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Title	SEVERAL TYPES OF THE MYCETANGIA FOUND IN PLATYPODID AMBROSIA BEETLES (COLEOPTERA : PLATYPODIDAE)
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Citation	Insecta matsumurana. New series : journal of the Faculty of Agriculture Hokkaido University, series entomology., 7, 1-69
Issue Date	1975-09
Doc URL	https://hdl.handle.net/2115/9781
Type	departmental bulletin paper
File Information	7_p1-69.pdf



SEVERAL TYPES OF THE MYCETANGIA FOUND IN PLATYPODID
AMBROSIA BEETLES
(COLEOPTERA: PLATYPODIDAE)

By TOSHIO NAKASHIMA

Abstract

NAKASHIMA, T. 1975. Several types of the mycetangia found in platypodid ambrosia beetles (Coleoptera: Platypodidae). *Ins. matsum. n.s.* 7, 69 pp., 1 tab., 28 pls.

The mycetangia of 13 species of platypodid ambrosia beetles were examined. The specimens examined belong to *Crossotarsus* (1 sp.), *Platypus* (9 spp., 2 subsp.), *Diapus* (1 sp.), and *Diacavus* (2 spp.), and originated in Japan, Mindanao, Borneo, Sumatra, and Solomon Is. These species are classified into 5 groups on the basis of the types of the mycetangia. It is inferred that the platypodid ambrosia beetles may generally have mycetangia of some types in much the same manner as scolytid ambrosia beetles.

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Contents

Introduction	3
Materials and methods	3
Description of the mycetangia	
Genus <i>Crossotarsus</i> Chapuis	
<i>Crossotarsus niponicus</i> Blandford	4
Genus <i>Platypus</i> Herbst	
<i>Platypus severini</i> Blandford	4
<i>Platypus calamus</i> Blandford	4
<i>Platypus caliculus</i> Chapuis	5
<i>Platypus jansonii</i> Chapuis	5
<i>Platypus solidus</i> Walker	5
<i>Platypus curtus</i> Chapuis	5
<i>Platypus shoreanus bifurcus</i> Schedl	6
<i>Platypus shoreanus mutilatus</i> Schedl	6
<i>Platypus forficula</i> Chapuis	6
<i>Platypus pseudocupulatus</i> Chapuis	6
Genus <i>Diapus</i> Chapuis	
<i>Diapus quinquispinatus</i> Chapuis	6
Genus <i>Diacavus</i> Schedl	
<i>Diacavus philippinensis</i> Schedl	7
<i>Diacavus abdominalis</i> Schedl	7
Discussion	7
Acknowledgements	9
References	10
Plates	13

INTRODUCTION

Ambrosia beetles bore deep tunnels, so-called pin-holes, in the wood of felled trees, logs or stumps. It is known that the symbiotic fungi of the beetles or the ambrosia fungi cultivated in the tunnels cause great damage to the quality of wood. Such ambrosia beetles have built-in repositories referred to as mycetangia, which are specialized structures in the body or on the body-surface in which symbiotic fungi are carried. Recently mycetangia have been examined especially from the viewpoint of the relationship between the ambrosia beetles and their symbiotic fungi.

Descriptions of the mycetangia of some ambrosia beetles have been given by several authors (Fisher, Thompson & Webb, 1953; Francke-Grosmann, 1956, '63, '67; Fernando, 1959; Roche & Lhoste, 1960; Schedl, 1962, '64; Batra, 1963; Finnegan, 1963; Farris, 1963, '69; Farris & Funk, 1965; Takagi & Kaneko, 1965; Kaneko & Takagi, 1966; Abrahamson & Norris, 1966, '67; Giese, 1967; Barras, 1967; Baker & Norris, 1968; Schneider & Rudinsky, 1969; Whitney & Farris, 1970; Barras & Perry, 1971; Happ, Happ & Barras, 1971; Nakashima, 1971, '72; Livingston & Berryman, 1972). In the family Scolytidae, the mycetangia are various, and classified into several groups on the basis of their location on or in the insect body (Batra, 1963; Francke-Grosmann, 1963). In the family Platypodidae, however, only a few species have been described (Roche & Lhoste, 1960; Farris & Funk, 1965; Francke-Grosmann, 1966; Nakashima, 1971, '72). In the present report, the mycetangia of further species of the family Platypodidae are given.

MATERIALS AND METHODS

Specimens of *Crossotarsus niponicus*, *Platypus severini* and *P. calamus* were collected from pinholed beech logs (*Fagus crenata* Blume) in Hokkaidô, and specimens of all the other species were collected at Harumi wharf, Tôkyô Harbor, from imported logs. The data of the specimens examined are shown in Table 1.

The beetles were kill-fixed in AFT solution. For histological studies, serial sections of 15 μ thickness were cut from whole beetles embedded in celloidin-paraffin, and stained with a modified Gram-Weigert stain (Leach 1940). For

Table 1. Specimens examined.

Species	Host plant	Origin	Collected date
<i>Crossotarsus niponicus</i>	Beech	Hokkaidô	May, 1969-'72
<i>Platypus severini</i>	Beech	Hokkaidô	July, '71, '72
<i>P. calamus</i>	Beech	Hokkaidô	July, '71
<i>P. solidus</i>	Lauan	Mindanao	Jun. 27, '72
<i>P. curtus</i>	Lauan	Mindanao	Jun. 20, '72
<i>P. shoreanus bifurcus</i>	Lauan	Mindanao	May 23, '72
<i>P. shoreanus mutilatus</i>	Meranti	Borneo	Jun. 18, '72
<i>P. caliculus</i>	Meranti	Borneo	Oct. 25, '72
<i>P. forficula</i>	Serayah	Borneo	Jun. 15, '72
<i>P. pseudocupulatus</i>	Meranti	Sumatra	Aug. 11, '72
<i>P. jansonii</i>	Camptosperma	Solomon Is.	Aug. 24, '72
<i>Diapys quinquespinatus</i>	Meranti	Borneo	Jun. 6, '72
<i>Diacavus abdominalis</i>	Meranti	Borneo	Aug. 1, '73
<i>D. philippinensis</i>	Lauan	Mindanao	Aug. 15, '73

surface examination, the beetles were scanned with a scanning electron microscope, Type JSM-SI.

DESCRIPTION OF THE MYCETANGIA

Genus *Crossotarsus* Chapuis

Crossotarsus niponicus Blandford (Plate I)

Female: The mycetangium of this species is a single, sphere-shaped repository about 0.2 mm in diameter, situated at the back of the preoral cavity, anteriorly to, but under, the suboesophageal ganglion (Figs. 1, 2, 4). Gland-like cell clusters are found around the mycetangium and extend forward along the cibarium (Figs. 1-5).

Male: No mycetangial tissues are found (Fig. 6).

Genus *Platypus* Herbst

Platypus severini Blandford (Plates II-V)

Female: About 600 integumentary pits concentrated on the caudal half of the pronotum serve as mycetangia (Fig. 7). The pitted area somewhat resembles the feathers of an arrow in outline (Fig. 8), approximately 0.70 mm in length, 0.17 mm in width at the anterior end, and about 0.25 mm in width at the posterior end. It is divided in the middle by a fine, slightly depressed line. Each pit or mycetangial opening is oval in shape and is about $11-13\mu \times 9-11\mu$ in size. The pits situated in the anterior fourth of the pitted area are slightly larger than those situated posteriorly. In the pit, on its posterior wall, a globular-headed process, about 3μ in length and about 2μ in width, projects forward (Fig. 10). On the posterior wall of the pit, 1 or 2μ below the surface of the integument, a few very small holes, $0.5-1.5\mu$ in diameter, are observed (Fig. 11). In longitudinal sections of the pitted area the pits contain densely packed gram-positive material, and gland-like cells are seen below the pits (Fig. 9).

Male: The male has two types of mycetangia. Integumentary pit-type mycetangia on the pronotum are limited in number (Figs. 12-15) and some are almost the same in size as those of the female but others are much smaller. The main mycetangia of the male are enlarged forecoxal and mesocoxal cavities about 0.08×0.03 mm in size (Figs. 16-18). Many globular fungous bodies, each about 8μ in diameter, are observed in the cavities.

Platypus calamus Blandford (Plates VI, VII)

Female: The pitted area on the pronotum is elongate reniform in outline, divided in the middle by a fine, slightly depressed line (Figs. 19-22). The pits, amounting to 250 in number, are oval in shape and about $12-15\mu \times 7-12\mu$ in size. The pits situated in the anterior third of the pitted area are clearly larger than the others. The inner process of the pit is somewhat compressed.

Male: Less than 20 pits are present at the corresponding part of the pronotum (Figs. 23-26). These pits are quite similar in shape and size to those of the female. Coxal cavities have not been examined because of the scarcity of the specimens.

Platypus caliculus Chapuis (Plates VIII-X)

Female: The pitted area on the pronotum is reniform in outline, and about 0.34 mm in length and 0.28 mm in width (Figs. 27-30). The area is divided in the middle by a fine, slightly depressed line in its anterior three-fourths. The pits, amounting to more than 300 in number, are about $11-14\ \mu \times 8-11\ \mu$ in size. The inner process of the pit is not conspicuous.

Male: Less than 20 pits are observed at the corresponding part of the pronotum (Figs. 31-34). The pitted area almost forms a sharp isosceles triangle. The inner processes of the pits can be seen in some specimens. Mycetangium-like cavities and gland-like tissues are observed around the forcoxa and mesocoxa, but no fungus-like material is found in the cavities. These specimens were collected in October, in the breeding season and not in the boring season of this species. This may be the reason why they have no fungus-like material in the cavities.

Platypus jansoni Chapuis (Plates XI, XII)

Female: The mycetangia of this species are quite similar in shape to those of *P. calamus*. The pitted area is reniform in outline and is about 0.55 mm in length and 0.65 mm in width. It is divided in the middle by a narrow non-pitted area (Figs. 35, 36). The pits, amounting to 650 in number, are about $11 \times 12\ \mu$ in diameter. The inner process of the pit is very small.

Male: No integumentary pits are observed at the corresponding part of the pronotum (Figs. 37, 38). Mycetangium-like forecoxal and mesocoxal cavities are observed (Fig. 39), but fungus-like material is not found in the cavities.

Platypus solidus Walker (Plates XIII, XIV)

Female: The pitted area is almost V-shaped in outline, and is about 0.20 mm in length and 0.22 mm in width (Figs. 40-42). The pits are about 50 in number. Pits situated in the anterior half of the area, 15 to 20 in number, are about twice as large as the posterior pits in diameter. The inner process of the pit is slender and small.

Male: No integumentary pits are observed at the corresponding part of the pronotum (Figs. 43, 44). Mycetangium-like forecoxal and mesocoxal cavities are observed (Fig. 45), but fungus-like material is not found in the cavities.

Platypus curtus Chapuis (Plates XV-XVII)

Female: The pitted area is cordate in outline. It is about 0.30 mm in length, 0.35 mm in width, and divided in the middle by a fine, slightly depressed line (Figs. 46-48). The pits are about 150-170 in number. Five to 12 pits which are situated at the posterior part of the pitted area are about $20\ \mu$ in diameter, and are about 5 times as large as the anterior pits in diameter. Fungus-like material is observed in the pits of both sizes (Figs. 49, 50). The inner process of the pit is very small.

Male: Less than 100 pits are situated at the corresponding part of the pronotum (Figs. 51-53). The pitted area is similar to that of the female in outline, but without larger-sized pits. Forecoxal and mesocoxal cavities are not enlarged, and no fungus-like material is observed.

Platyplus shoreanus bifurcus Schedl (Plates XVIII, XIX)

Female: The pitted area is cordate in outline. It is about 0.45 mm in length, 0.45 mm in width and divided in the middle by a fine, slightly depressed line (Figs. 54, 55). The pits, amounting to 250–270 in number, are about $8 \times 12 \mu$ in size. The inner process of the pit is about $1 \times 1 \mu$ in size.

Male: The mycetangia of the male are quite similar to those of the female. The pitted area forms a somewhat narrow cordate shape. It is about 0.35 mm in length, 0.30 mm in width, and divided in the middle by a fine, slightly depressed line (Figs. 57, 58). The pits amount to 100–130 in number and are about $8 \times 12 \mu$ in size. The inner process of the pit is somewhat larger than in the female, and about $2 \times 2 \mu$ in size. Fungus-like material is observed clearly in the pits (Fig. 56). Forecoxal and mescoxal cavities are not enlarged and no fungus-like material is observed.

Platyplus shoreanus mutilatus Schedl (Plates XX, XXI)

Female: No specimens were available.

Male: The pitted area has an arrowhead shape. It is about 0.25 mm in length, 0.15 mm in width, and divided in the middle by a slightly depressed line (Figs. 59–61). The pits amount to 100 in number and are about $10\text{--}12 \mu \times 7\text{--}8 \mu$ in size. The inner process of the pit is about $2 \times 2 \mu$ in size. Fungus-like material is observed in the pits (Fig. 62). The forecoxal and mescoxal cavities are not enlarged and no fungus-like material is found (Fig. 63).

Platyplus forficula Chapuis (Plate XXII)

Female: No specimens were available.

Male: The pitted area forms a sharp isosceles triangle. It is 0.20 mm in length, 0.10 mm in width, and is divided in the middle by a slightly depressed line (Figs. 64–66). The pits amount to 40 in number and are about 10μ in diameter. The inner process of the pit is very small. Forecoxal and mescoxal cavities have not been examined because of the scarcity of the specimens.

Platyplus pseudocupulatus Chapuis (Plate XXIII)

Female: No specimens were available.

Male: The pitted area is nearly cordate in outline. It is about 0.17 mm in length, and 0.12 mm in width (Figs. 67, 68). The pits amount to 15–30 in number and are about $6 \times 8 \mu$ in size. The inner process of the pit is obsolete. Fungus-like material is observed in the pits (Fig. 69). The forecoxal and mescoxal cavities are slightly enlarged (Fig. 70), while fungus-like material is not observed.

Genus *Diapus* Chapuis

Diapus quinquespinatus Chapuis (Plates XXIV–XXVI)

Female: A long, transverse, crevice-type mycetangium is situated about 0.08–0.10 mm anteriorly to, and parallel to, the posterior margin of the pronotum (Figs. 71–73). The crevice is divided in the middle by a fine, slightly depressed line. About 30 integumentary pit-type mycetangia are arranged transversely along both sides of the crevice. Each pit is $10\text{--}15 \mu$ in diameter. The inner processes

of the pits and of the crevice are very large. They are 20–30 μ in length, 5–8 μ in width, polydactyl, and largely exposed out of the mycetangia. Fungus-like material is observed in the pits and in the crevice also (Figs. 74, 75).

Male: Crevice, pits and polydactyl processes are quite similar in type to those of the female. The pits, however, form a well-defined line (Figs. 76, 77).

Genus *Diacavus* Schedl

Diacavus philippinensis Schedl (Plate XXVII)

Female: No specimens were available.

Male: Two large pores, about 40–45 μ in diameter, are situated near the base of the pronotum (Figs. 78–80). The inner process of the pore is flat, slender, polydactyl, about 40 μ in length, and 10 μ at anterior part and about 3 μ at the base in width. Serial sections of the body were not prepared because of the scarcity of the specimens. Therefore, fungous material and gland-like cells have not been confirmed.

Diacavus abdominalis Schedl (Plate XXVIII)

Female: No specimens were available.

