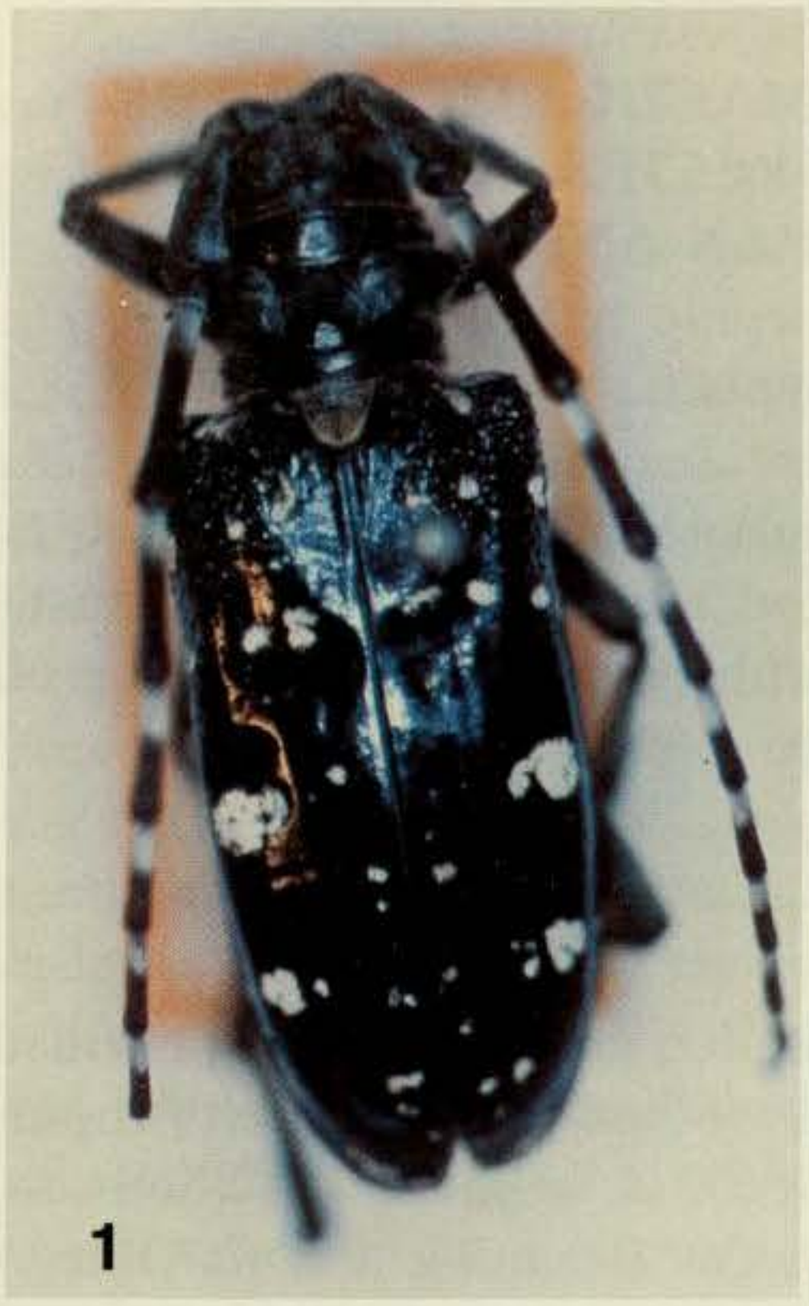
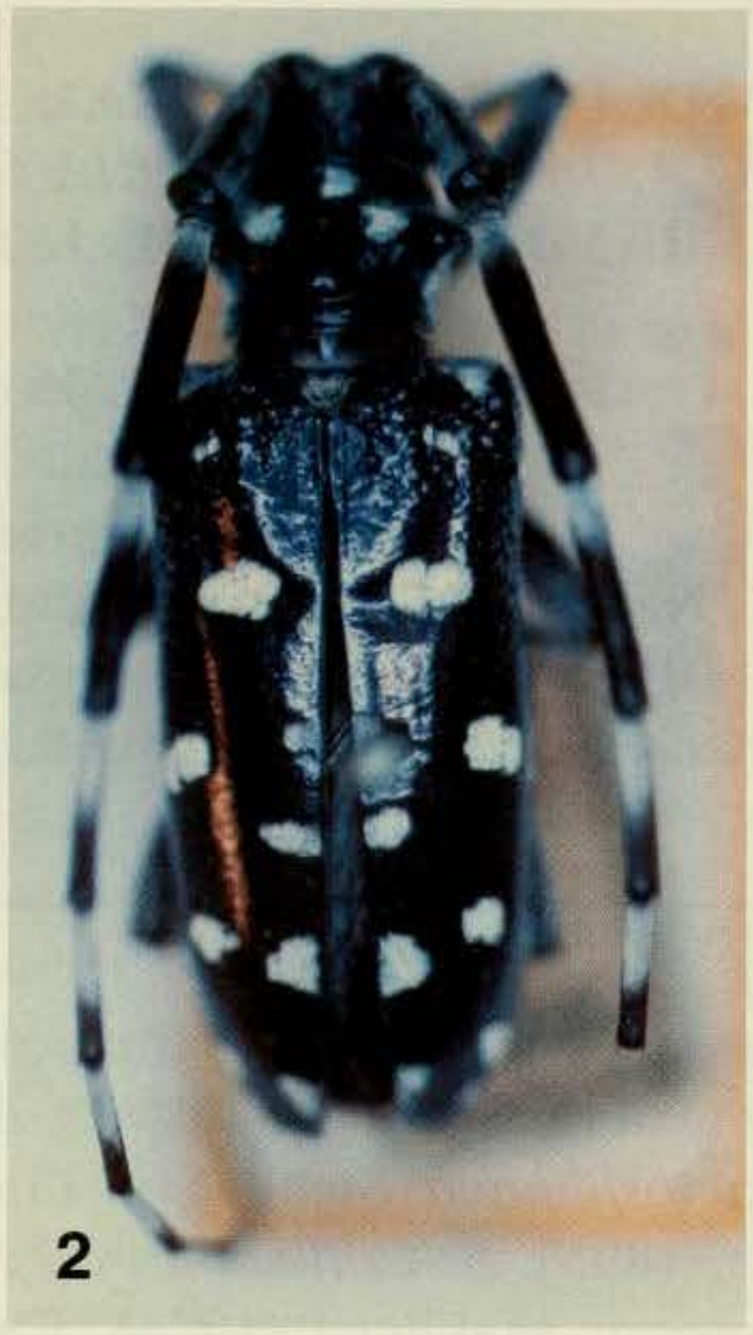
Abstract.—A description and assessment of elytral maculation and variation is provided for the following *Anoplophora* taxa in Japan and Taiwan: *Anoplophora malasiaca* (Thomson, 1865), *A. malasiaca tokunoshimana* Samuelson (1965), *A. macularia* (Thomson, 1865), *A. oshimana* (Fairmaire, 1895), *A. oshimana ryukyensis* Breuning and K. Ohbayashi (1964), and *A. ogasawaraensis* Makihara (1976). Elytral maculae are homologized and compared based on their position to each other and to other elytral features. Because considerable overlap in patterns of maculation occurs among members of the *A. malasiaca/macularia* complex, we conclude that elytral maculation alone should not be used to define these taxa.

