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A REVISION OF THE JAPANESE SPECIES OF
THE GENUS *ASPIDIOTUS*, WITH DESCRIPTIONS
OF A NEW GENUS AND A NEW SPECIES

(Homoptera: Coccoidea)

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So far as the writer is aware, 5 species included in the genus *Aspidiotus* have been recorded in Japan. In the course of the present study, however, the writer has come to the conclusion that *Aspidiotus stauntoniae* TAKAHASHI and *Aspidiotus multipori* TAKAHASHI should be referred to the new genus *Meta-aspidiotus* which will be described herein after. On this occasion will be described a new species belonging to the genus *Temnaspidotus* which is also quite close to *Aspidiotus*.

The writer wishes here to acknowledge his great indebtedness to Prof. Dr. T. UCHIDA and Prof. Dr. C. WATANABE for their kind continuous guidance and encouragement. He is also sincerely grateful to Prof. Dr. R. TAKAHASHI not only for his kindness in offering invaluable specimens and literature, but also for his very helpful advice.

Genus *Aspidiotus* BOUCHÉ

Aspidiotus BOUCHÉ (1833), Naturgesch. schäd. nütz. Gart.-Ins., p. 52;
FERRIS (1941), Microent., Vol. 6, Pt. 2, p. 1; BALACHOWSKY (1948), Actual.
Sci. Indust., 1054 (Les Cochenilles IV), p. 273.

Genotype: *Chermes hederæ* VALLOT (1829).

It should be emphasized here that in this genus the marginal setae of the pygidium are always of usual form, not lanceolate.

Authentically 3 species belonging to the genus have been known in Japan. Although *A. hederæ* has been recorded, it lives only in green houses.

Key to the Japanese species

(Adult female)

1. Third lobe much reduced in size, represented by a small conical projection. Dorsal macroducts numerous, present on pygidium and also on prepygidial abdominal segments, slender and rather short. *A. ophiopogonus*.
- Third lobe slightly smaller than the second. Dorsal macroducts, present only on pygidium, long. 2

2. Median lobe more or less extending beyond apex of the second. *A. cryptomeriae*.
 - Median lobe not or scarcely extending beyond apex of the second. *A. destructor*.

Aspidiotus cryptomeriae KUWANA

Aspidiotus cryptomeriae KUWANA (1902), Pap. Cal. Acad., Vol. 3, Pt. 3, p. 69; Ibid. (1933), Minist. Agr. For., Dep. Agr., Sci. Bull., No. 3 (Diasp. Cocc. Japan, VII), p. 4; TAKAHASHI et TACHIKAWA (1956), Tr. Shikoku Ent. Soc., Vol. 5, Pars 1-2, p. 14.

Adult female—Body ovate, attaining 1.5 mm. in length. Prepygidial segment membranous. Prosomatic tubercle at most represented by a somewhat sclero-

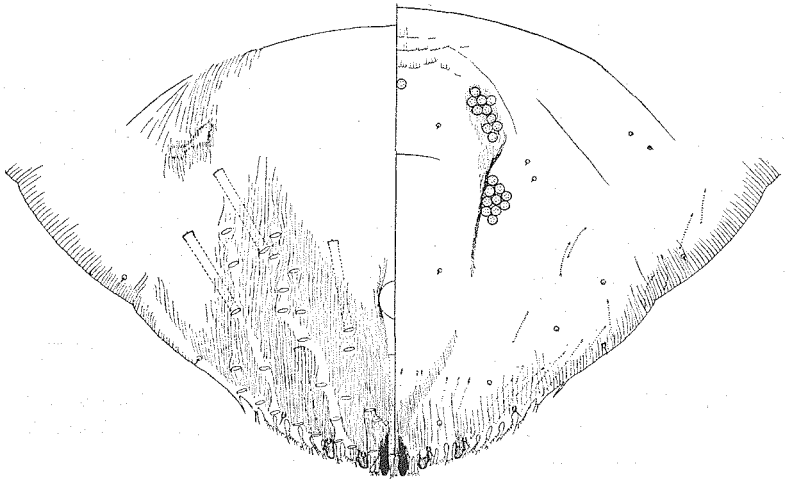


Fig. 1. *Aspidiotus cryptomeriae* KUWANA.