Male: Any pores or pits taken for mycetangia are not seen on the pronotum (Figs. 81, 82). Serial sections of the body were not prepared because of the scarcity of the specimens.

DISCUSSION

Francke-Grosman (1967) classified 45 species of the family Scolytidae into 13 types according to the location of the mycetangia. In the family Platypodidae, however, only two types were recognized based on three species.

The species of the family Platypodidae studied in this paper should be classified into the following 5 groups according to the types of mycetangia.

Group A

Female: A single spherical mycetangium at the back of the preoral cavity, surrounded by sponge-like tissue.

Male: No mycetangium.

In the present study, only one species, *Crossotarsus niponicus*, belongs to this group. In *C. niponicus*, the male bores the galleries, while the female stores and propagates the fungi, i.e., one pair produces one gallery system. In spring and early summer, when the male bores, the mycetangium, with the sponge-like tissue around, and a mildly viscous, pale yellowish-white fluid held in the preoral cavity are clearly observed in the female. In the breeding period, i.e., after the inoculation of the associated fungi, however, the mycetangium and sponge-like tissue become atrophied, and neither fungous material nor the pale yellowish-white fluid in the preoral cavity are observed.

Group B

Female: Several tens or several hundred of integumentary pit-type mycetangia

are concentrated in a distinct area on the posterior half of the pronotum.

Male: Mycetangia are similar to those of the female, but somewhat less developed.

The pitted area is cordate, reniform, or like an arrow feather in outline. Each pit is oval or round in shape and is 10μ or so in diameter. On the posterior wall of each pit, a small process, about $1-3\mu$ in length, projects forward. The function of this inner process is not clear, but it may play a role in transferring fungous material from the gallery-wall into the mycetangial openings in the newly emerged adult. A few minute holes, $0.5-1.5\mu$ in diameter, are situated on the posterior wall of the pit. They may lead to ducts, which were assumed by Farris and Funk (1965) to transport secretions from the glands associated with the mycetangia. In this group, both sexes have almost the same type of mycetangia, while the mycetangia of the male are slightly less numerous than those of the female.

In the present study, *Platypus curtus* and *P. shoreanus bifurcus* belong to this group. Regarding *P. shoreanus mutilatus*, only the male was examined, and it was assumed that this species may belong to this group because of the fact that the male has a distinct pitted area on the pronotum.

Group C

Female: The mycetangia of this group are quite similar to those of group B. Several tens or several hundred of integumentary pit-type mycetangia are concentrated in a distinct area on the posterior half of the pronotum.

Male: The males of this group have two types of mycetangia. Enlarged forecoxal and mescoxal cavities stand for main mycetangia, while a few integumentary pits are concentrated at the ordinary part of the pronotum. The enlarged forecoxal and mescoxal cavities are distinct, and many globular fungous materials or fungous spores are observed in the cavities. These enlarged forecoxal and mescoxal cavities are not found in the males of group B. The integumentary pits are few in number, at times the pits are very small, and in some species these pits are not found.

In the present study, *Platypus severini*, *P. caliculus*, *P. solidus*, *P. jansoni*, and *P. calamus*, and possibly *P. forficula* and *P. pseudocupulatus* also, belong to this group. As to *P. calamus*, while no sections were observed, the results of scanning observations show that there is little doubt that this species belongs to this group. In *P. forficula*, and *P. pseudocupulatus* female specimens were not collected, but the males suggest that these species belong to this group.

Group D

Female: A long, transverse, crevice-type mycetangium is situated at about 0.1 mm anteriorly to, and parallel to, the posterior margin of the pronotum. The crevice is divided in the middle by a fine slightly depressed line. About 20-30 integumentary pits are also found along the crevice. The inner processes of the pits and of the crevice are very large, polydactyl, and exposed out of the mycetangia.

Male: The mycetangia are quite similar in type to those of the female. The pits are, however, fewer in number than in the female.

In the present study, *Diapus quinquespinatus* belongs to this group.

Group E

Female: No specimens were available.

Male: Two large pores, 40–45 μ in diameter, are situated near the base of the pronotum. A flat, slender and polydactyl process extends forward at the posterior wall of the pore.

In the present study, *Diacavus philippinensis* shows this type of mycetangia. *D. abdominalis*, while lacking such pores, may tentatively be placed in this group.

Ambrosia beetles bore tunnels in wood, cultivate their symbiotic fungi, and breed their larvae in the tunnels. Hitherto, two manners have been observed regarding the relation between the boring habits of the beetles and the types of the mycetangia.

In one manner, only one sex attacks the host plant first, and the mycetangia are present in that sex only. In the family Scolytidae, this sex is the female in most cases (Francke-Grosmann, 1967).

In the other manner, the male takes the lead in boring exclusively and the female cares for the larvae and cultivates the fungi. In the family Scolytidae, it seems that most species of *Scolytoplatypus* and several species of *Xyloterus*, e.g. *X. signatus*, have this manner. In the family Platypodidae, all species which have been examined to date may belong to this manner, and regarding the development of mycetangia three types are distinguished. In the first type, the mycetangia are developed in the female alone as in the group A of the present study. In the second type, the mycetangia are almost the same in both sexes as in the groups B and D of the present study. In the third type, both sexes have developed mycetangia, which are, however, completely different in type between the sexes. The species of the group C of the present study show this.

Francke-Grosmann (1967) stated: "It seems true that in many Platypodidae the spores of their symbiotic fungi might adhere to any part of the integument and might be transported without being stored in mycetangia." In the present study, however, it was observed that most of the species examined have specialized fungus-carrying organs. It seems true that platypodid ambrosia beetles have mycetangia of some types in much the same manner as scolytid ambrosia beetles.

ACKNOWLEDGEMENTS

The author wishes to express his sincere gratitude to Mr. S. Ito, the head of the Harumi Sub-Branch of Yokohama Plant Protection Station, Tôkyô, and the staff of the Sub-Branch for collecting materials from imported logs. His thanks are also due to Dr. K. Umeya of the Fruit Tree Research Station, Hiratsuka, Kanagawa, Dr. A. Nobuchi of the Forest Protection Division, Government Forest Experiment Station, Meguro, Tôkyô, and to Mr. K. Takagi of the Tea Research Station, Kanaya, Shizuoka, for their valuable suggestions in the present work. The author also wishes to thank the members of the Hiyama Experiment Forest of Hokkaido University for their help in collecting pinholed beech logs.

This investigation was supported in part by a research grant from the Ministry of Education, Japan (#848037, 1973).

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PLATES

Plate I

Crossotarsus niponicus Blandford (♀, ♂)

- Fig. 1. Sagittal section of the head of female.
- Fig. 2. Longitudinal section of the head of female (slightly to the right of Fig. 1).
- Fig. 3. Same as above (slightly more to the right of Fig. 2).
- Fig. 4. Horizontal cross section of the head of female.
- Fig. 5. Same as above (slightly forward of Fig. 4).
- Fig. 6. Longitudinal section of the head of male.
(my: mycetangium; fm; fungus-like material; gc: gland-like cell.)

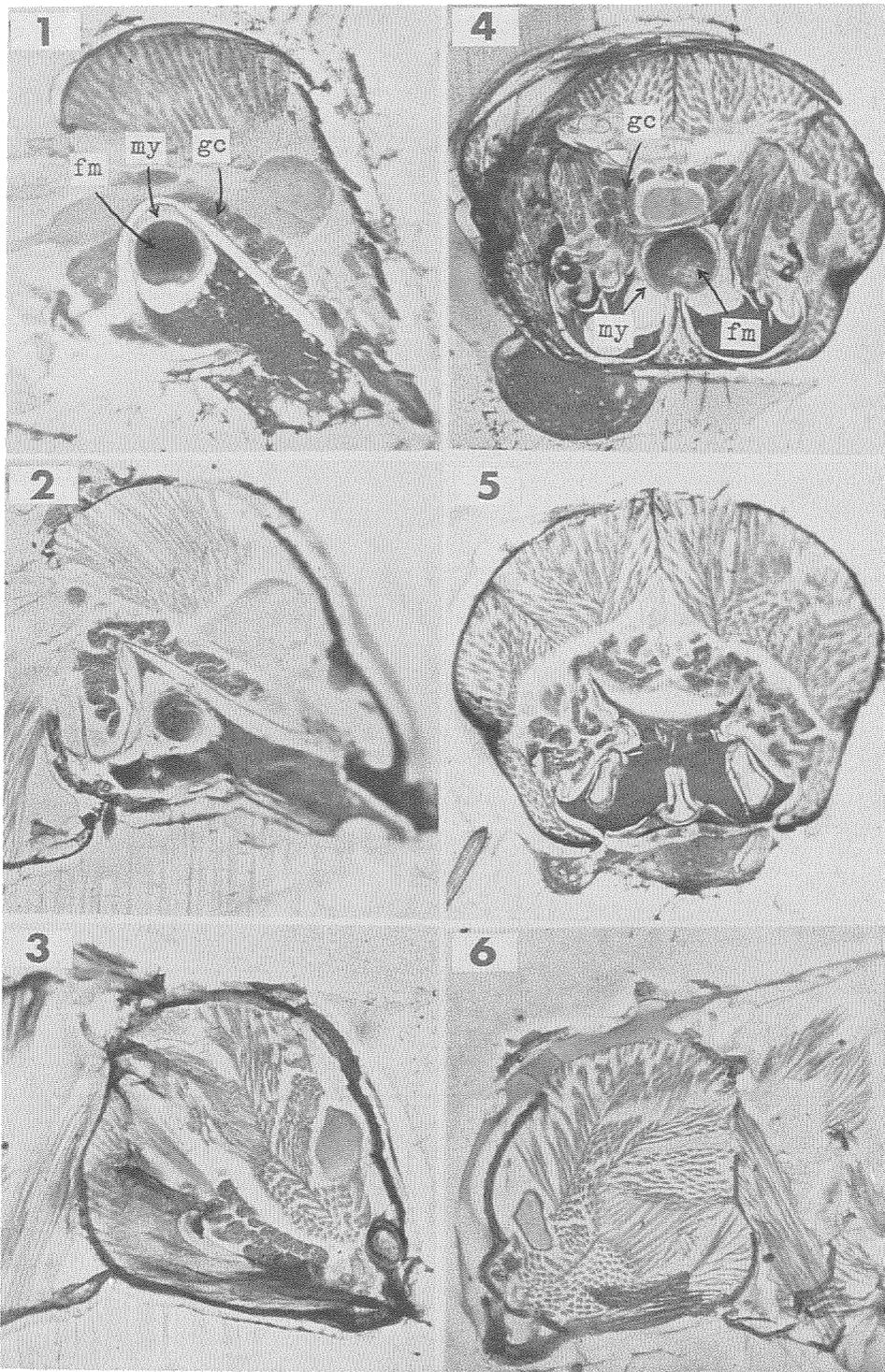


Plate II

Platypus severini Blandford (♀)

Figs. 7, 8. Pit-type mycetangia on the pronotum.

Fig. 9. Longitudinal section of the pitted area.

(fm: fungus-like material; gc: gland-like cell.)

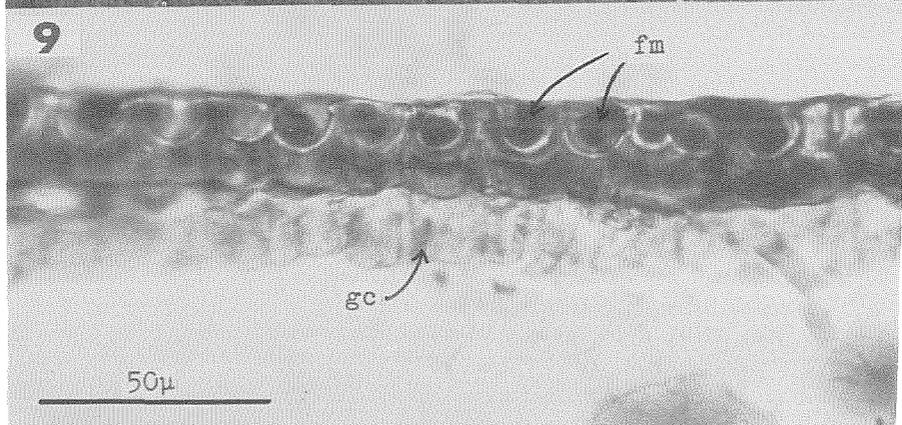
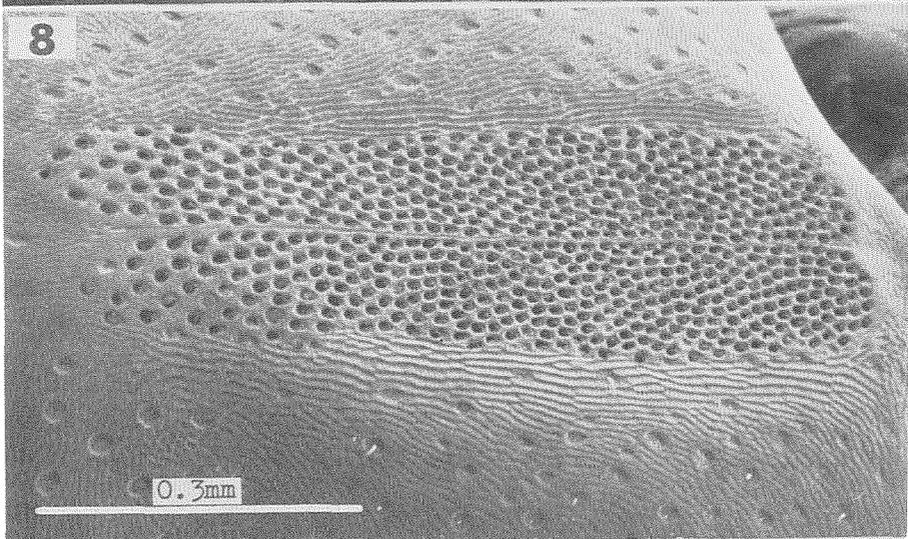
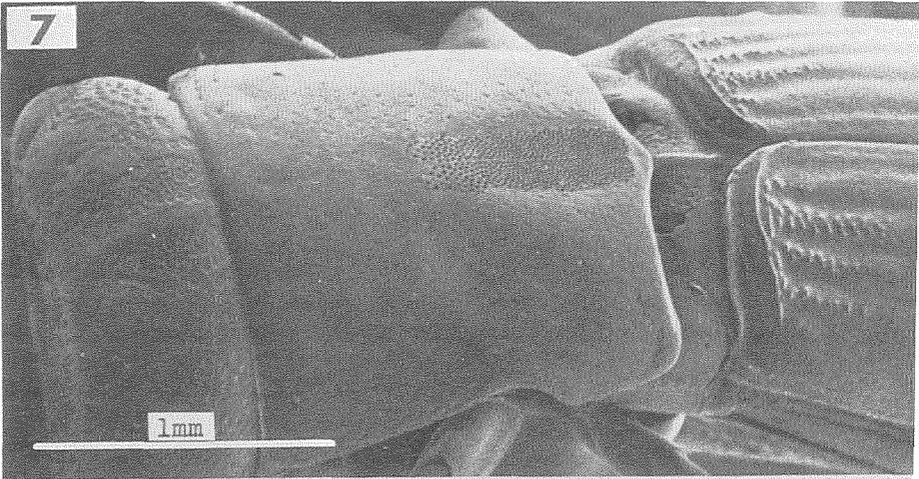


Plate III

Platypus severini Blandford (♀) (continued)

Figs. 10, 11. Pit-type mycetangia on the pronotum.