Key Words: Asian Longhorned Beetle, *Anoplophora,* Cerambycidae, Lamiinae, Lamiini, woodborer, white-spotted citrus longhorn, Japan, Taiwan, systematics, morphoclinal variation

Our goal is to qualitatively define and assess variation of elytral maculation across individuals and species in the *Anoplophora malasiaca/macularia* complex of Japan and Taiwan. We extensively demonstrate the geographic variability in elytral maculation to assess the value of this character in *Anoplophora* taxonomy. These maculae are regions of very dense, fine, appressed white or yellow setae, arising from a field of minute punctures. Without magnification, they appear as white or yellow spots on the integument. These maculae have been used as a primary character system to distinguish species in *Anoplophora,* however no previous comparative analysis of their variation within species or homology among species has been made. These data, when combined with other morphological information in a forthcoming revision of *Anoplophora* Hope (Lingafelter and Hoebeke in prep.), will facilitate decision-making to stabilize the systematics of this group of longhorned beetles.

Approximately 40 valid species of *Anoplophora* have been described from the Oriental and eastern Palearctic regions; about 10 species and subspecies occur in Japan and Taiwan (Nakamura et al. 1982, Ohbayashi et al. 1992). This paper focuses on the *A. malasiaca/macularia* complex which includes species characterized by a black integument with white and/or flavous spots of pubescence on the elytra and pronotum, a distinct field of coarse granulae at the base of the elytra, and black and white annulated antennae. Larvae in this complex are most frequently associated with *Citrus* and have





Figs. 1–6. Taxa in *Anoplophora malasiaca macularia* complex. 1, Type of *A. malasiaca* (Thomson) (probably from Honshu, Japan). 2, Type of *A. macularia* (Thomson) (probably from Taiwan). 3, Syntype of *A. oshimana* (Fairmaire) (from Amami-Oshima, Japan). 4, Paratype of *A. oshimana ryukyensis* Breuning and K. Ohbayashi (from Yonaguni, Japan). 5, Holotype of *Anoplophora malasiaca tokunoshimana* Samuelson (from Tokunoshima, Japan). 6, Holotype of *A. ogasawaraensis* Makihara (from Ogasawara Islands, Japan).

been listed among the major insect pests in Japan (Anonymous 1981, Adachi 1988, Clausen 1931, Chang 1975, Ho et al. 1995). As generalist feeders, however, the larvae frequently develop in other tree genera including *Platanus, Acer, Zelkova, Salix,* and *Robinia* (Ohga et al. 1995). The following names have been proposed to date in the *A. malasiaca/macularia* complex: *Anoplophora malasiaca* (Thomson 1865), *A. malasiaca tokunoshimana* Samuelson (1965), *A. macularia* (Thomson, 1865), *A. oshimana*

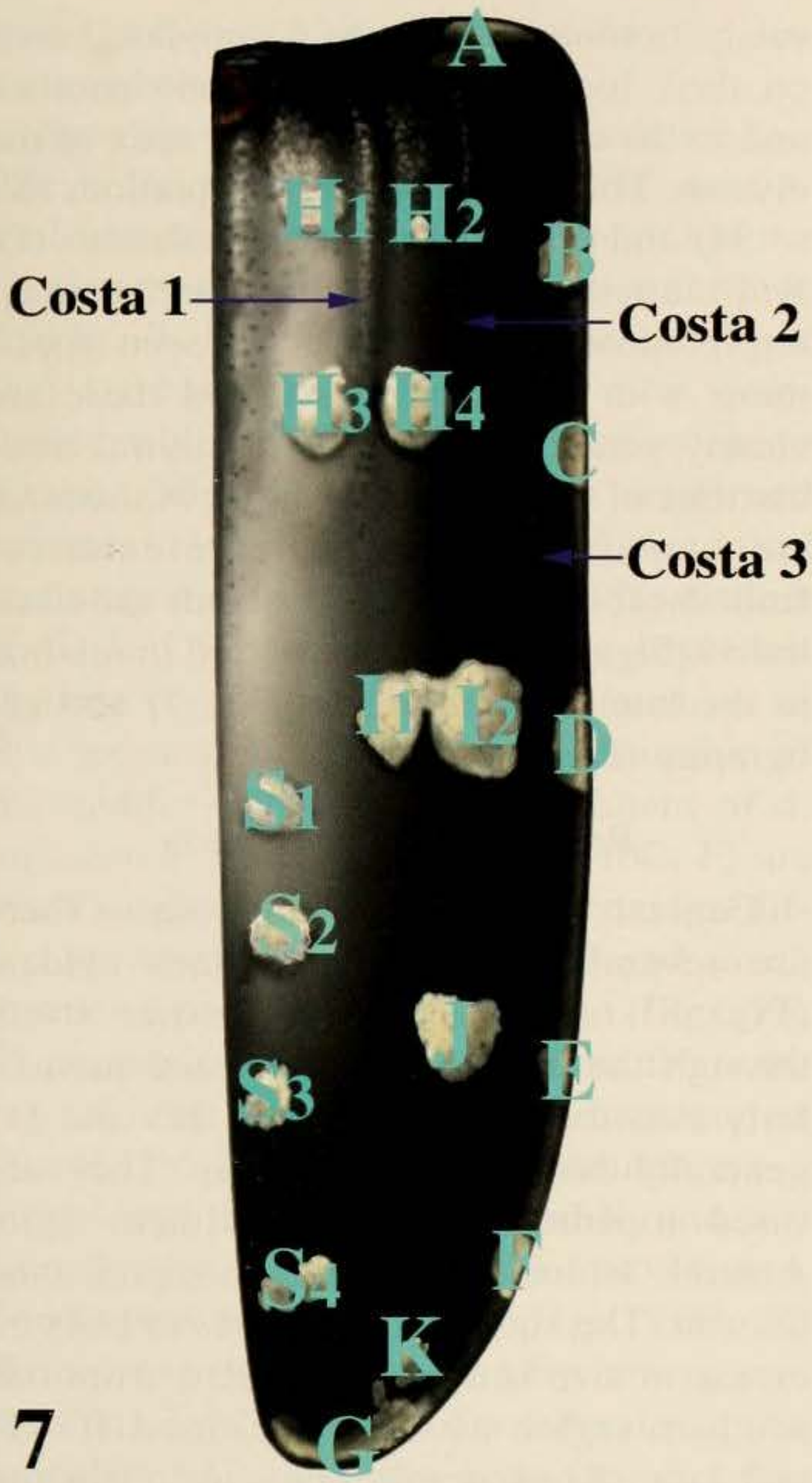


Fig. 7. Homology and designation of elytral maculations for *A. malasiaca/macularia* complex of species, based on *A. malasiaca* (Thomson) from Honshu, Japan.