Adult female: pygidium, figured from a specimen collected on *Torreya* at Amagi-san, Sizuoka-ken.

tized patch of derm. Distinct intersegmental furrows on pygidium. Perivulvar pores in 4 or 5 groups; 0 or 1-6 pores in median group, 7-16 in the laterocephalic, and 4-14 in the laterocaudal. Anus elliptical, definitely longer than median lobe; distance between anus and bases of median lobes 2-3 times anal length. Dorsal macroducts long, arranged as follows: marginal ducts, 1 between median lobes and also between the median and second, usually 2 between the second and third, and a few ducts beyond third lobe on fifth and sixth, and sometimes also fourth, abdominal segments; submarginal ducts mostly in intersegmental furrows of pygidium. Prepygidial macroducts absent. Lobes in 3 pairs, parallel to longitudinal axis of body, or lateral pairs being sometimes slightly convergent. Median lobe strongly sclerotized, almost straight on lateral

margins or slightly spatulate, round apically, with a subapical notch on outer side and sometimes also on inner side, or sometimes entire, variable in length, but always more or less exceeding lateral lobes. Second lobe as long as wide or a little longer than wide, more or less narrowed basally, very flatly round apically, with a distinct notch on outer side alone, or sometimes almost entire. Third lobe similar to the second, but slightly smaller. Fringed marginal spines as long as or slightly exceeding lobes; 2 spines between median lobes and also between the median and second, 3 between the second and third; a series of spines beyond third lobe on fifth and sixth abdominal segments, well developed, oblique on outer margin.

Scale—In female circular or oval, flatly convex, grayish brown, with first exuvium central and yellow; in male similar, oval.

Specimens examined: 12 adult females, Amagi-san, Sizuoka-ken, Honsyu, 27. and 28. V, 1955, S. TAKAGI leg., hosts—*Torreya nucifera* (L.) SIEBOLD et ZUCCARINI and *Abies* sp.; 10 adult females, Sapporo, Hokkaido, 28. VII, 1956, S. TAKAGI leg., host—*Taxus cuspidata* SIEBOLD et ZUCCARINI.

This species infests the leaves of the hosts. It has been recorded by KUWANA (1933) from various conifers including *Abies*, *Chamaecyparis*, *Cryptomeria* and *Pinus*. In this paper *Torreya* and *Taxus* should be added to the list of hosts. This species is widely distributed over the island of Japan.

This species is closely allied to *A. destructor*, from which it may be distinguishable by the preceding key. Furthermore, it seems that the second and third lobes in the former are somewhat more robust than in the latter, being almost as long as wide or only a little longer than wide. The difference between these species is quite apparent in the food plants and distribution as mentioned by TAKAHASHI and TACHIKAWA (1956).

The pygidial lobes in the specimens taken at Sapporo are much shorter than in those from Amagi-san, and also the pygidium in the former is less protruding than in the latter.

Aspidiotus destructor SIGNORET

Aspidiotus destructor SIGNORET (1896), Ann. Soc. Ent. Fr., sér. 4, tome 9, p. 120; KUWANA (1933), Minist. Agr. For., Dep. Agr., Sci. Bull., No. 3 (Diasp. Cocc. Japan, VII), p. 9; FERRIS (1933), Atl. Scale Ins. N. Amer., SII-191; Ibid. (1941), Microent., Vol. 6, Pt. 2, p. 51; BALACHOWSKY (1948), Actual. Sci. Indust., 1054 (Les Cochenilles IV), p. 275; TAKAHASHI et TACHIKAWA (1956), Tr. Shikoku Ent. Soc., Vol. 5, Pars 1-2, p. 13.