(p: process in the pit; sh: very small holes in the pit.)

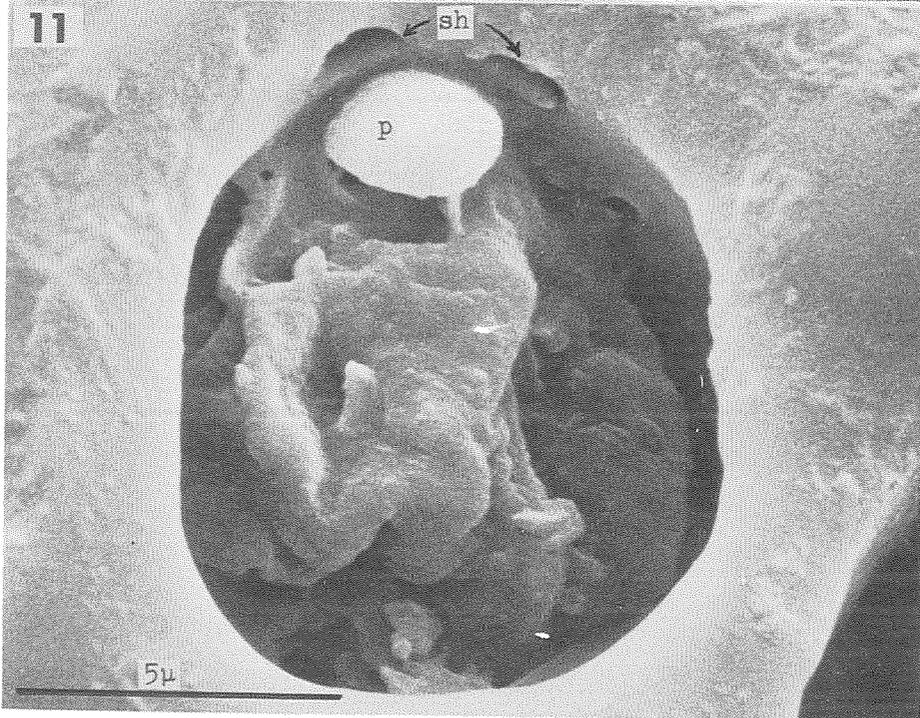
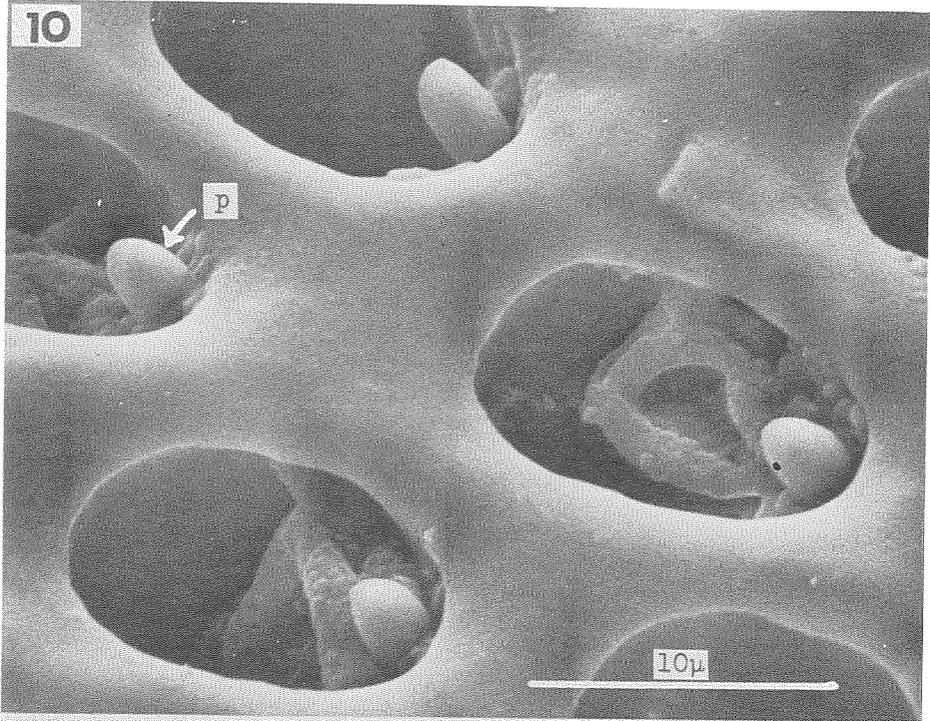


Plate IV

Platypus severini Blandford (♂)

Figs. 12-15. Pit-type mycetangia on the pronotum.

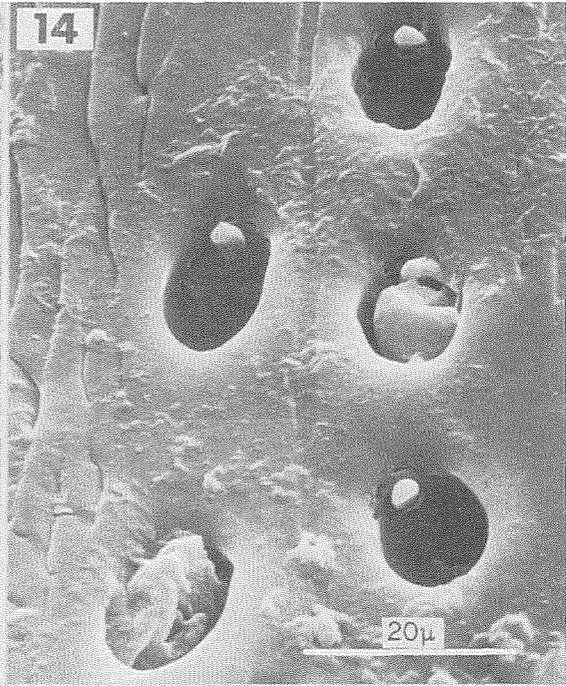
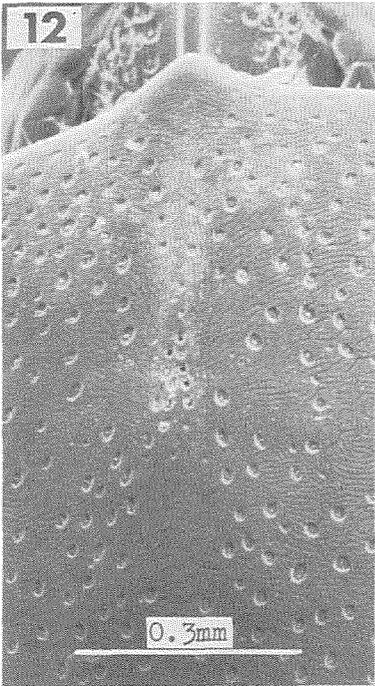


Plate V

Platypus severini Blandford (♂) (continued)

Fig. 16. Longitudinal section.

Figs. 17, 18. Enlarged forecoxal cavity.

(my: mycetangium; fm: fungus-like material; efc: enlarged forecoxal cavity.)

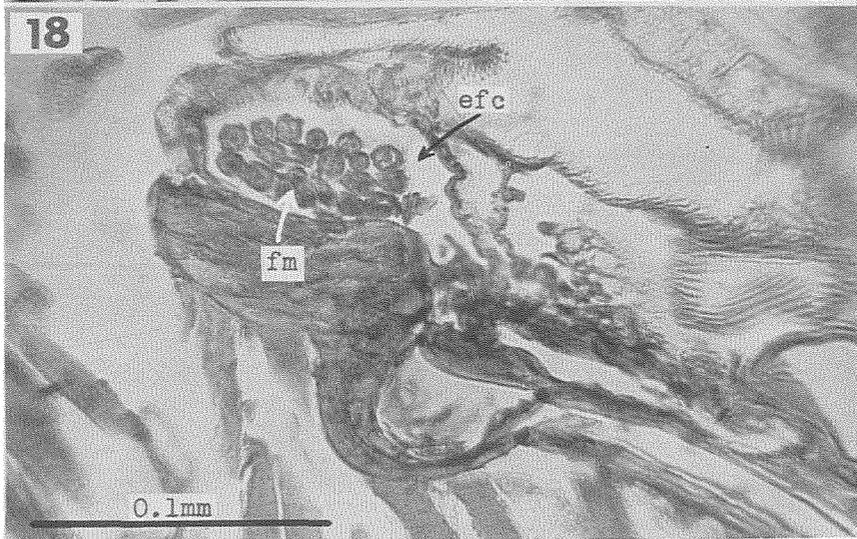
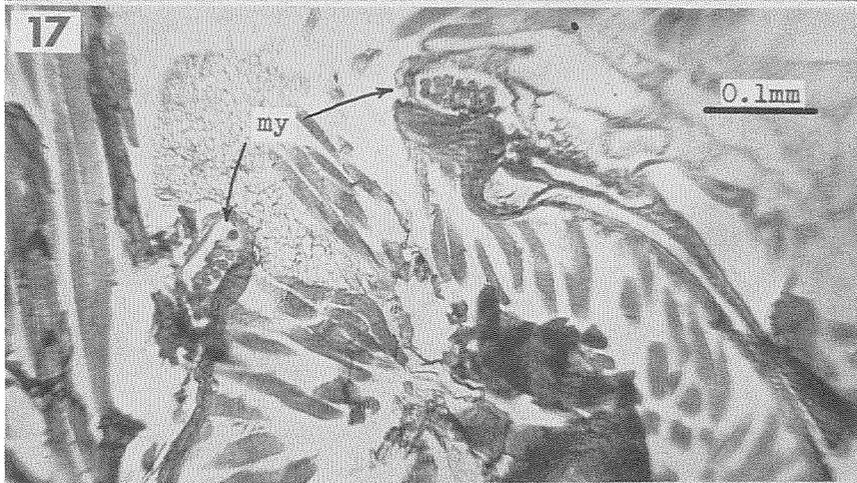
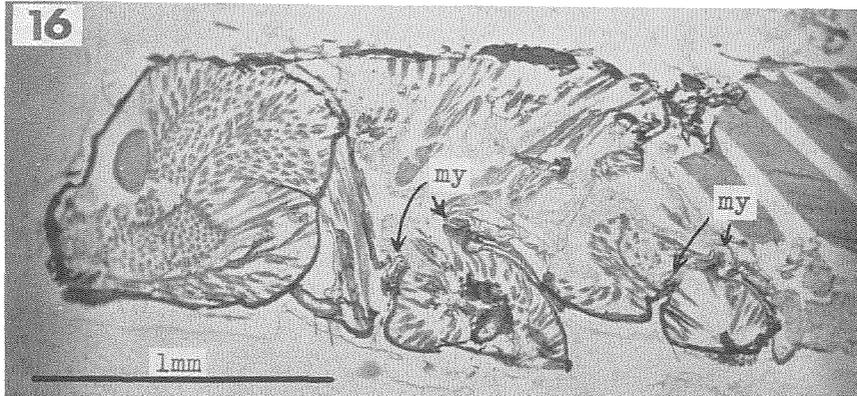


Plate VI

Platypus calamus Blandford (♀)

Figs. 19-22. Pit-type mycetangia on the pronotum.

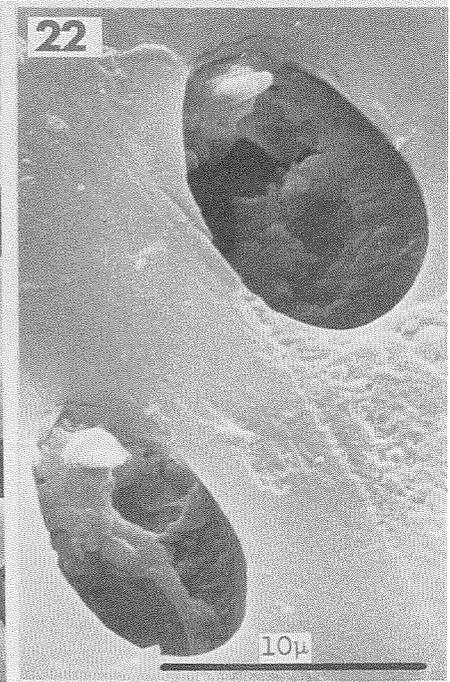
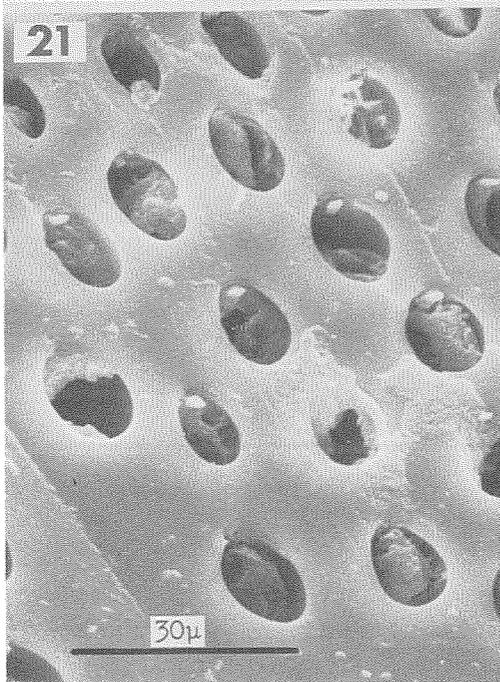
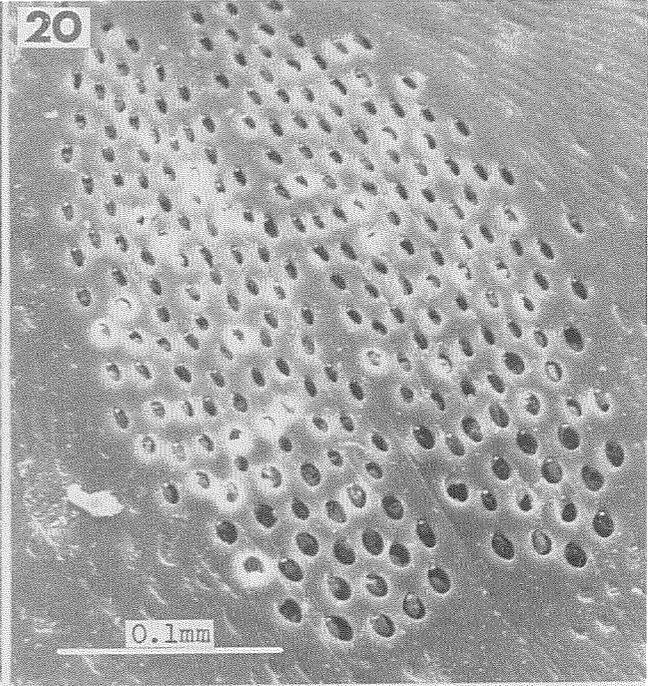
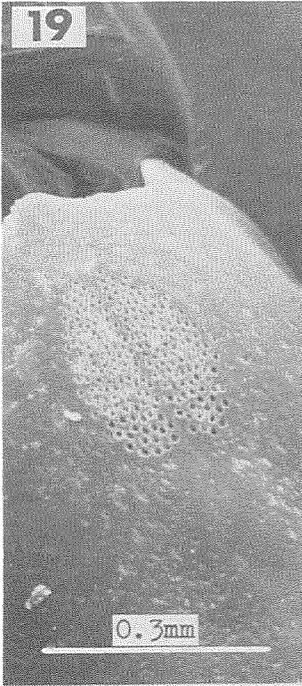


Plate VII

Platypus calamus Blandford (♂)

Figs. 23-26. Pit-type mycetangia on the pronotum.