(Fairmaire 1895), *A. oshimana ryukyensis* Breuning and K. Ohbayashi (1964), and *A. ogasawaraensis* Makihara (1976). We have been unable to locate the holotypes of *A. wusheana* Chang (1960) and *A. flavomaculata* (Gressitt 1934) and their affinities are unclear based on the original descriptions. Because they both have non-annulated antennae (according to the original descriptions), they probably do not belong in the *A. malasiaca/macularia* group. A brief taxonomic history and description of the aforementioned taxa follows.

Anoplophora malasiaca and *A. macularia* were described by Thomson (1865). The type of *A. malasiaca* (Fig. 1) was stated to be from "Malasia", but no additional records of other specimens from Malaysia have been found. The label on the type specimen simply states, "Malas" and could refer to the collector's name, and not a locality (N. Ohbayashi personal communication). It most closely resembles specimens common on Honshu Island, Japan. The type locality of *A. macularia* (Fig. 2) is given as "China bor.[ealis]" and resembles specimens common to southern Japan (Ryukyu Islands including Yonaguni, Ishigaki, and sometimes Tokunoshima and Amami-Oshima) and Taiwan. *Anoplophora malasiaca tokunoshimana* (Fig. 5) from Tokunoshima in the Ryukyu Islands, was described by Samuelson (1965) and said to differ from the nominate form by the presence of larger maculations and to differ from *A. oshimana* by the white (rather than pale flavous) maculations. *Anoplophora oshimana* (Fig. 3), described by Fairmaire (1895) from the island of Amami-Oshima, has larger and more flavous maculations than *A. malasiaca* (Thomson). *Anoplophora oshimana ryukyensis* Breuning and K. Ohbayashi (1964) (Fig. 4), from the island of Yonaguni in the southern Ryukyu Islands, was described to be similar to the typical form but with fine, much more distinct elytral punctures and purely white maculations. It was elevated to species status in Ohbayashi et al. (1992). *Anoplophora ogasawaraensis* (Fig. 6) was described by Makihara (1976) from the Ogasawara Islands, about 1,100 km east of the Ryukyu Islands. This species is the most geographically isolated taxon of the complex and is distinctive because of its numerous yellow and white, large and small maculations, and the apices of the elytra are more completely suffused with white. Makihara (1976) noted that it differs from *A. macularia* of Taiwan and *A. malasiaca* and *A. oshimana* of the Ryukyus by having more numerous small elytral maculations, pale (not white) pubescence on the venter, and subtle differences in the hind wing color.

Methods

Over 300 specimens of *Anoplophora* were examined for this study from the following institutions (acronyms from Arnett et al. 1993): Entomological Laboratory, College of Agriculture, Ehime University, Matsuyama, Shikoku, Japan (EUMJ); Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Kyushu, Japan (KUEC); Bernice P. Bishop Museum, Honolulu, Hawaii, United States (BPBM); National Museum of Natural History, Smithsonian Institution, Washington, D. C., United States (USNM); Museum National d'Histoire Naturelle, Paris, France (MNHN); and The Natural History Museum, London, England (BMNH).

Representatives of each taxon in the *A. malasiaca/macularia* complex from Taiwan and most of the Japanese islands were examined and photographed. Drawings of elytra were made from scans of the slides using Adobe Photoshop™ and Adobe Illustrator™ on a Macintosh™ computer. The illustrated elytron for each island represents the median or the most common representation of maculation position for specimens of each sex (when both sexes were available) for each island based on all the material seen for a given island (see Material Examined). We have standardized elytral shape and size so that information of relative size and position of the maculations is most easily interpreted. Using an elytron of a representative specimen of *A. malasiaca* from Honshu, Japan as a template, primary elytral maculations were homologized based on their locations (Fig. 7). These maculations are lettered in order, starting at the base of the elytron, continuing around the outside lateral margin to the apex, and then continuing on the disk from base to apex and left to right in cases where maculations are paired or closely associated. The lettering then continues along the suture from base to apex. The maculations are referred to by these letters in the following descriptions. In most cases, maculations are easily homologized to this template based on their locations relative to one another, and to the costae, humerus, and apex of the elytron. The loss of sutural maculations (S1 to S4) and fusion of apical maculations (G, K, F) in some specimens can complicate interpretations. Rarely have we seen specimens with no maculations, and these are clearly genetic aberrants. The elytral maculations of each taxon in the *A. malasiaca/macularia* complex and representatives from most of the Japanese islands are illustrated (Figs. 9–12) and discussed in relation to the homology template (Fig. 7) and geography (Fig. 8).

Results and Discussion

General trends in maculations.—There are several morphological clines evident (Fig. 8). As one moves farther south through the Japanese Islands, and particularly into the Ryukyu Islands, H3 and H4 generally become much larger. They are fused together in most specimens from Amami-Oshima, Ishigaki, Yonaguni, and Taiwan. The sutural maculations (S1–4) increase in size in most specimens from this southern region as well. The fused H3-H4 and large S1–4 maculations are characteristic of the type of *A. macularia* (Fig. 2), most of the syntypic series of *A. oshimana* (Fig. 3), and *A. oshimana ryukyensis* (Fig. 4). *Anoplophora malasiaca tokunoshimana* (Fig. 5) is similar, but there are small secondary maculations scattered around the basal half of the elytra and the sutural maculations are not noticeably larger than the typical *A. malasiaca* from Honshu.

Maculations are predominately white except for most specimens from the northern and middle Ryukyu Islands (Yakushima, Amami-Oshima, and Okinawa), where the maculations vary from off-white to flavous to orange. Some specimens from Tsushima in southwest Japan (but north of the Ryukyu Islands) also have flavous maculations. Aside from these minor clines, the pattern of maculations does seem to vary slightly from one locality to another. The specific

patterns for each taxon and locality are discussed below.

Specific descriptions of maculations.—The holotype of *A. malasiaca,* like most *A. malasiaca* specimens from Honshu, has the characteristic pattern of maculations shown in Fig. 7. Specimens from Honshu (Figs. 9C, D) have the maculations most commonly white, but occasionally off-white to flavous. Maculations H1–4 are small and separate, I1–2 are partially fused, the apical maculations are small, usually with distinct F, G, and K maculae, S1–4 are small but distinct (occasional secondary maculae in this region) and S1 is always posterior of the middle of the elytron. Specimens of *A. malasiaca* from Kyushu (Figs. 10E, F) are most similar to Honshu specimens, but differ by having I1 and I2 fused and much smaller. Specimens from Hachijo (Figs. 9E, F), to the east of Honshu, differ from the typical form by having smaller maculations, I1 and I2 divided, the apical maculation enlarged with fusion of F, G, and K, and two sutural maculae, probably S1 and S4, lost. Specimens from Shikoku (Figs. 10C, D) differ from the typical form by having separate I1 and I2, a loss of a sutural macula, probably S1 or S4, the presence of a few small, secondary maculae, a more clear separation of the apical maculae F, G, and K, and off-white to flavous representatives are more common in the populations. Specimens from Tsushima (Figs. 10A, B) are quite similar to the typical form but have the maculations bolder and more commonly with flavous representatives. The apical maculae (F, G, and K) are partially fused. Hokkaido specimens (Figs. 9A, B) have very large fused patches of I1-I2 and J is typically quite large. The apical patches of F, G, and K are fused. Two sutural maculae (unable to make specific determination) are lost. In the northern and middle Ryukyu Islands, off-white to flavous maculated specimens of *A. malasiaca* occur in greater proportions in the populations. On Yakushima, specimens have bold white to off-white maculations (Figs. 11A, B). In particular H3-H4 and some of the sutural maculae are quite bold; otherwise, Yakushima specimens are similar to Honshu specimens.