Specimens examined: a few adult females, Sizuoka, Honsyu, IX, 1950, J. MINAMIKAWA leg., host—*Thea chinensis* L., determined by Dr. R. TAKAHASHI as *Aspidiotus destructor*.

The present species lives on various plants, but is not recorded from conifers. TAKAHASHI and TACHIKAWA (1956) have mentioned *Camellia*, *Daphne*, *Thea* and *Trachelospermum* as its hosts in Japan. This species is a well known tropicopolitan, distributed over the world in the tropical and subtropical areas.

According to TAKAHASHI and TACHIKAWA (1956) it is found in Sikoku and Kyusyu, and also in Honsyu along the southern coast of the western half.

Aspidiotus ophiopogonus KUWANA et MURAMATSU

Aspidiotus ophiopogonus KUWANA et MURAMATSU (1932), J. Plant Prot., Vol. XIX, No. 2, p. 96; *Aspidiotus pavlovskii* BORCHSENIUS (1955), Trud. Zool. Inst. Akad. Nauk SSSR., XXI, p. 247, syn. nov.

Adult female—Body ovate, attaining 0.9 mm. in length. Prepygidial segments membranous. Prosomatic tubercle rudimentary, represented by a patch of derm. Pygidium rather weakly sclerotized. Perivulvar pores present, 5-10 in laterocephalic group, and 3-7 in the laterocaudal; median group absent, or rarely indi-

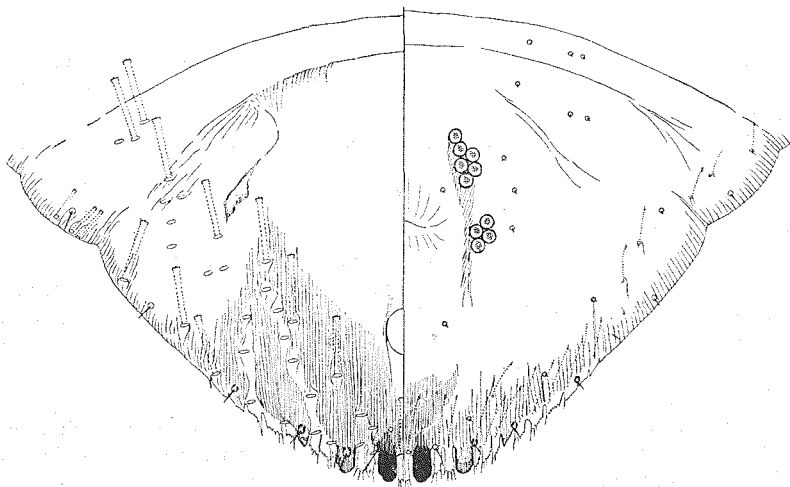


Fig. 2. *Aspidiotus ophiopogonus* KUWANA et MURAMATSU. Adult female; pygidium, figured from a specimen collected on *Carex* at Osyoro, Hokkaido.

cated by a single pore. Anus elliptical or subcircular, rather large, much longer than median lobe; distance between anus and bases of median lobes 2-3 times anal length. Dorsal macroducts slender and rather short; marginal ducts of pygidium as follows: 1 between median lobes, 1 or 2 between the median and second, usually 2 between the second and third, and a few ducts beyond third lobe on fifth and sixth, and sometimes also fourth, abdominal segments; numerous submarginal ducts almost in a wide irregular row which extends from on pygidium anteriorly on to third, sometimes to second or even first, abdominal segment. Some pleural macroducts on second and third, and occasionally also first, abdominal segments, sometimes quite small, but sometimes becoming larger and getting to be scarcely smaller than submarginal dorsal macroducts. Lobes in 3

pairs, median pair alone being strongly sclerotized. Median lobe almost straight on lateral margins, stout, notched once subapically on each side, or sometimes entire. Second lobe similar to the median, but somewhat shorter, stout, notched once on each side, or sometimes entire. Third lobe very small, conical, pointed apically. Fringed marginal spines slightly exceeding lobes; 2 spines between median lobes and also between the median and second; 3 between the second and third, oblique on outer margin, inner 1 of this group being apparently smaller; a series of spines beyond third lobe, oblique on outer margin, spines of fifth abdominal segment being quite rudimentary and often almost obsolete, and those of sixth segment more or less well developed.