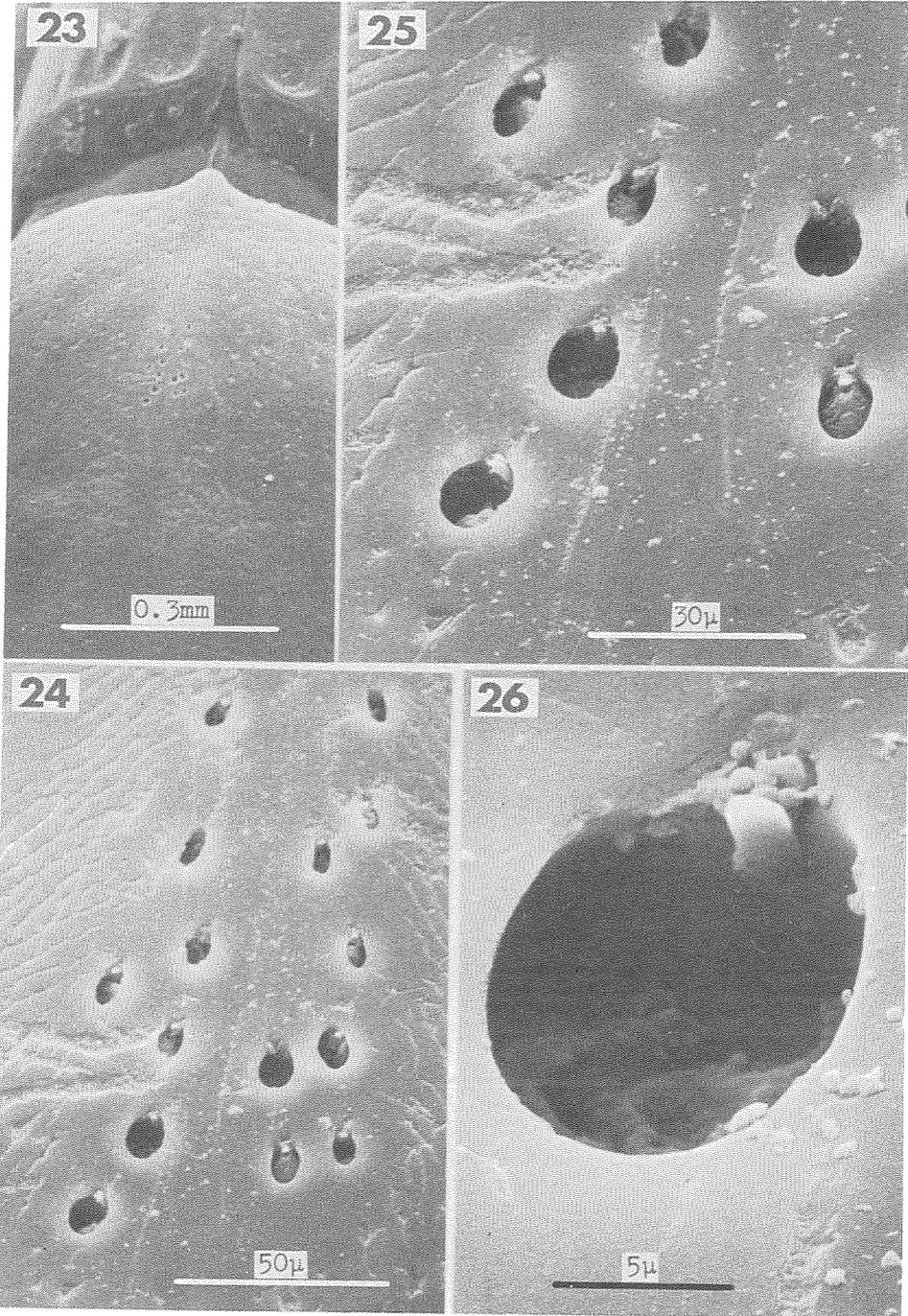


Plate VIII

Platypus caliculus Chapuis (♀)

Figs. 27, 28. Pit-type mycetangia on the pronotum.

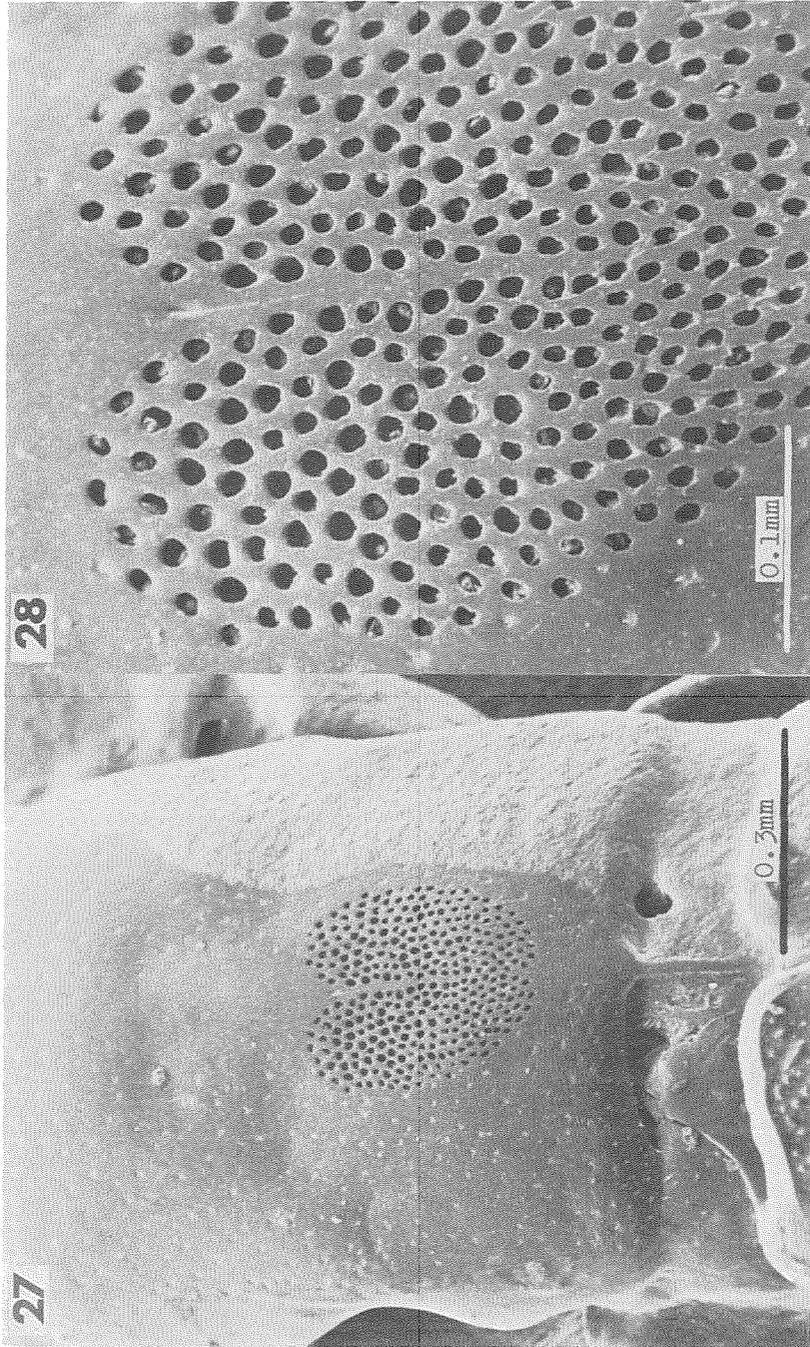


Plate IX

Platypus caliculus Chapuis (♀) (continued)

Figs. 29, 30. Pit-type mycetangia on the pronotum.

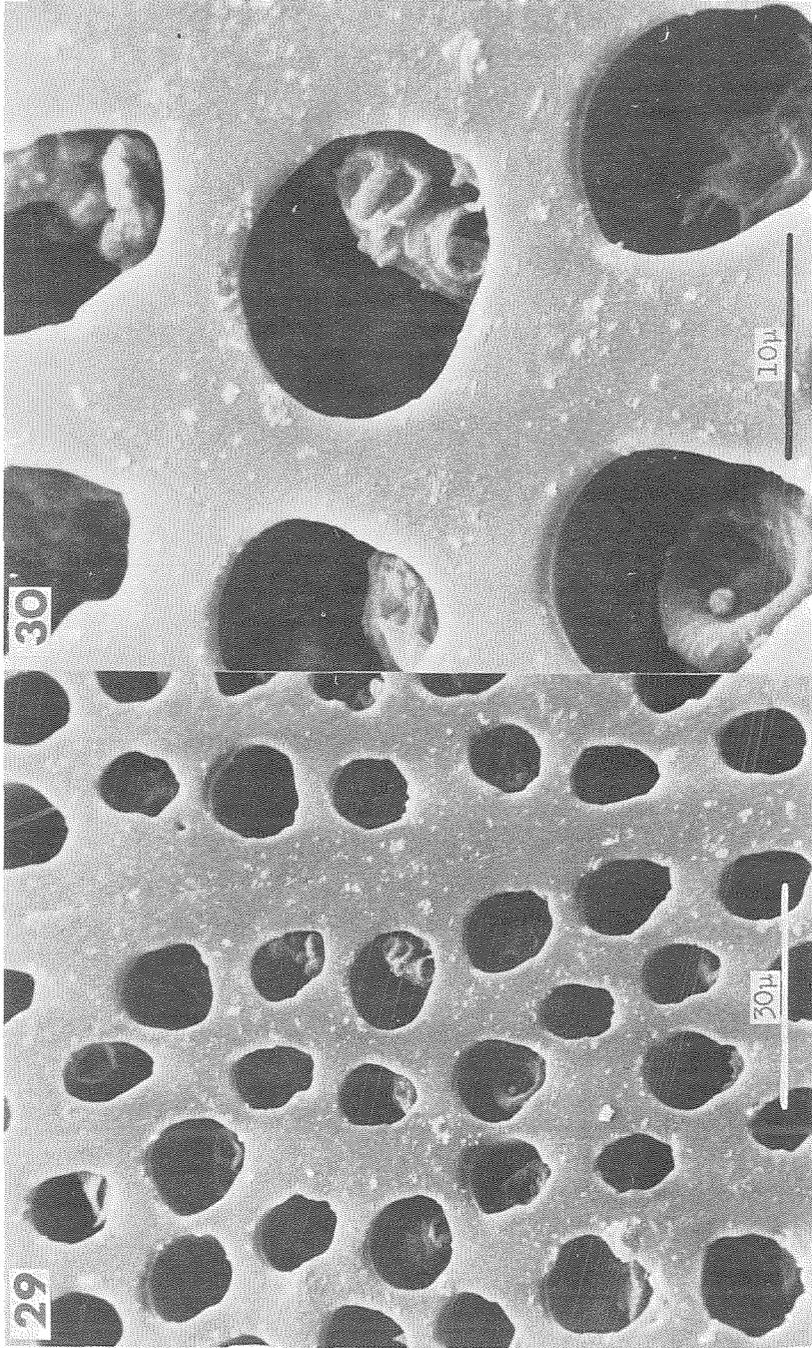


Plate X

Platypus caliculus Chapuis (♂)

Fig. 31. Longitudinal section of the pitted area.

Figs. 32-34. Pit-type mycetangia on the pronotum.
(fm: fungus-like material.)

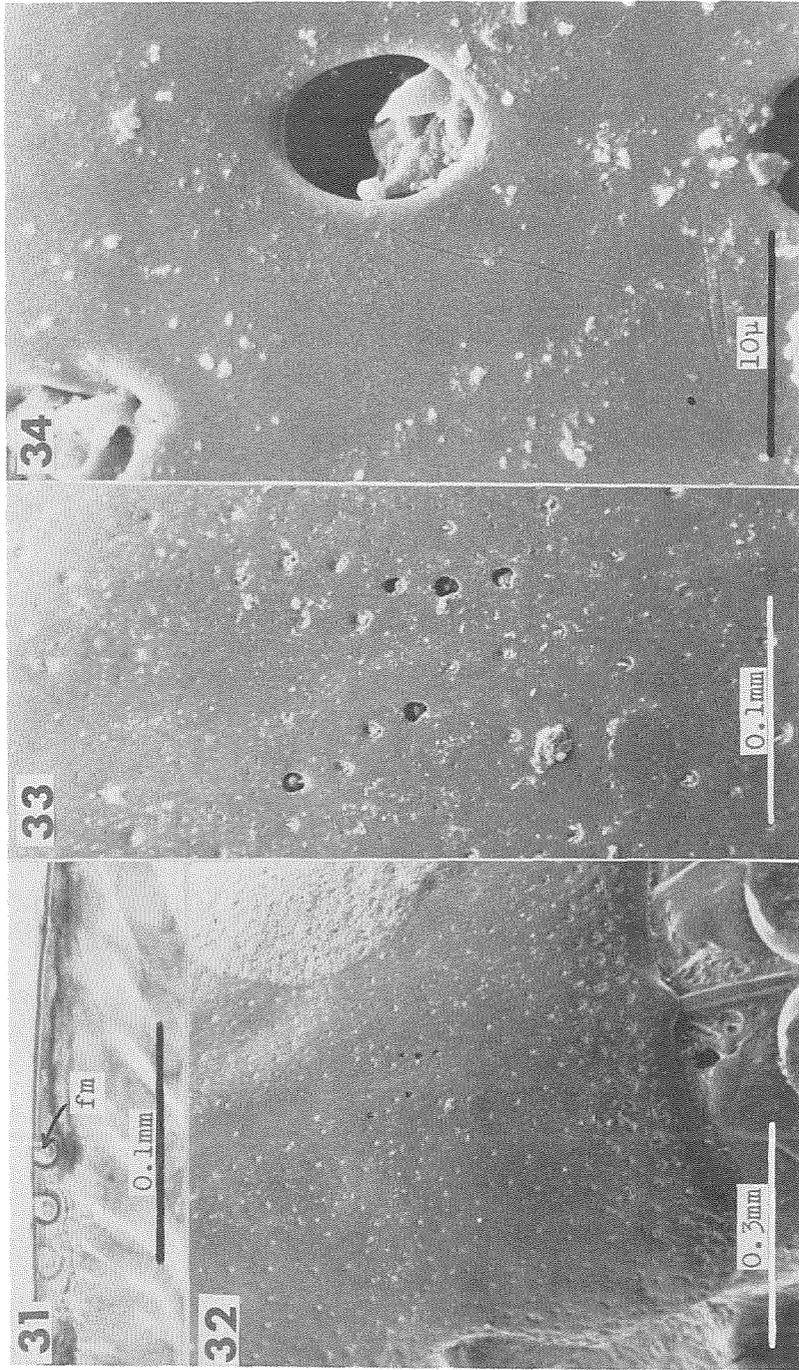


Plate XI

Platypus jansoni Chapuis (♀)

Figs. 35, 36. Pit-type mycetangia on the pronotum.