Anoplophora oshimana (Figs. 3, 11C, D) from Amami-Oshima have the greatest proportion of flavous-maculated individuals of any region. They are also characterized by the large sutural maculae and fusion of H3 to H4 and I1 to I2. Tokunoshima specimens, described by Samuelson (1965) as *A. malasiaca tokunoshimana* (Fig. 5), vary from most *A. oshimana* by having white maculations and more numerous small, secondary maculae along the basal half and suture of the elytra. Specimens of *A. oshimana* from Okinawa (Fig. 11E, F) and Miyako (Fig. 12A) in the southern Ryukyu Islands typically have H3-H4 separate, and the sutural and apical maculae are much smaller than in specimens from other Ryukyu localities. Yonaguni specimens, described as *A. oshimana ryukyensis* by Breuning and K. Ohbayashi (1964) and treated as a species in Ohbayashi et al. (1992) (Figs. 4; 12C, D), have very large, bright white maculae. H1 is nearly fused with H2; H3 and H4 are fused into a broad macula; I1, I2, and D are all fused into a large patch; J is large and fused with E in many individuals. Specimens from Taiwan and Ishigaki, generally referrable to *A. macularia* (Figs. 2; 12B, E, F) are similar to *A. o. ryukyensis,* but with less fusion of J to E and I to D.

The most extreme variant within the *A. malasiaca/macularia* complex is *A. ogasawaraensis* (Fig. 6) but its maculations can be easily homologized with the typical form. The color of the maculations is unique among members of the *A. malasiaca/macularia* complex. The maculae are flavous around the outside of the elytra, while the discal maculae are mostly white. Color aside, it is most similar to specimens from the southern Ryukyus, in particular Miyako and Okinawa, by having separate H3 and H4 maculae, but very large and nearly fused I2-D and J-E maculae. The apex is fully maculate with F, G, and K

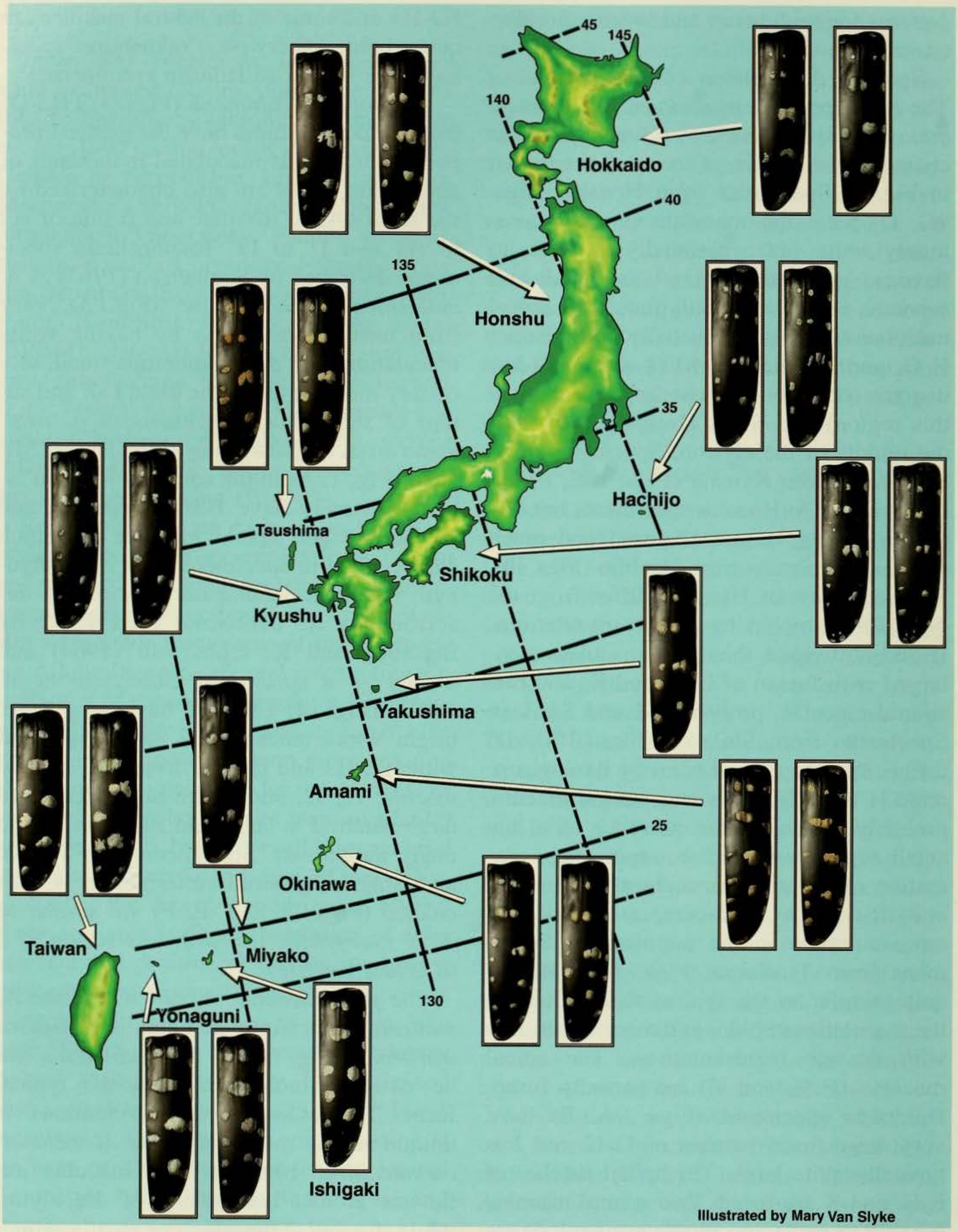


Fig. 8. Map of Japan and Taiwan showing geographical clinal variation in elytral maculation for all members of *A. malasiaca/macularia* complex of species. Thumbnail elytra are more fully illustrated in Figs. 9–12.