Scale—In female circular or elliptical, pale or dark brown, with first exuvium central; in male somewhat elongate, pale brown.

Specimens examined: a few adult females, Korea, 30. VII, 1950, N. BORCHSENIUS leg., host—*Festuca* sp., determined by Dr. N. BORCHSENIUS as *Aspidiotus pavlovskii*; a few adult females, Katuura, Wakayama-ken, Honsyu, 11. VII, 1955, R. TAKAHASHI leg., host—*Ophiopogon japonicus* (L. fil.) KER-GAWLER, determined by Dr. R. TAKAHASHI as *Aspidiotus ophiopogonus*; 6 adult females, Osyoro, Hokkaido, 20. IX, 1956, T. KUMATA leg., host—*Carex* sp.; 7 adult females, Ryōtu, Sado, 22. X, 1956, S. TAKAGI leg., host—*Carex* sp.

This species is a grass-infesting one, being found on the leaves of the hosts. It has been originally described from specimens taken on *Ophiopogon* at Ōita-ken, Kyusyu, and recently recorded by BORCHSENIUS (1955) under the name, *A. pavlovskii*, from Korea on *Festuca*. Also *Carex* is here designated as a food plant of this species.

After his careful examinations through the specimens collected in Korea and determined by Dr. N. BORCHSENIUS as *A. pavlovskii* and also those collected in Japan, the writer has convinced that *A. pavlovskii* must be sunken as a synonym of *A. ophiopogonus*. The female scale of the former is much paler than that of the latter, but in the adult females themselves there is no distinct difference between them.

The present species is quite similar to *Aspidiotus chinensis* KUWANA et MURAMATSU (1931), especially in the structure and arrangement of the dorsal macroducts, but may be a distinct species, being distinguishable from the latter by the third lobes which are much reduced in size. It also somewhat resembles *A. hederæ*, but differs from the latter chiefly by the longer dorsal macroducts.

Genus *Metaspidiotus* novum

Genotype: *Aspidiotus stauntoniae* TAKAHASHI (1933).

Adult female—Body pyriform, with pygidium strongly protruding. Prepygidial segments scarcely convex laterally. Derm membranous in prepygidial segments, or heavily sclerotized throughout. Antennae small, widely separated, with a slender seta. Anterior spiracle with or without associated pores. Anus moderate in size, elliptical, located at caudal 1/3 of pygidium. Dorsal macroducts

of pygidium long, with orifice oval; 1 or 2 marginal ducts in interlobar spaces, and also a few marginal ducts beyond third lobe; a number of submarginal ducts almost in 3 irregular rows. Pygidial lobes in 3 pairs, well developed, parallel to longitudinal axis of body, or divergent. Paraphyses absent. Marginal spines of pygidium well developed; interlobar spines nearly as long as lobes, fringed apically, slender, 2 spines between median lobes and also between the median and second, 3 between the second and third; a series of spines beyond third lobe on fifth and sixth abdominal segments, well developed, broad and robust, serrate, with 1 or 2 elongate processes at inner apical angle, these processes being blunt apically, scarcely dilate, of a fleshy appearance. Marginal setae at dorsal bases of second and third lobes remarkable, being robust and lanceolate; dorsal marginal seta of fifth abdominal segment somewhat similar, but much slender.

The new genus is closely related to the genus *Aspidiotus*, but may be easily distinguishable from the latter by the particular form of the marginal setae at the dorsal bases of the second and third lobes.

Key to the Japanese species

(Adult female)

Body heavily sclerotized throughout at maturity. Dorsal macroducts of pygidium slightly swollen and thickly sclerotized just within orifice, about 25-30 in number on each side. *M. stauntoniae*.