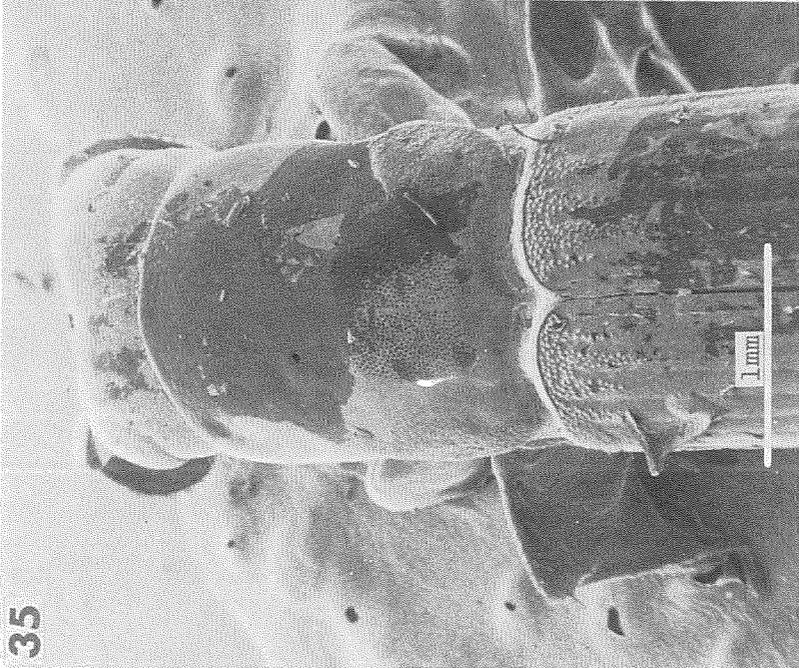
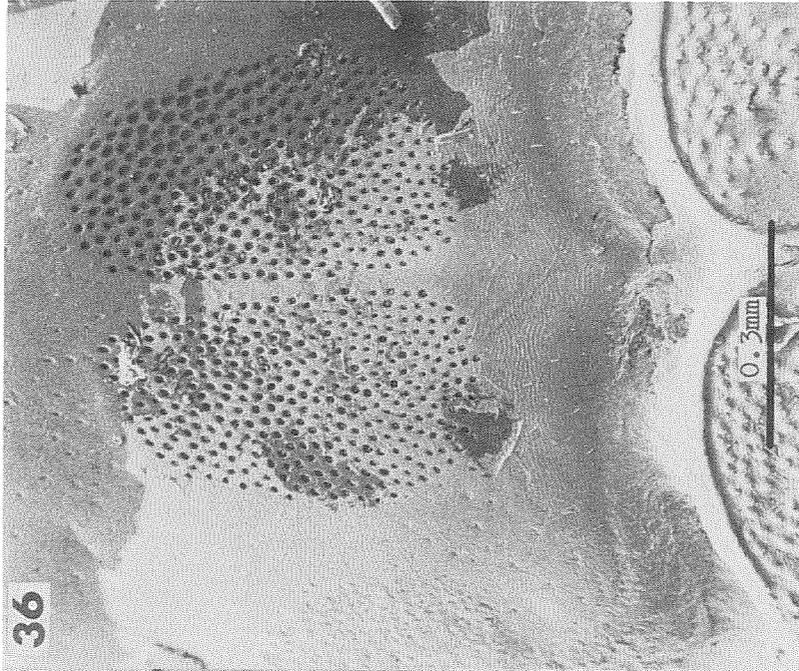


Plate XII

Platypus jansoni Chapuis (♂)

Figs. 37, 38. The pronotum with no mycetangium.

Fig. 39. Enlarged forecoxal cavity (longitudinal section). (efc: enlarged forecoxal cavity.)

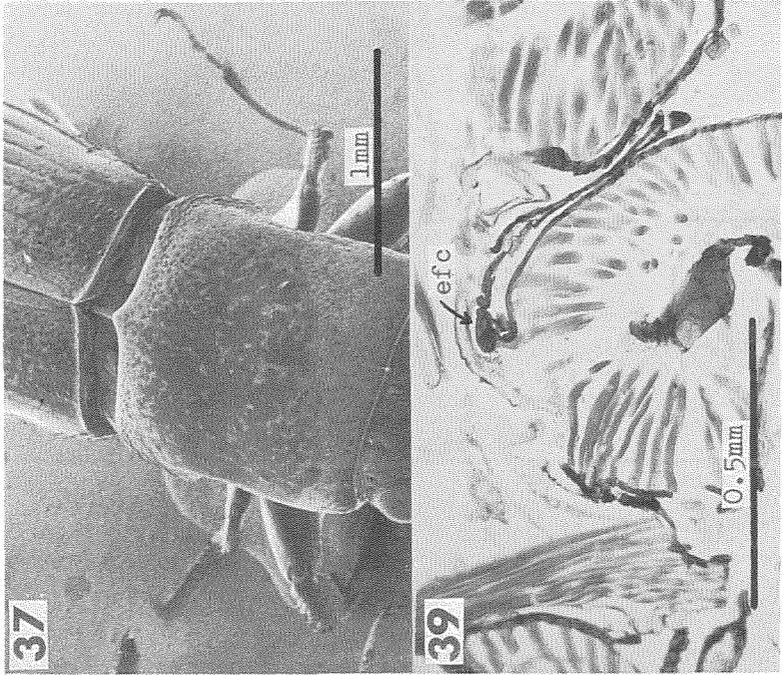
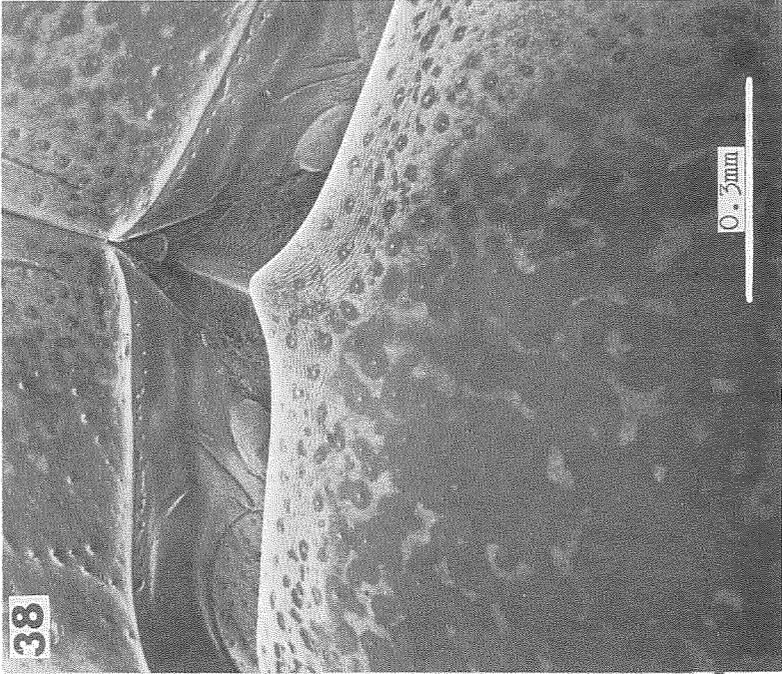


Plate XIII

Platypus solidus Walker (♀)

Figs. 40-42. Pit-type mycetangia on the pronotum.

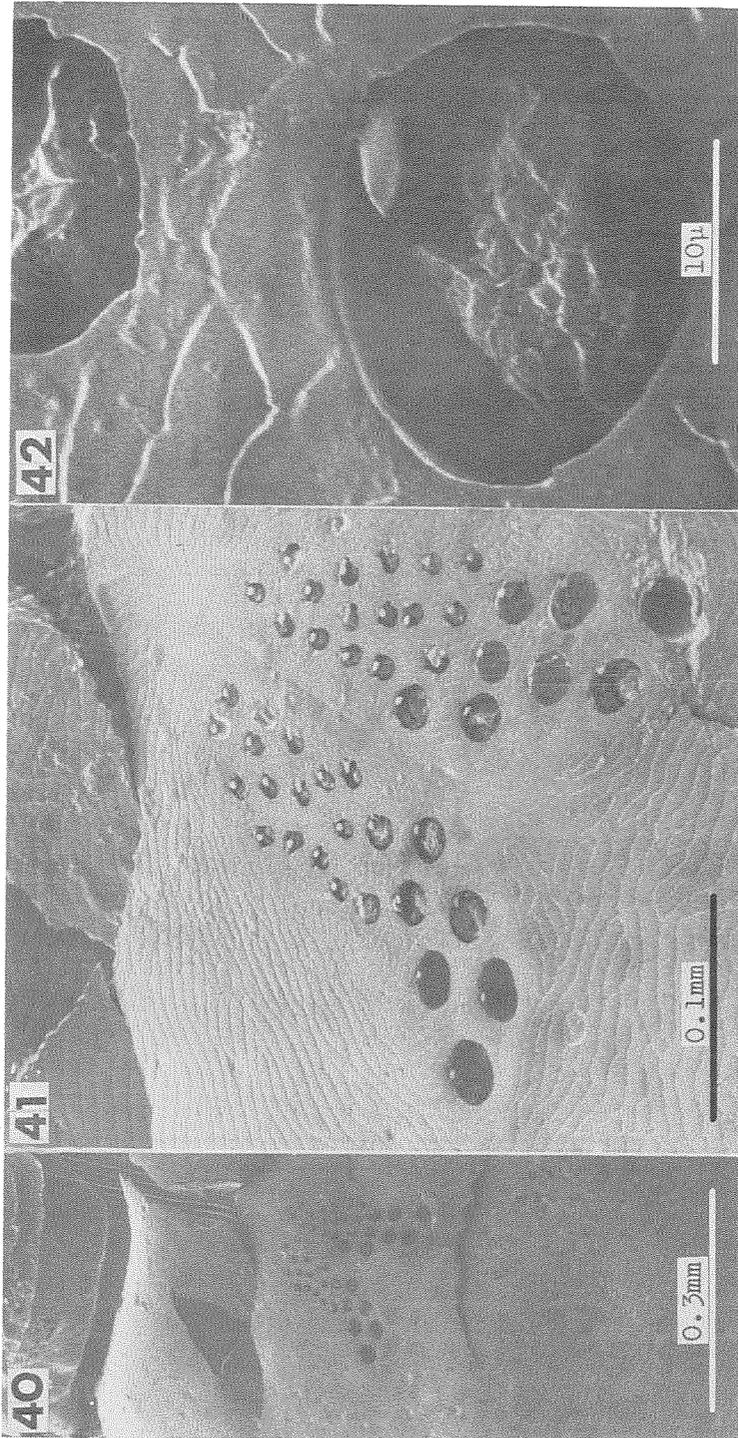


Plate XIV

Platypus solidus Walker (♂)

Figs. 43, 44. The pronotum with no mycetangium.

Fig. 45. Enlarged forecoxal cavity (longitudinal section). (efc: enlarged forecoxal cavity.)

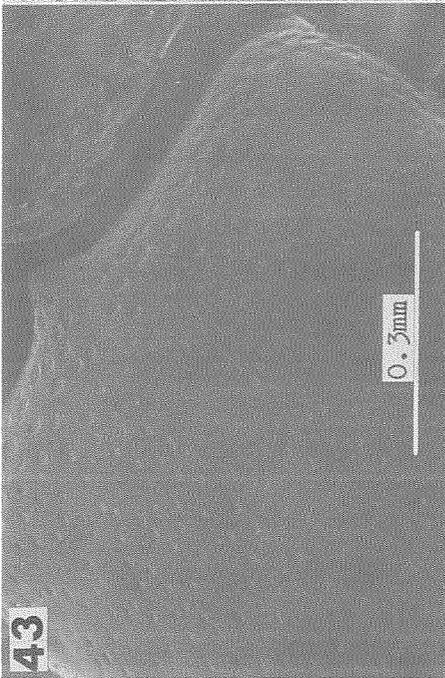
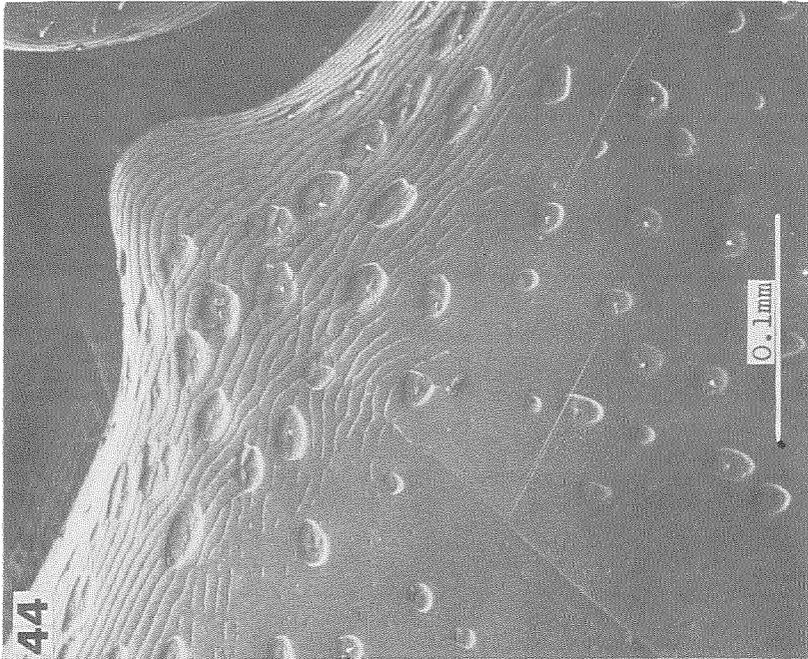


Plate XV

Platypus curtus Chapuis (♀)

Fig. 46. Pit-type mycetangia on the pronotum.

Fig. 47. Large-sized pit-type mycetangia.