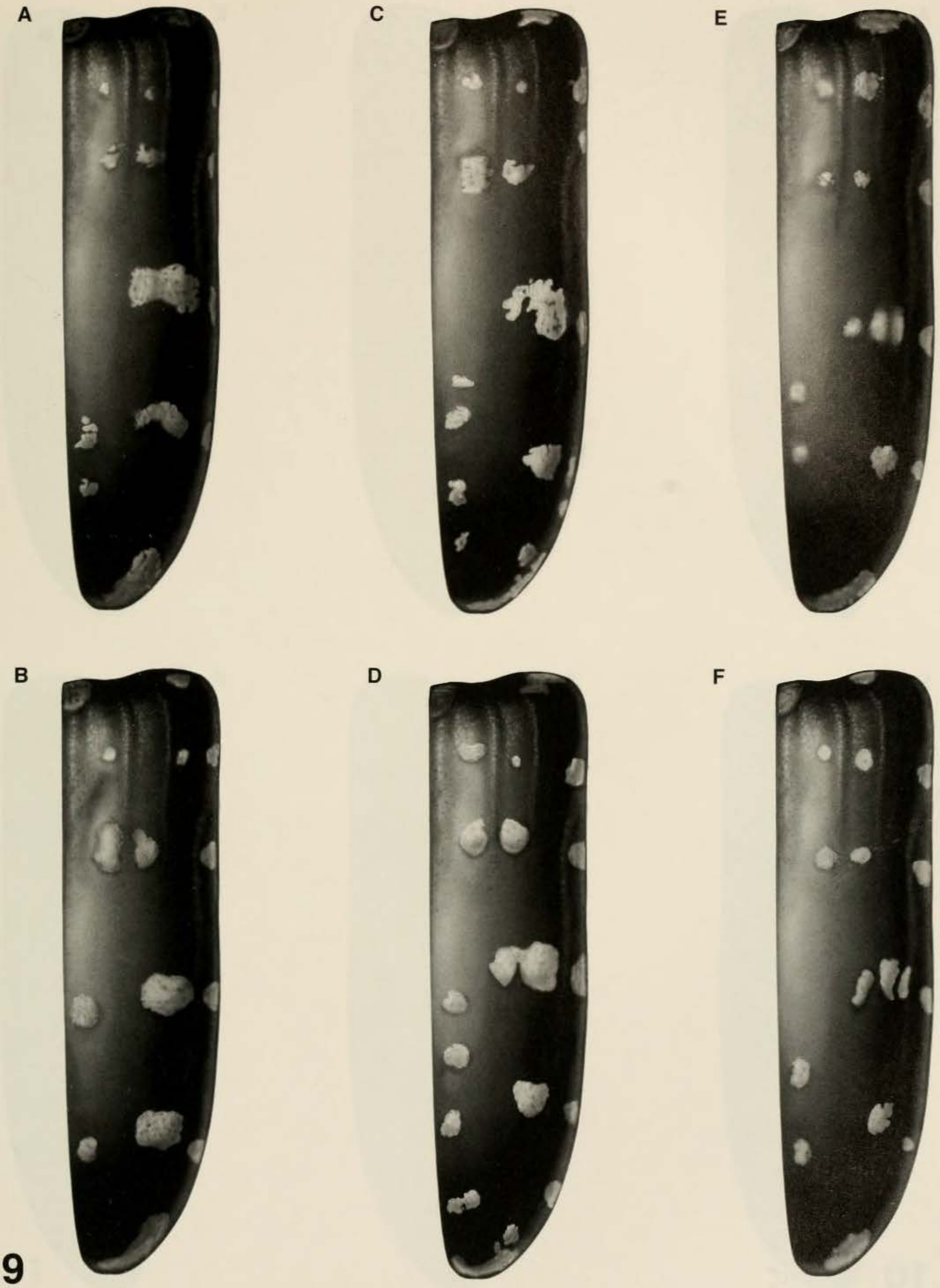


Fig. 9. Representative elytra of *A. malasiaca* (Thomson) from various Japan Islands. A, Hokkaido (female). B, Hokkaido (male). C, Honshu (female). D, Honshu (male). E, Hachijo (female). F, Hachijo (male).

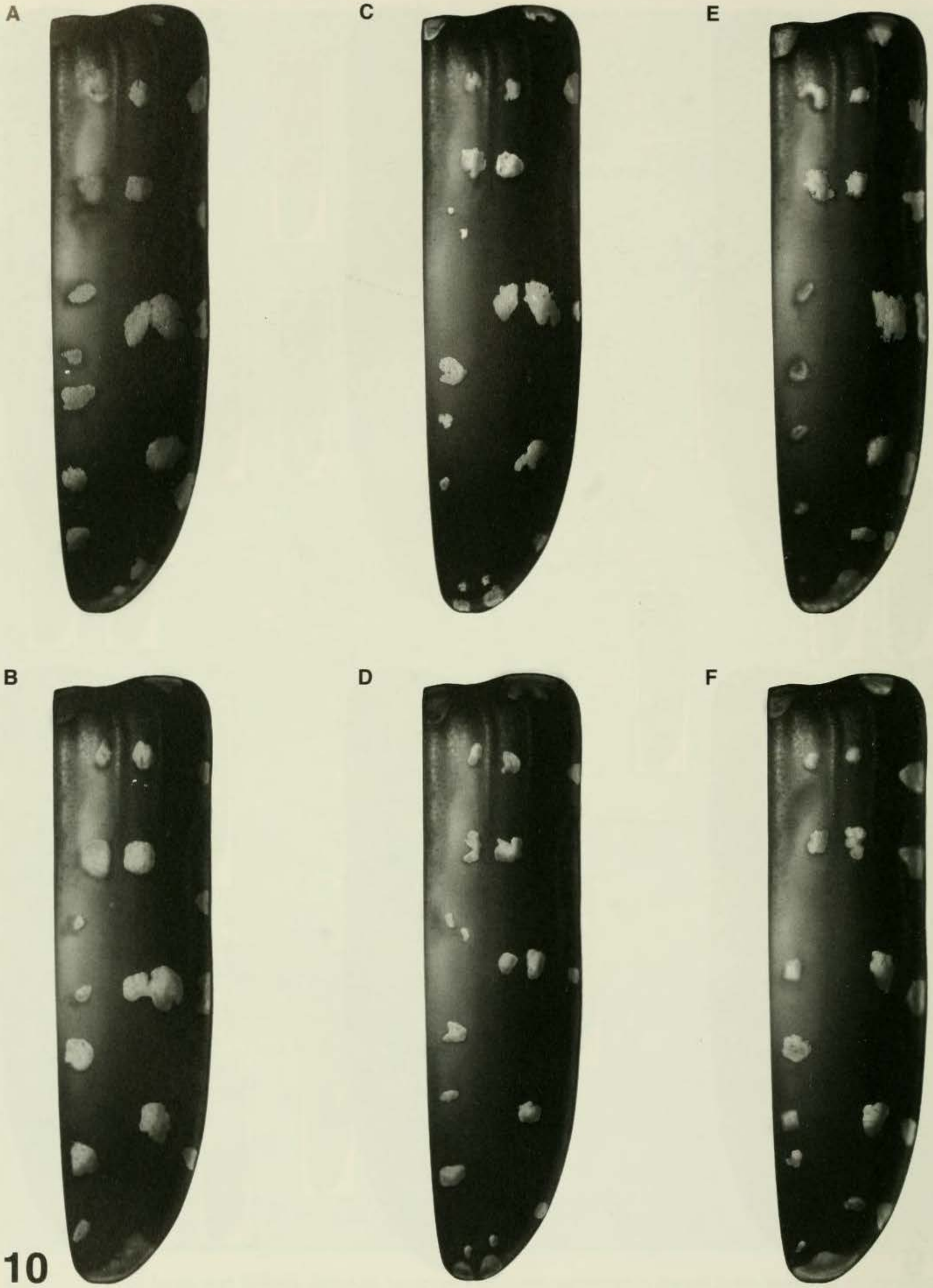


Fig. 10. Representative elytra of *A. malasiaca* (Thomson) from various Japan Islands. A, Tsushima (female). B, Tsushima (male). C, Shikoku (female). D, Shikoku (male). E, Kyushu (female). F, Kyushu (male).