Body membranous except for pygidium. Dorsal macroducts of pygidium usual, not sclerotized just within orifice, numerous, about 40-50 in number on each side. *M. multipori*.

Metaspidiotus stauntoniae (TAKAHASHI)

Aspidiotus stauntoniae TAKAHASHI (1933), Dep. Agr., Gov. Res. Inst. Formosa, Rep. No. 60 (Observ. Cocc. Formosa III), p. 54; Ibid. (1955), Bull. Biogeogr. Soc. Japan, Vols. 16-19, p. 242; TAKAHASHI et TACHIKAWA (1956), Tr. Shikoku Ent. Soc., Vol. 5, Pars 1-2, p. 14.

Adult female—Body stout, attaining 1.46 mm. in length. Derm strongly sclerotized throughout at maturity. Prepygidial intersegmental furrows of dorsum quite thickly sclerotized; a similar transverse furrow occurring midway on first abdominal segment, and also on the second. Prosomatic tubercle flat, sometimes invisible. Anterior spiracle without associated pores. First to third abdominal segments with some pleural macroducts which are much shorter than pygidial dorsal ones. Perivulvar pores in 4 groups of not numerous pores. Pygidial dorsal macroducts long, slightly swollen and thickly sclerotized just within orifice; marginal ducts, 1 between median lobes and also between the median and second, 2 between the second and third, and a few ducts beyond third lobe on fifth and sixth abdominal segments; submarginal ducts said to be about 25-30 in number on each side. Lobes membranous, parallel to longitudinal axis of body or somewhat divergent. Median lobe almost symmetrical, robust, slightly constricted basally, round apically, with a deep notch on each side. Second lobe

quite smaller than the median, narrower, more or less narrowed basally, with a distinct notch on outer side, and sometimes with a faint notch on inner side, flatly round apically. Third lobe similar to the second, but slightly smaller. Lanceolate setae of pygidium scarcely extending beyond apices of second and third lobes.

Scale—In female circular, grayish brown.

Specimens examined: 4 adult females. Matuyama, Ehime-ken, Sikoku, 15. IV, 1956, T. TACHIKAWA leg., host—*Hedera rhombea* (MIQUEL) BEAN, determined by Dr. R. TAKAHASHI as *Aspidiotus stauntoniae*.

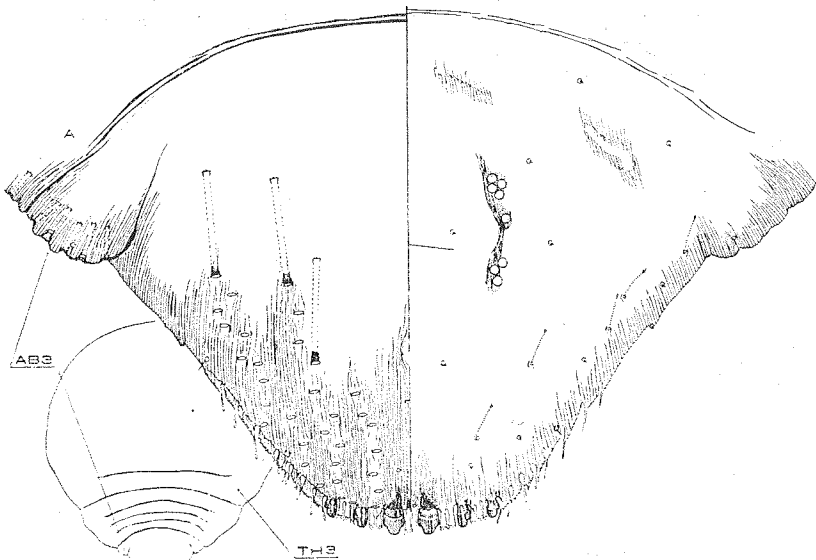


Fig. 3. *Metaspidotus stauntoniae* (TAKAHASHI).

Adult female: A, pygidium; B, body in dorsal aspect; AB3, third abdominal segment; TH3, metathorax.