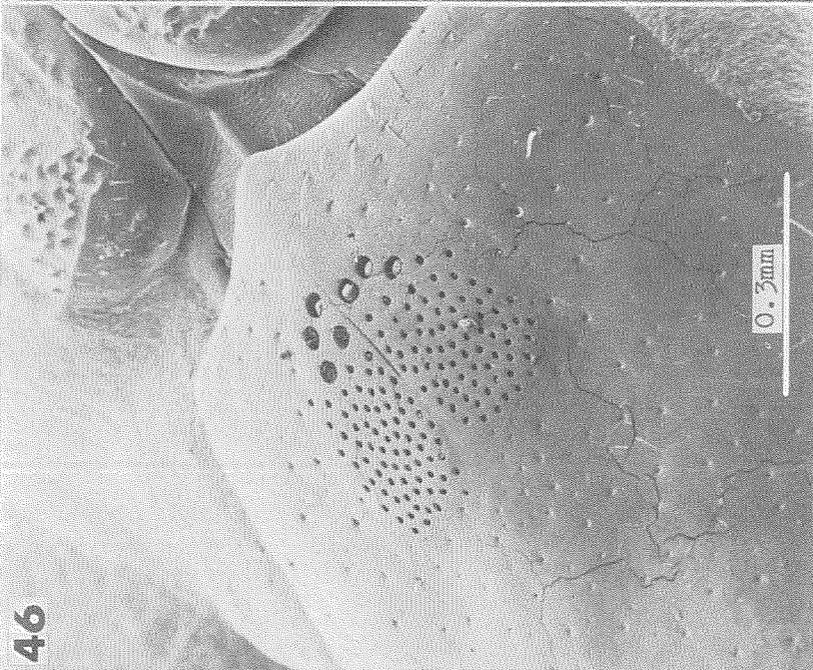
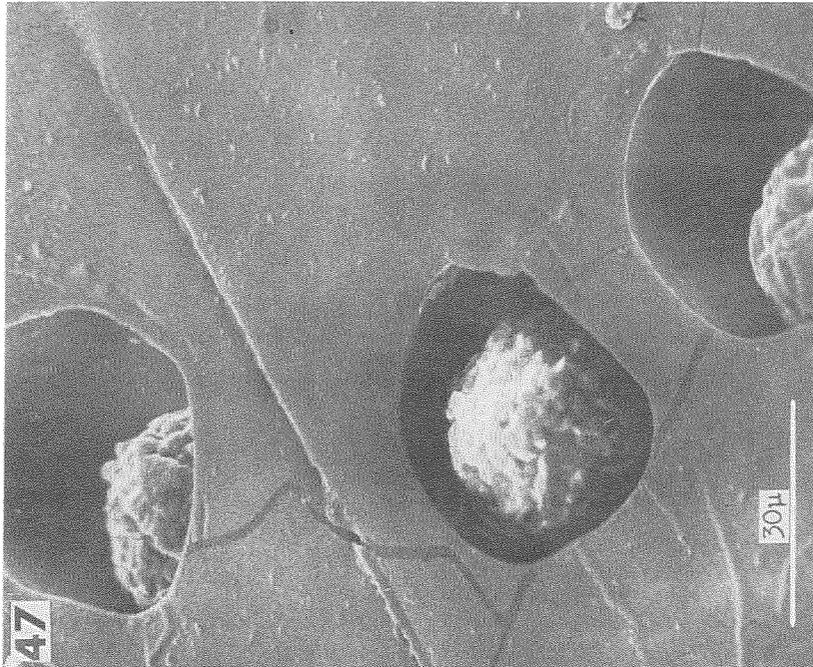


Plate XVI

Platypus curtus Chapuis (♀) (continued)

Fig. 48. Small-sized pit-type mycetangia.

Fig. 49. Longitudinal section of the pitted area.

Fig. 50. Sagittal section of the female. (fm: fungus-like material.)

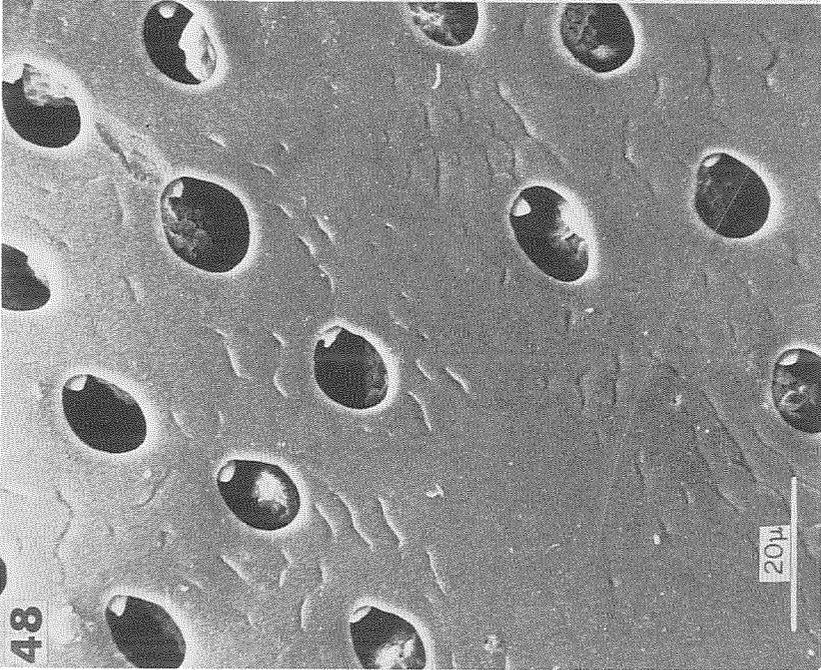
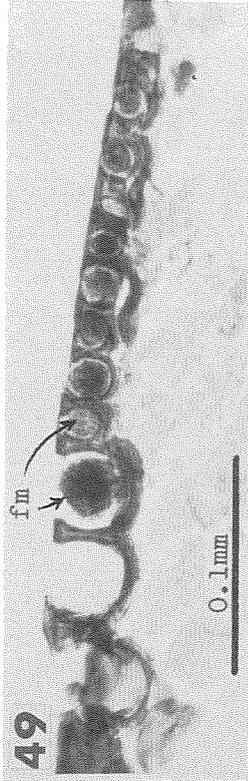


Plate XVII

Platypus curtus Chapuis (♂)

Figs. 51-53. Pit-type mycetangia on the pronotum.

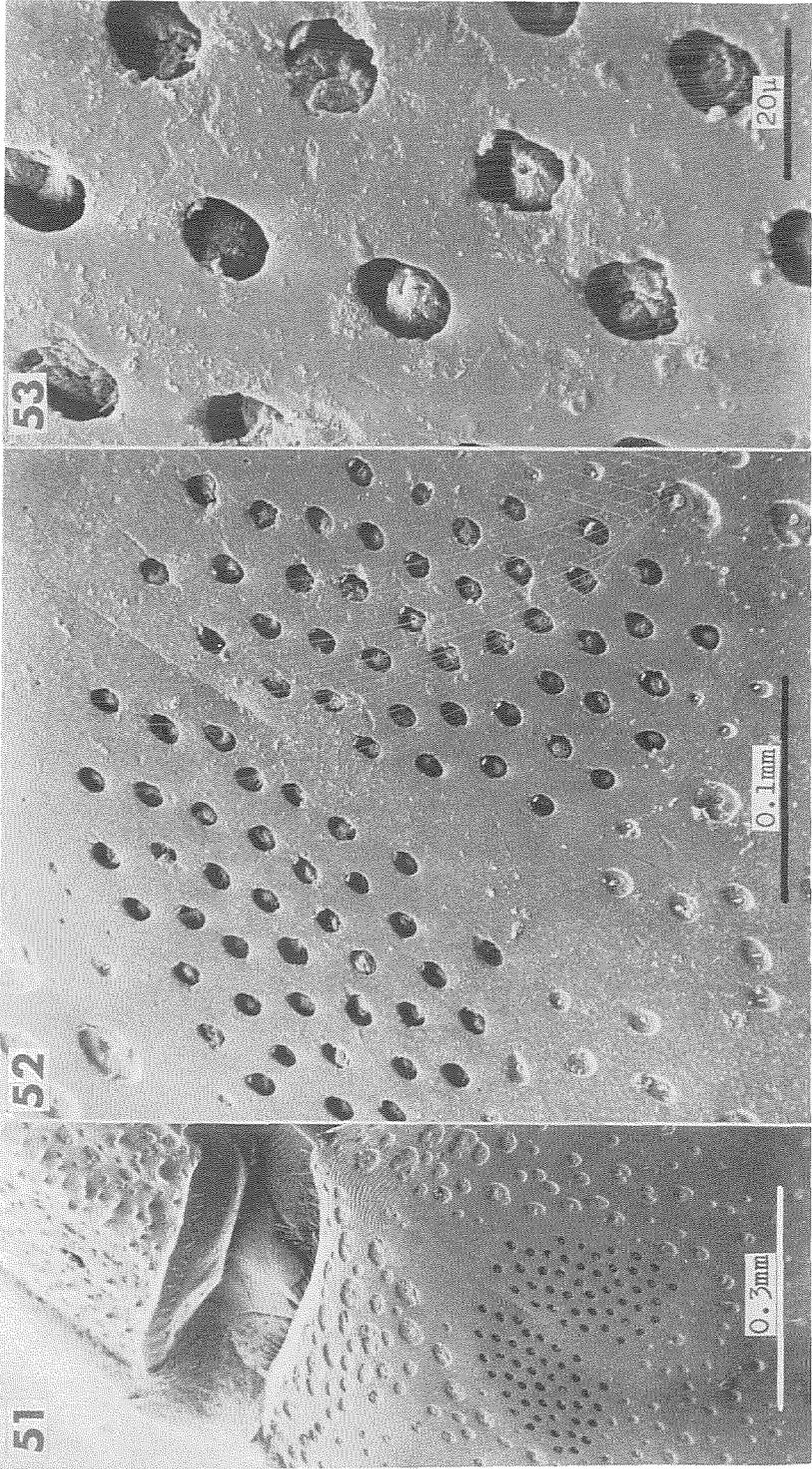


Plate XVIII

Platypus shoreanus bifurcus Schedl (♀)

Figs. 54, 55. Pit-type mycetangia on the pronotum.

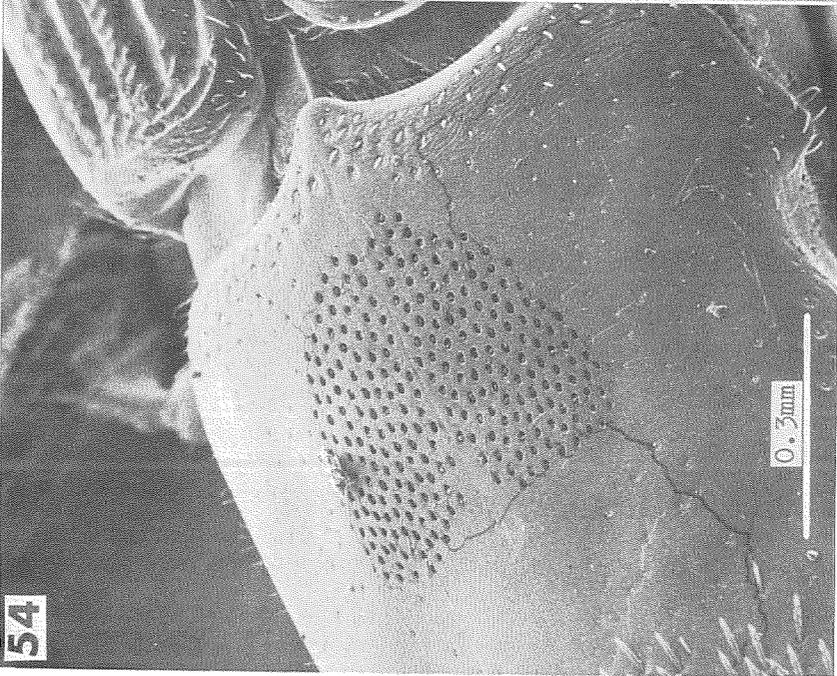
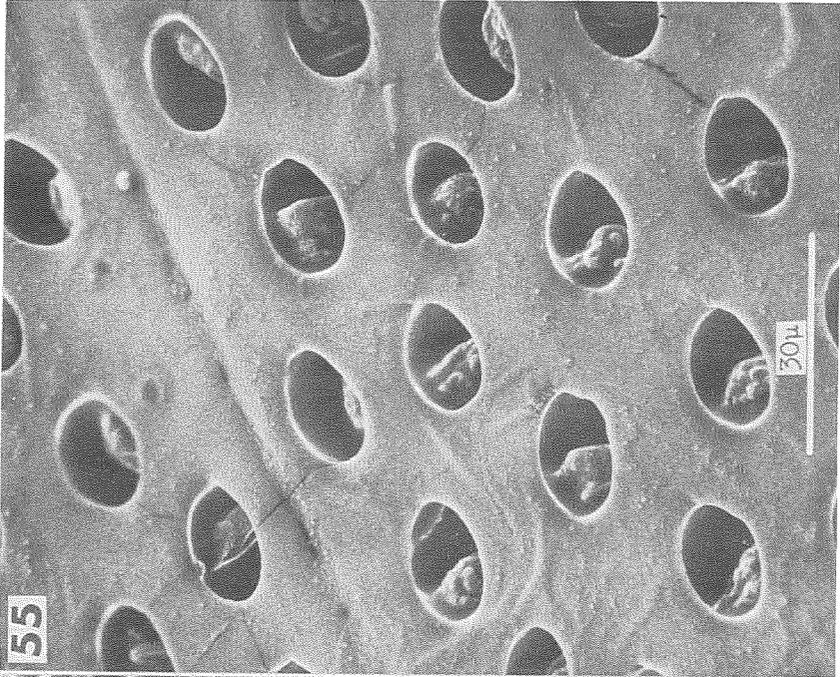


Plate XIX

Platypus shoreanus bifurcus Schedl (♂)

Fig. 56. Longitudinal section of the pitted area.

Figs. 57, 58. Pit-type mycetangia on the pronotum. (fm: fungus-like material.)

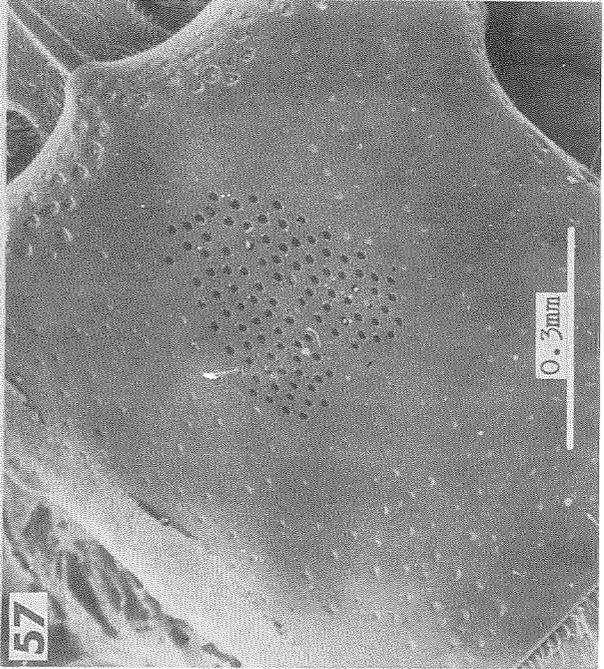
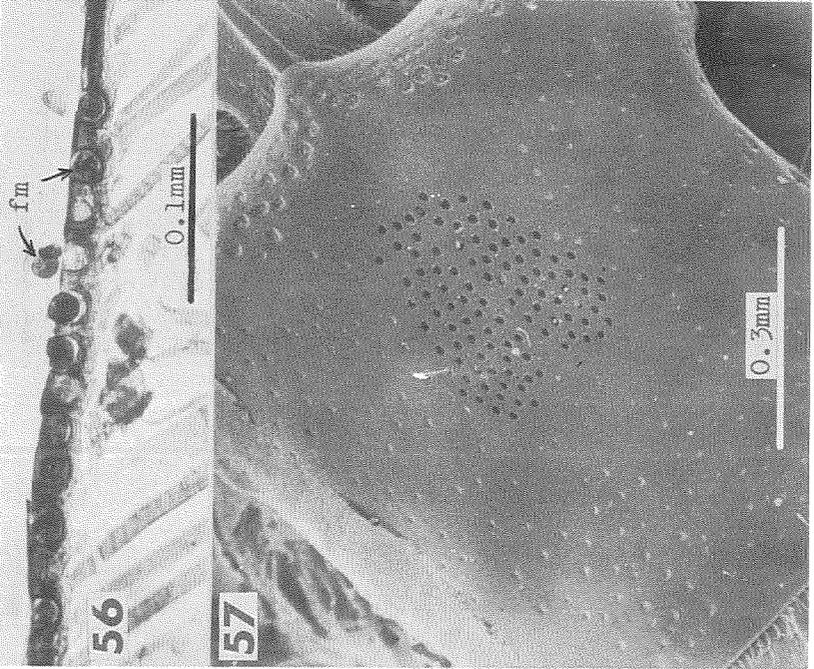
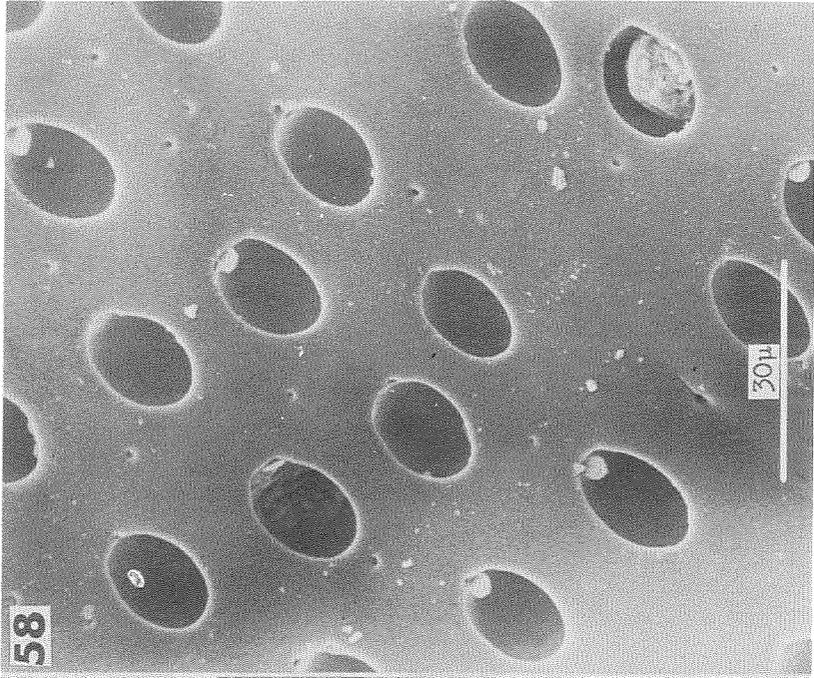


Plate XX

Platypus shoreanus mutilatus Schedl (♂)

Figs. 59, 60. Pit-type mycetangia on the pronotum.