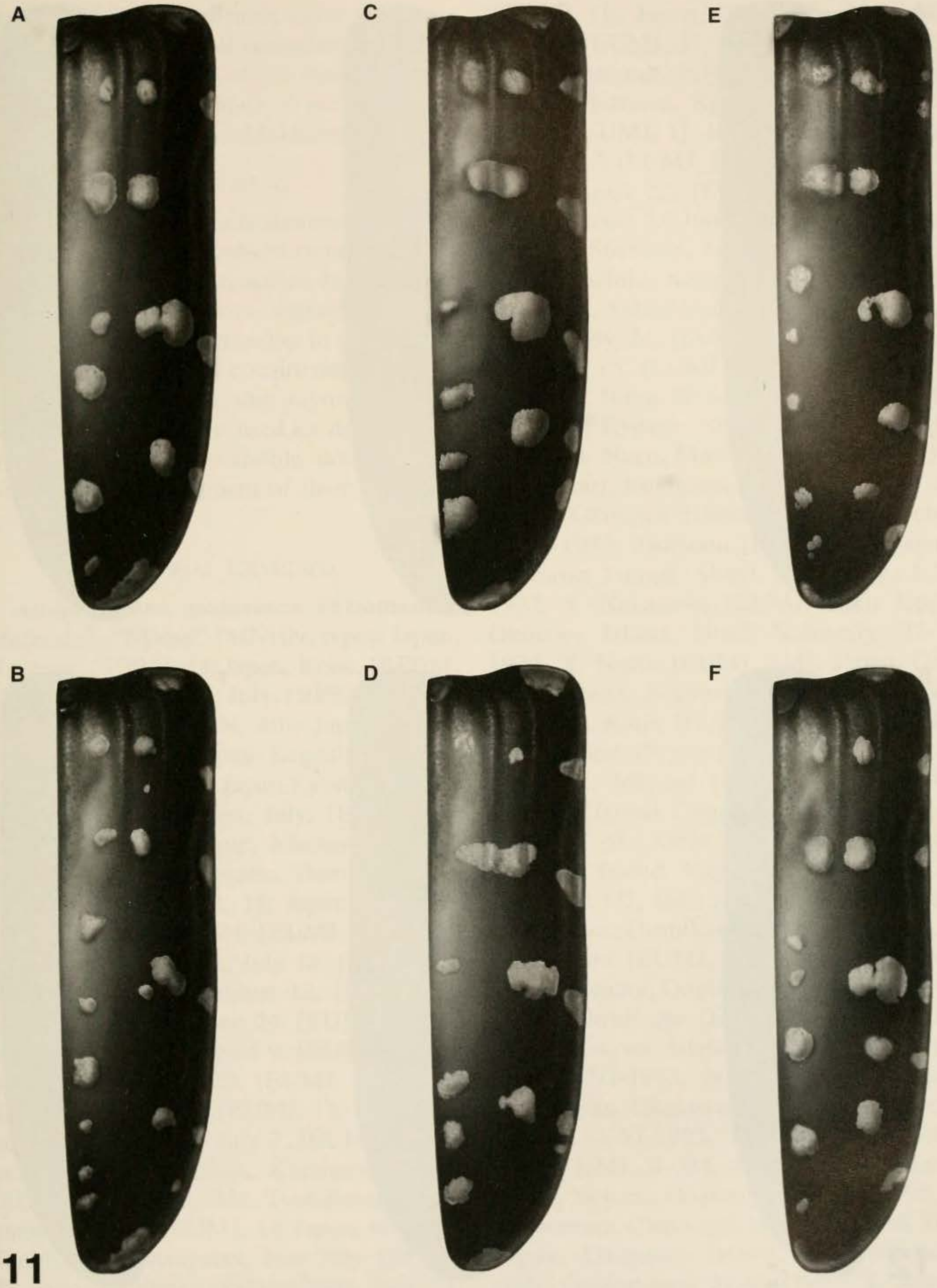


Fig. 11. Representative elytra of *A. malasiaca* (Thomson) from: A, Yakushima (male); B, Yakushima (male). Representative elytra of *A. oshimana* (Fairmaire) from: C, Amami-Oshima (female); D, Amami-Oshima (male); E, Okinawa (female); F, Okinawa (male).