This species lives on the leaves of the hosts. It has been originally described from Formosa, being collected on *Stauntonia*. Recently, it has been recorded by TAKAHASHI (1955) and TAKAHASHI and TACHIKAWA (1956) from the Ryukyu Islands and the southern parts of Japan on various plants including *Aucuba*, *Citrus*, *Elaeagnus*, *Fatsia* and *Hedera*.

Metaspidotus multipori (TAKAHASHI)

Aspidiotus multipori TAKAHASHI (1956), Ins. Mats., Vol. 20, Nos. 1-2, p. 24.

Specimens examined: 7 adult females, Unzen, Nagasaki-ken, Kyusyu, III,

1953, HIGUCHI leg., host—*Illicium religiosum* SIEBOLD et ZUCCARINI, determined by Dr. R. TAKAHASHI as *Aspidiotus multipori*.

The present species occurs on the upper side of the leaves of *Illicium religiosum*, a unique host plant known at the present time, forming a shallow pit under the body. It has been found in Kyusyu (Unzen, Nagasaki-ken and Mozi, Hukuoka-ken).

Genus *Temnaspidotus* MACGILLIVRAY

Temnaspidotus MACGILLIVRAY (1921), The Coccidae, p. 387 (genotype: *Aspidiotus excisus* GREEN, 1896); FERRIS (1952), Microent., Vol. 17, Pt. 1, p. 8; *Brainaspis* MACGILLIVRAY (1921), The Coccidae, p. 390 (genotype: *Aspidiotus kellyi* BRAIN, 1918).

Genotype: *Aspidiotus excisus* GREEN (1896).

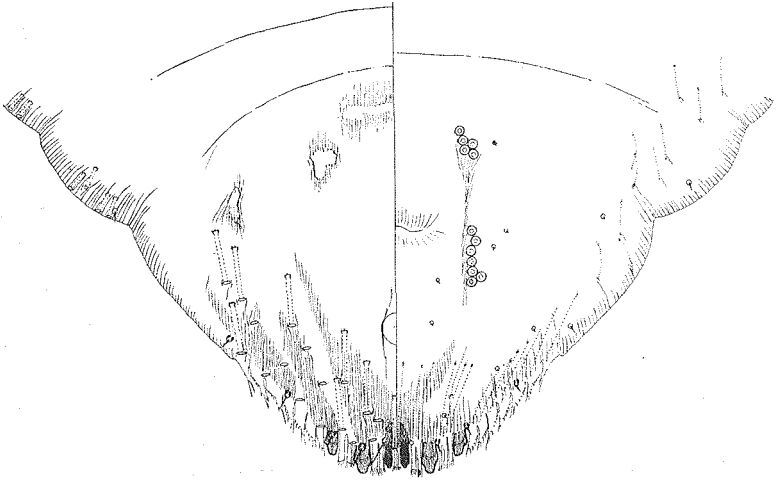
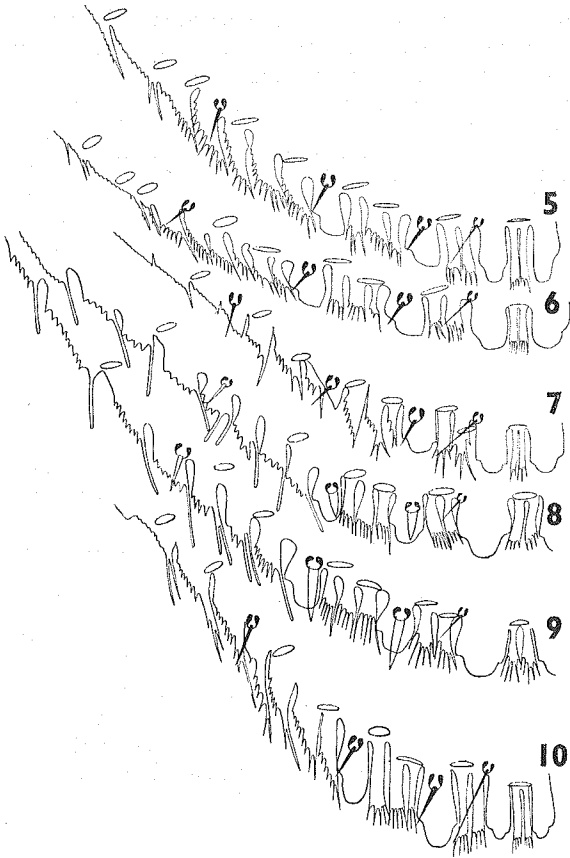