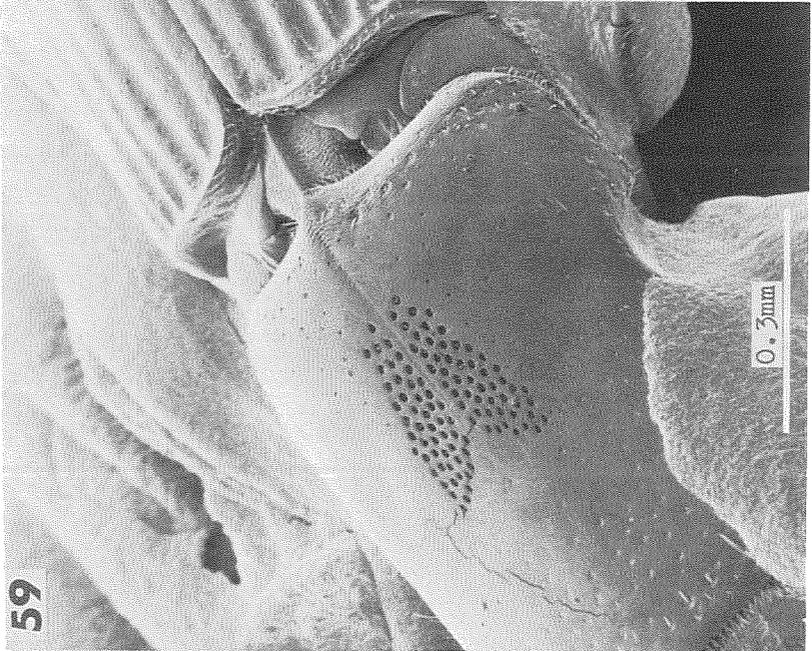
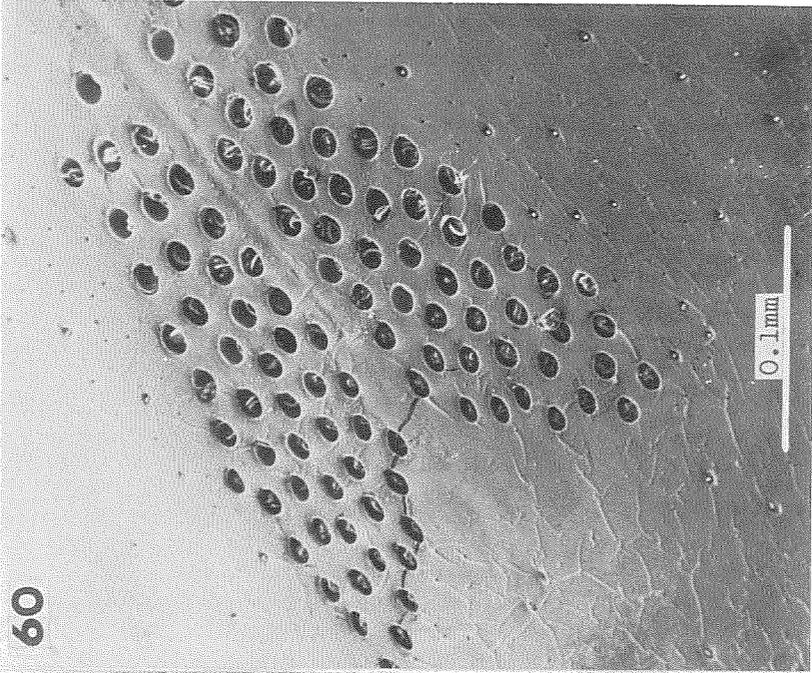


Plate XXI

Platypus shoreanus mutilatus Schedl (♂) (continued)

Fig. 61. Pit-type mycetangia on the pronotum.

Fig. 62. Longitudinal section of the pitted area.

Fig. 63. Longitudinal section of the forecoxal cavity. (fm: fungus-like material.)

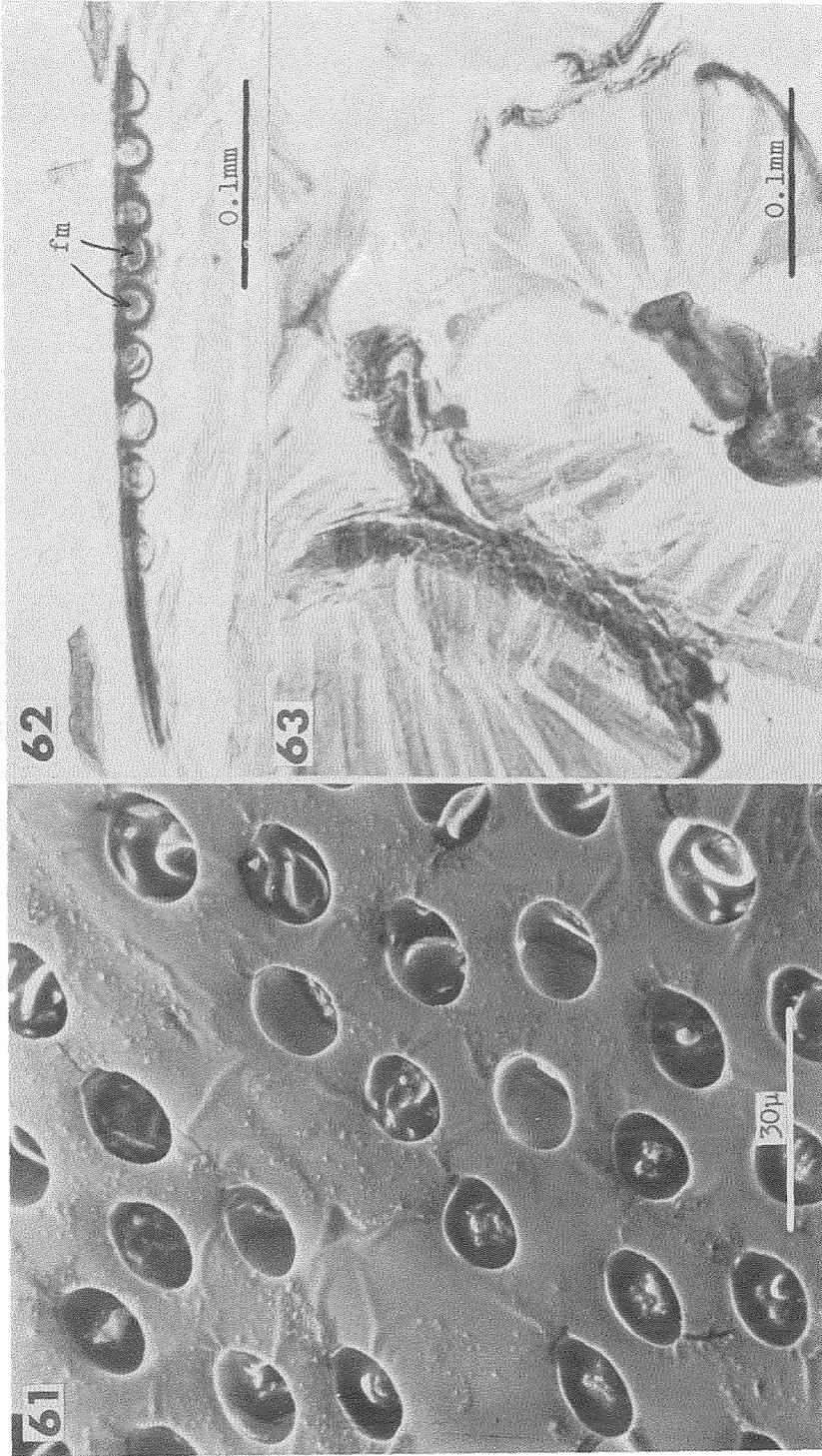


Plate XXII

Platypus forficula Chapuis (♂)

Figs. 64-66. Pit-type mycetangia on the pronotum.

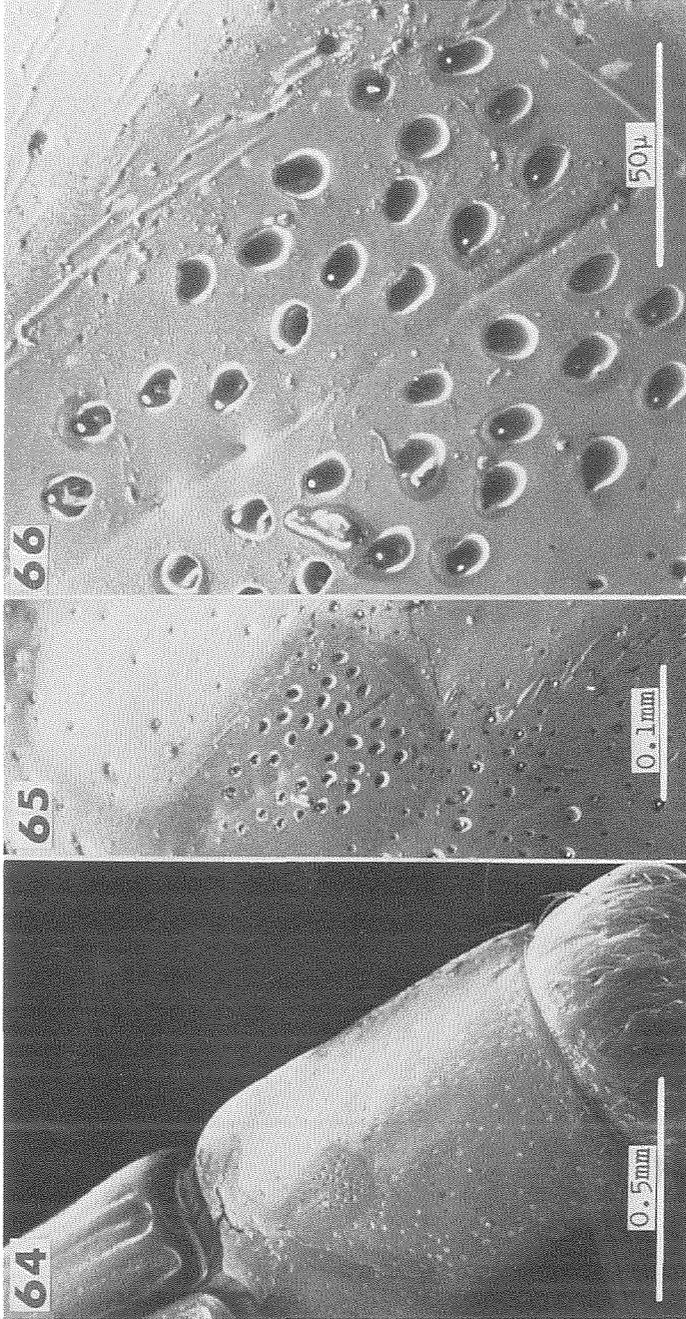


Plate XXIII

Platypus pseudocupulatus Chapuis (♂)

Figs. 67, 68. Pit-type mycetangia on the pronotum.

Fig. 69. Longitudinal section of the pitted area.

Fig. 70. Longitudinal section of the forecoxal and mescoxal cavities.
(fm: fungus-like material; efc: enlarged forecoxal cavity.)

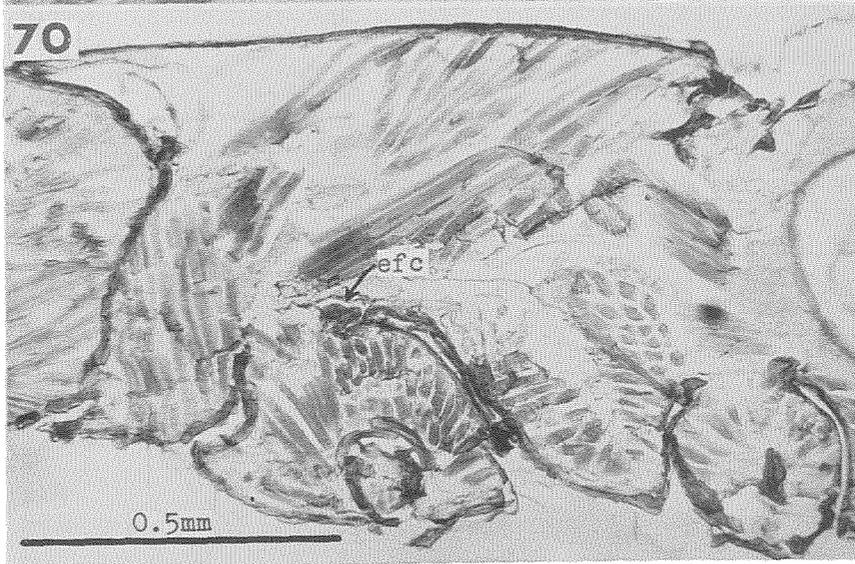
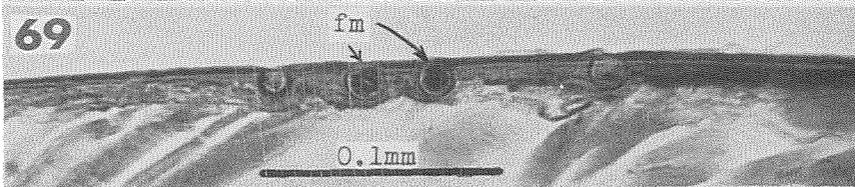
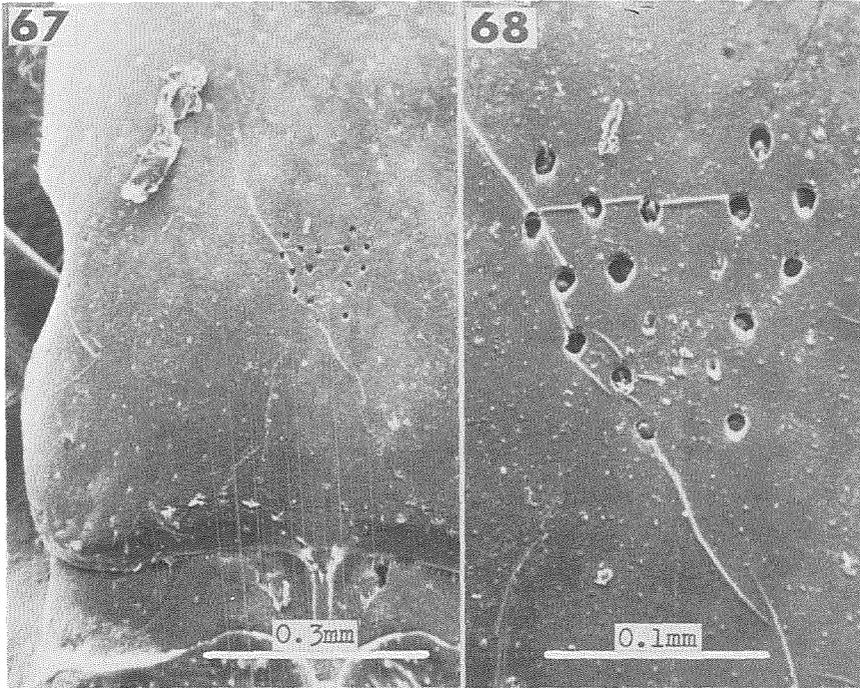


Plate XXIV

Diapus quinquispinatus Chapuis (♀)

Figs. 71, 72. Crevice-type and pit-type mycetangia on the pronotum.