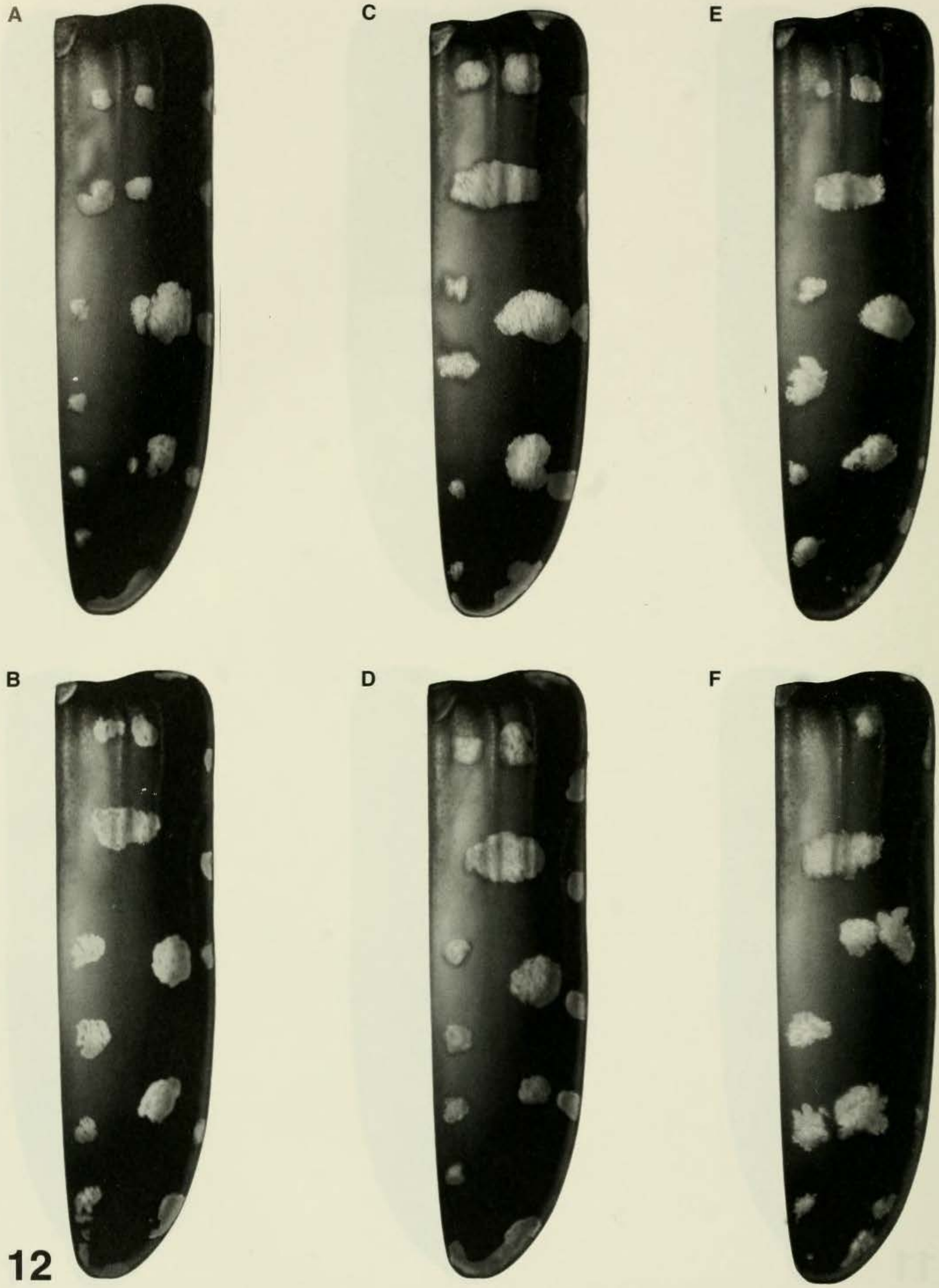


Fig. 12. Representative elytron of *A. oshimana* from: A, Miyako (female). Representative elytra of *A. oshimana ryukyensis* Breuning and K. Ohbayashi from: C, Yonaguni (female); D, Yonaguni (male). Representative elytra of *A. macularia* (Thomson) from: B, Ishigaki (male); E, Taiwan (female); F, Taiwan (male).

fused. It differs from most other forms by having numerous small secondary maculae, and by the characters of the ventral pubescence and slight curvature of the tegmen as originally described by Makihara (1976).

Conclusions

Our comparative study demonstrates that there are some geographical trends in some features of the elytral maculae, but there are also seemingly random variant patterns, with no apparent relationship to geography. Based on our careful consideration of this variability, we assert that elytral maculations alone cannot be used to define taxa, and further, their use should not be made without acknowledgment of their variability.

Material Examined

***Anoplophora malasiaca* (Thomson)**: Malaysia?, "Malas" [MNHN, type]; Japan, Hayama, [BPBM, 1]; Japan, Kobe, [BPBM, 1]; Japan, Mimasaka, July, [BPBM, 1]; Tokyo; Gensan, [MNHN, 40]; Japan, Yokohama, [BPBM, 1]; Japan, Kagoshima, Chiran, July, [BPBM, 1]; Japan,Kyoto, [BPBM, 2]; Japan, Nagano-ken, July, [BPBM, 1]; Japan, Shikoku, Ehime, Matsuyama, July [EUMJ, 1]; Japan, Honshu, Tiamuji, Bushicity, August, [EUMJ, 1]; Japan, Shikoku, Cape Ashizuri, July 24, [EUMJ, 1]; Japan, Ninomiya, Kanagawa, July 18, [EUMJ, 1]; Japan, Mt. Yatsu, August 13, [EUMJ, 1]; Japan, Seki, Gifu, June 24, [EUMJ, 1]; Japan, Idani, Gifu, August 9, [EUMJ, 1]; Japan, Nagoya, June 25, [EUMJ, 1]; Japan, Seki, Gifu, June 29, [EUMJ, 1]; Japan, Ninomiya, Kanagawa, July 7, [EUMJ, 1]; Japan, Miura Peninsula, Kanagawa, July, [EUMJ, 1]; Japan, Mt. Tyotokusan, Okayama, June 22, [EUMJ, 1]; Japan, Shikoku, Tanimachi, Matsuyama, June/July, [EUMJ, 2]; Japan, Shikoku, Odamiyama, July 21, [EUMJ, 5]; Japan, Shikoku, Tarumi, Matsuyama, [EUMJ, 1]; Japan, Tsushima, Sasuna, 25–30 July, [EUMJ, 1]; Japan, Tsushima, Mt. Ohtoshiyama, 28 June, [EUMJ, 1]; Japan, Tsushima, Mt. Tatena, October 10, [EUMJ, 1]; Japan, Tsushima, Nagasaki, July 23, [EUMJ, 1]; Japan, Hokkaido, Kiyobe, Matsumae, July 5, [EUMJ, 1]; Japan, Kyushu, Kanose, Kuma vil., Kumamoto, June 6, [EUMJ, 1]; Japan, Kyushu, Chikugo, July 17, [EUMJ, 1]; Japan, Ishigaki, Mt. Banna, April 22, [EUMJ, 1]; Japan, Miyako, Hirara, 21 June, [EUMJ, 1]; Japan, Hachijo, Sueyoshi, July 8–15, [EUMJ, 6]; Japan, Hachijo, Kashidata, July 4, [EUMJ, 6]; Japan, Yakushima, Anbou, Kagoshima, July 6, July 24, [EUMJ, 2]; Japan, Okinawa, May 15, [EUMJ, 1]; Japan, Okinawa, Sueyoshi, Naha, 28 June, April 30, [EUMJ, 2]; Japan, Ryukyo, Shuri, May 27, [EUMJ, 1]; Japan, Nago, May–July, [EUMJ, 3]; Japan, Takari, Kunigami, June 29, [EUMJ, 2]; Japan, Okinawa Island, Shuri, Naha-city, 20-VI-1975, Tsutsumi [EUMJ, 1F]; Japan, Okinawa Island, Shuri, Naha-city, 1-V-1977, T. Nakamoto [EUMJ, 1M]; Japan, Okinawa Island, Shuri, Naha-city, 27-V-1975, Y. Notsu [EUMJ, 1M]; Japan, Okinawa Island, Sueyoshi, Naha-city, 16-VI-1976, M. Kinjo [EUMJ, 1M]; Japan, Okinawa Island, Ooyama, Ginowan-city, 17-V-1970, K. Miyagi [EUMJ, 1M]; Japan, Okinawa Island, Gogayama, Nakijin-son, 9-VI-1979, M. Kinjo [EUMJ, 1M]; Japan, Okinawa Island, Nago-city, 13-V-1980, N. Ooba [EUMJ, 1M]; Japan, Okinawa Island, Gushikawa, Gushikawa-city, 1-VII-1995, T. Matsumura [EUMJ, 1F]; Japan, Okinawa Island, Uehara, Oogimi-son, 22-VI-1999, S. Inada, Citrus spp. [EUMJ, 3–1M, 2F]; Japan, Okinawa Island, Takasato, Oogimi-son, 29-VI-1993, N. Ohbayashi [EUMJ, 1M]; Japan, Okinawa Island, Nejime, Oogimi-son, 2-VI-1995, T. Matsumura, Citrus spp. [EUMJ, 7–3M, 4F]; Japan, Okinawa Island, Nejime, Oogimi-son, 18-VI-1995, T. Matsumura, Citrus spp. [EUMJ, 4–1M, 3F]; Japan, Okinawa Island, Mt. Nekumachiji, Oogimi-son, 24-VII-1995, T. Sasaki [EUMJ, 1F]; Japan, Okinawa Island, Mt. Nekumachiji, Oogimi-son, 8-VIII-1995, T. Sasaki [EUMJ, 1F]; Japan, Okinawa Island, Mt. Nekumachiji, Oogimi-son, 14-VII-1996, T. Sasaki [EUMJ, 1F]; Japan, Oki-

nawa Island, Kakazu, Ginowan-city, 30-IV-1995, T. Matsumura [EUMJ, 1F]; Japan, Okinawa Island, Kakazu, Ginowan-city, 11-V-1971, Tukasa Kohama [EUMJ, 1F]; Japan, Okinawa Island, Syoshi, Nakijin-son, 18-VI-1995, T. Matsumura [EUMJ, 1F]; Japan, Okinawa Island, Yona, Kunigami-son, 18-VII-1999, Teruya [EUMJ, 1M].