Fig. 4. *Temnaspidotus japonicus* sp. nov.
Adult female: pygidium.

Temnaspidotus japonicus sp. nov.

Adult female—Body ovate, attaining 1.1 mm. in length. Prepygidial segments membranous. Antennae widely separated, conical, with a slender curved seta. Pygidium rather weakly sclerotized; intersegmental furrows of pygidium evident. Perivulvar pores present, 5-8 in each of laterocephalic and laterocaudal groups; median group absent or indicated by a single pore. Anus oval, as long as or slightly longer than median lobe; distance between anus and bases of median lobes 2.3-4 times anal length. Lobes in 3 pairs, well developed, median pair alone being strongly sclerotized. Median lobe slender, straight or nearly so on lateral margins, with a distinct subapical notch on each side, notch on



Figs. 5-10. Adult females: pygidial margins in dorsal aspect.

5. *Aspidiotus cryptomeriae* KUWANA, figured from a specimen collected on *Torreya* at Amagi-san, Sizuoka-ken; 6. ditto, figured from a specimen collected on *Taxus* at Sapporo, Hokkaido; 7. *Aspidiotus ophiopogonus* KUWANA et MURAMATSU, figured from a specimen collected on *Carex* at Osyoro, Hokkaido; 8. *Metaspidiotus stauntoniae* (TAKAHASHI); 9. *Metaspidiotus multipori* (TAKAHASHI); 10. *Temnaspidotus japonicus* sp. nov.

inner side being situated a little posteriorly than on the outer. Second lobe definitely surpassing median lobe and quite much larger, robust, but longer than wide, more or less narrowed basally, flatly round apically, with a notch on each side, inner notch sometimes becoming obscure. Sclerosis, which extends anteriorly from inner margin of second lobe, very fine and inconspicuous. Third lobe similar to the second, but smaller. Pygidial dorsal macroducts slender and short, their orifices being arranged as follows: marginal ducts, 1 between median lobes and also between the median and second, 2 between the second and third, and a few ducts beyond third lobe on fifth and sixth abdominal segments; some submarginal ducts mostly in intersegmental furrows of pygidium. A few pleural macroducts on second and third abdominal segments, shorter than pygidial ones. Fringed marginal spines of pygidium as long as or slightly exceeding lobes; interlobar spines slender, 2 between median lobes and also between the median and second, 3 between the second and third; 7 spines beyond third lobe on fifth and sixth abdominal segments, broader, oblique on outer margin, those of fifth segment sometimes tending to be reduced.

Scale—In female irregularly circular, flat or slightly convex, pale brown; in male slightly elongate.

Syntypes: 4 adult females, Amagi-san, Sizuoka-ken, Honsyu, 28. V, 1955, S. TAKAGI leg., host—*Camellia* sp., deposited in the collection of the Entomological Institute, Hokkaido University.

This species is found on the under side of the leaves of the host.

The new species is closely allied to *Temnaspidiotus excisus*, from which it may be distinguishable by the median lobes slender and by the second lobes larger. It differs also from *Temnaspidiotus kellyi* and *Temnaspidiotus smensis* FERRIS (1952) in lacking preanal dorsal macroducts, in lacking remarkable scleroses at the inner bases of the second lobes, in having perivulvar pores, etc. It also somewhat resembles *Aspidiotus destructor*, in which the median lobes take often an appearance which is sunken into a recess, being surpassed by the second lobes, but is distinct by the structure of the dorsal macroducts.