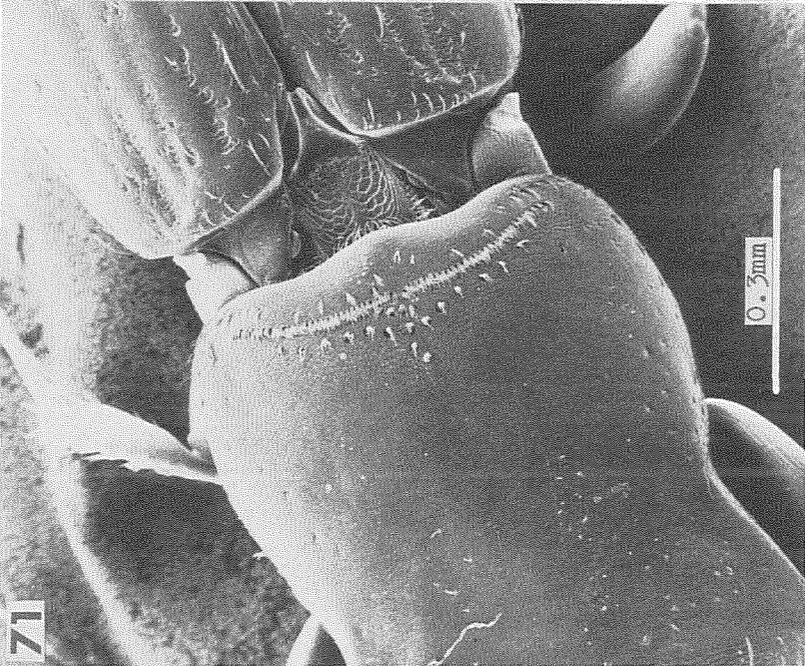
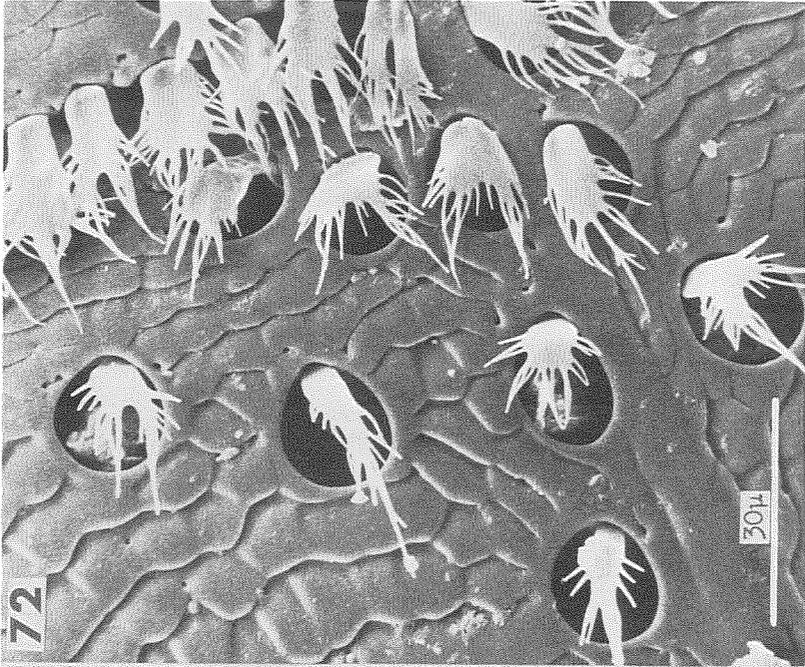


Plate XXV

Diapus quinquespinitus Chapuis (♀) (continued)

Fig. 73. A pit-type mycetangium.

Figs. 74, 75. Longitudinal section of the mycetangial area. (fm: fungus-like material.)

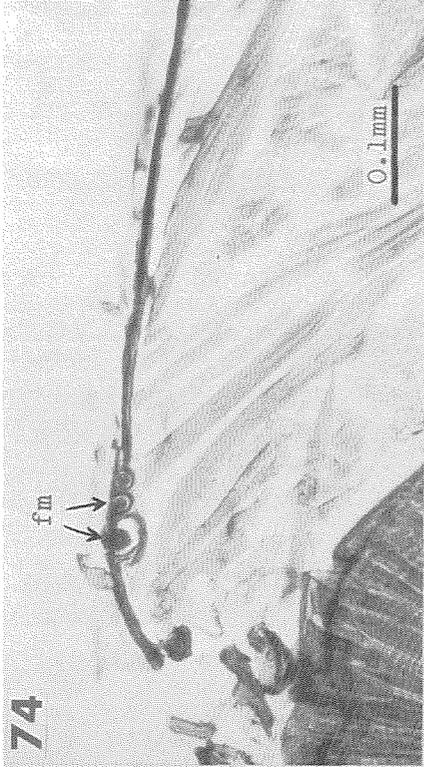
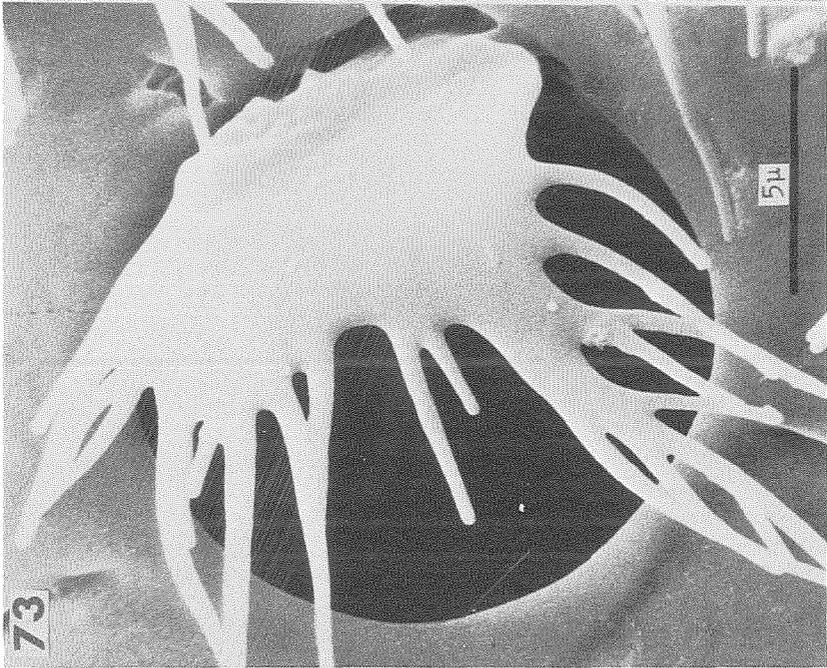


Plate XXVI

Diapus quinquespinitus Chapuis (♂)

Figs. 76, 77. Crevice-type and pit-type mycetangia on the pronotum.

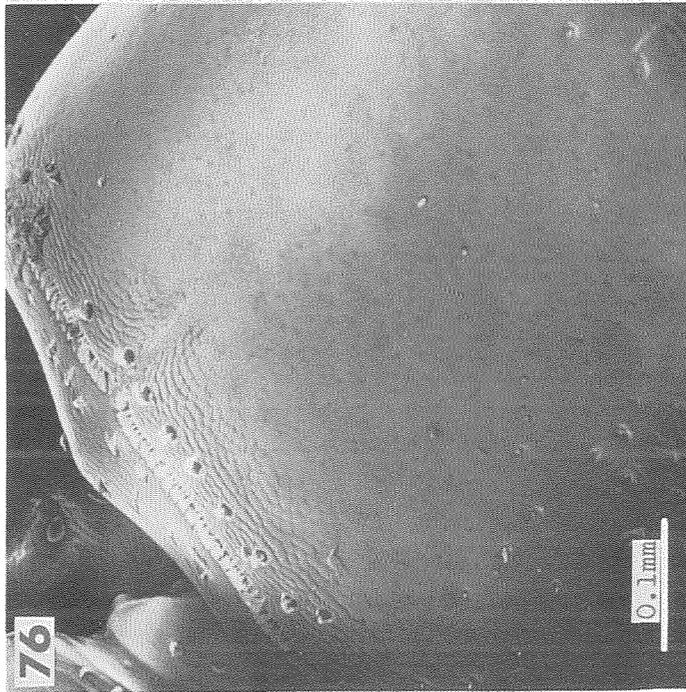
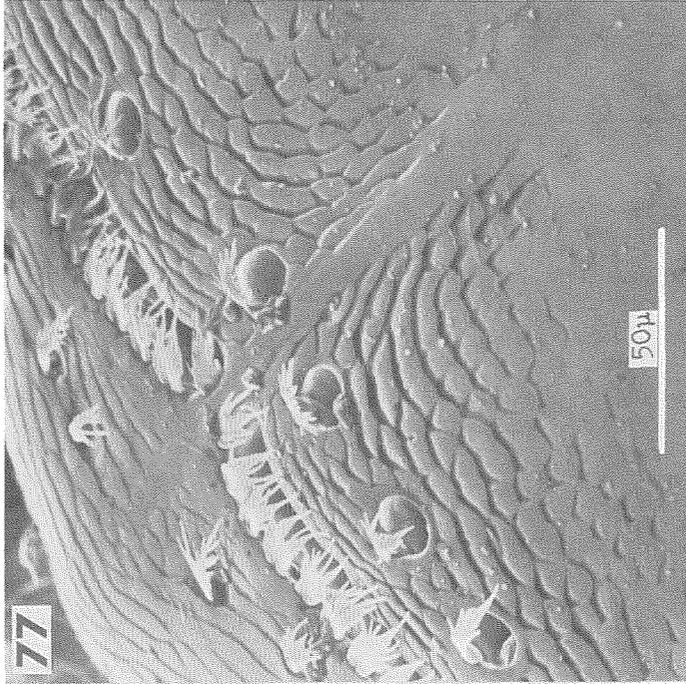


Plate XXVII

Diacavus philippinensis Schedl (♂)

Figs. 78-80. Pore-type mycetangia on the pronotum.

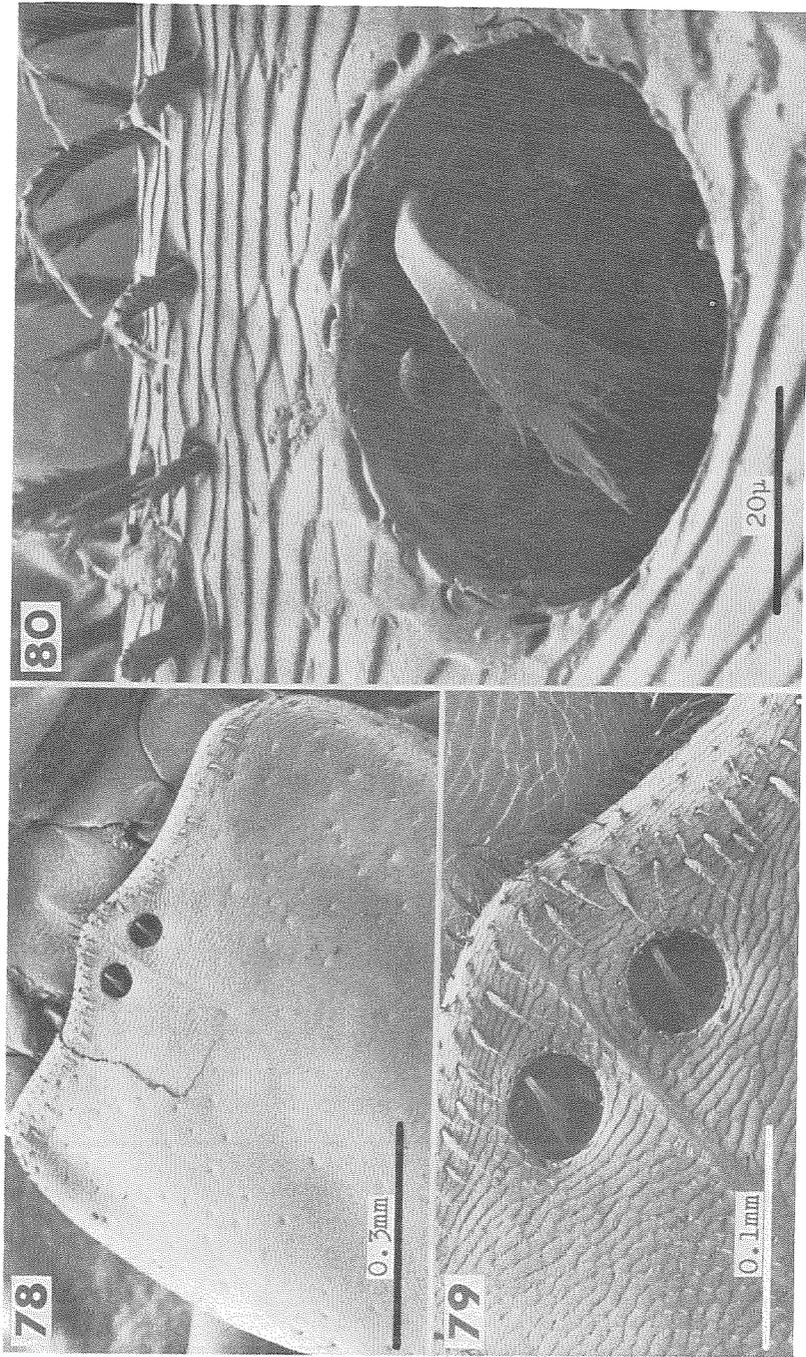


Plate XXVIII

Diacavus abdominalis Schedl (♂)

Figs. 81, 82. The pronotum with no mycetangium.