***A. oshimana* (Fairmaire, 1895)**: Japan, Liao-Kiou Archipelago, I'le de Shima, Amami Island, June, July [BMNH, part of syntype series, 21]; Japan, Liou-Kiou Archipelago (I'le de Oshima), Ferrie coll., [MNHN, part of syntype series, 200]; Japan, Liao-Kiou Archipelago, I'le de Shima, Amami Island, [USNM, 2]; Japan, Amami, Hatsuno, July 3, [EUMJ, 1]; Japan, Amami Isl., Mt. Ogami, June 30, [EUMJ, 1]; Japan, Amami, Yakkachi, June2, [EUMJ, 1]; Japan, Amami-Oshimana, July, [EUMJ, 1]; Japan, Amami, Shimura, June 12, [EUMJ, 1]; Japan, Amami, Koshuku, June 5, [EUMJ, 1]; Japan, Amami, Sakibaru, June 18, [EUMJ, 1]; Japan, Amami, Higashinakame, July 17, [EUMJ, 1]; Japan, Hatsuno, Amami-Oshimana, July 27, [EUMJ, 1]; Japan, Shimura, July 19, [EUMJ, 1]; Japan, Amami, Hatsuno, July 3, [EUMJ, 1]; Japan, Naze, Amami, June 13, [EUMJ, 1]; Japan, Okinawa Island, Yamada, Onna-son, 6-VII-1999, M. Kimura, ex. Schima liukiuensis [EUMJ, 4–3M, 1F]; Japan, Okinawa Island, Yofuke, Nago-city, 3-VI-1999, S. Inada [EUMJ, 1F]; Japan, Okinawa Island, Isagawa, Nago-city, 27-V-1999, Sakashita [EUMJ, 1F].

***A. oshimana ryukyensis* Breuning and K. Ohbayashi (1964)**: Japan, Is. Yonakuni, Tabaru-gawa, May 15, 1963, Y. Arita coll. [EUMJ, holotype]; Japan, Yonakuni, Sonai and Mt. Urabe, May 16, July 6, July 8, July 11 [EUMJ, 10 paratypes].

***A. macularia* (Thomson, 1865)**: China bor., (no specific data), [MNHN, type]; Formosa (Taiwan), Sengpei, May 5, [EUMJ, 1]; Formosa (Taiwan), Mt. Yangminshan, June 3, [EUMJ, 1]; Formosa (Taiwan), Kenfing Park, Pingtung, May 3, June 5, [EUMJ, 2]; Taiwan, Jieyuehtan, Nantou, June 2, [EUMJ, 1]; Taiwan, Lu-Shan, May 23, [EUMJ, 1]; Taiwan, Nanshanchi, June 23, [EUMJ, 1]; Taiwan, Rozan, 1200m, July 29–30, [EUMJ, 1]; Taiwan, Peipo Hsinchu Hsien, June 7, [EUMJ, 1]; Taiwan, Chihpen Spa, Taitung Hsien, June 11, [EUMJ, 1]; Taiwan, Wulei, July 3, [EUMJ, 1]; Japan, Okinawa Island, Furushima, Naha-city, 29-VI-1999, Teruya [EUMJ, 1F]; Japan, Okinawa Island, Tomari, Naha-city, 3-VII-1999, M. Kimura [EUMJ, 2-M, F]; Japan, Okinawa Island, Tomari, Naha-city, 27-VII-1999, M. Kimura, Melia azedarach var. subtripinnata [EUMJ, 2-M, F]; Japan, Okinawa Island, Sueyoshi, Naha-city, 28-VI-1993, N. Ohbayashi [EUMJ, 4M]; Japan, Okinawa Island, Sueyoshi, Naha-city, 30-VII-1999, M. Kimura [EUMJ, 2F]; Japan, Okinawa Island, Maejima, Naha-city, VI-1999, H. Nakachi, Melia azedarach var. subtripinnata [EUMJ, 3–2M, 1F]; Japan, Okinawa Island, Ikehara, Okinawa-city, 30-VI-1999, S. Inada, Melia azedarach var. subtripinnata [EUMJ, 8–6M, 2F]; Japan, Okinawa Island, Goya, Okinawa-city, 29-VI-1999, S. Inada [EUMJ, 2-M, F]; Japan, Okinawa Island, Goya, Okinawa-city, 29-VI-1999, M. Kimura [EUMJ, 1F]; Japan, Okinawa Island, Yogi, Okinawa-city, 30-VI-1999, M. Kimura, Melia azedarach var. subtripinnata [EUMJ, 2M]; Japan, Okinawa Island, Yogi, Okinawa-city, 2-VII-1999, S. Inada [EUMJ, 3–2M, 1F]; Japan, Okinawa Island, Nishihara, Nakagami-gun, 1-VII-1999, T. Sasaki [EUMJ, 1F]; Japan, Okinawa Island, Nishihara, Nakagami-gun, 27-VII-1999, Teruya [EUMJ, 1F]; Japan, Okinawa Island, Kadena, Nakagami-gun, 9-VII-1999, N. Kawauchi [EUMJ, 1M]; Japan, Okinawa Island, Nakahusuku, Nakagami-gun, 27-VII-1999, T. Sasaki [EUMJ, 14M]; Japan, Okinawa Island, Kanekodan, Gushikawa-city, 30-VI-1999, S. Inada, Melia azedarach var. subtripinnata [EUMJ, 6–5M, F]; Japan, Okinawa Island, Kojya, Okinawa-city, 3-VII-1999, S. Inada, Melia azedarach var. subtripinnata [EUMJ, 5–3M, 2F]; Japan, Okinawa Island, Miyasato, Gushikawa-city, 15-V-1995, T. Matsumura

[EUMJ, 1M]; Japan, Okinawa Island, Nashiro, Itoman-city, 30-VII-1999, S. Inada [EUMJ, 1M]; Japan, Okinawa Island, Tamagusuku, Shimajiri-gun, 26-VII-1999, T. Sasaki [EUMJ, 1F]; Japan, Okinawa Island, Okubi, Kunigami-gun, 21-VII-1999, Teruya [EUMJ, 1M].

***A. malasiaca tokunoshimana* Samuelson (1965)**: Japan, Amami Group, Tokunoshima, Mikyo, 200m, July 27, 1963, J. L. Gressitt, Coll. [BPBM, holotype].

***A. ogasawaraensis* Makihara (1976)**: Japan, Ogasawara Isls., 2, VI, 1915, M. Suzuki, leg., [KUEC, holotype].

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