












SCREENING AID FOR EASTERN SCOLYTINAE

JAMES R. LaBONTE

STEVEN A. VALLEY

E. RICHARD HOEBEKE

ROBERT J. RABAGLIA

Contributions and Acknowledgements

James LaBonte (Oregon Dept. of Agriculture, ODA) designed this Power Point screening aid.

Steve Valley (ODA) acquired the images for this aid.

Robert Rabaglia (USFS) developed the original text version of the screening aid for the southeastern Scolytines and reviewed this aid.

E. Richard Hoebeke (Cornell University) developed the original text version of the screening aid for the northeastern Scolytines and reviewed this aid.

Don Bright (Canada Dept. of Agriculture, retired) and Steve Wood (Brigham Young University, emeritus) for their tireless efforts in developing the systematics and taxonomy of Scolytinae.

USDA APHIS/Forest Service for funding of this project and the acquisition of the ODA imaging system.

Introduction

This screening aid is not intended to replace a full course in the identification of Scolytinae nor is it a comprehensive treatment of the Scolytines of the eastern USA. It is intended to enable individuals responsible for sorting and identifying large volumes of wood boring insect trap samples to quickly and efficiently sort out the most common species encountered in samples from surveys in the eastern USA. This aid will be most reliable east of the Midwest and north of the southern edge of the U.S. (e.g., southern Florida). Specimens from other areas may not be addressed by the aid. It is designed to be used by individuals with a wide range of taxonomic expertise. Images of all character states are provided. It is not intended to operate completely independently of support by a taxonomist but instead in the context of a workshop.

Use of This Screening Aid

This screening aid functions much like traditional dichotomous keys, with couplets. However, buttons linking non-sequential couplets and enabling return to the originating couplet have been utilized. In general, the most obvious or reliable characters come first in a couplet half, followed by those that are less so. Names of species known to be abundant in the North are followed by the “snowflake” ⍙, those known to be abundant in the South are followed by the “sun” ☼ . Text associated with exotic species of regulatory significance is in white. Species names of exotic species are followed by the ☹ symbol.

Where possible and efficient, taxonomic jargon has been kept to a minimum. It is intended that unfamiliar terms and character states are explained via the images and associated labels. The first several slides following the introduction illustrate the basic body parts of Scolytinae and the terms applied to them. A single slide explaining a few technical terms follows those.

Use of This Screening Aid: II

THIS IS VERY IMPORTANT!

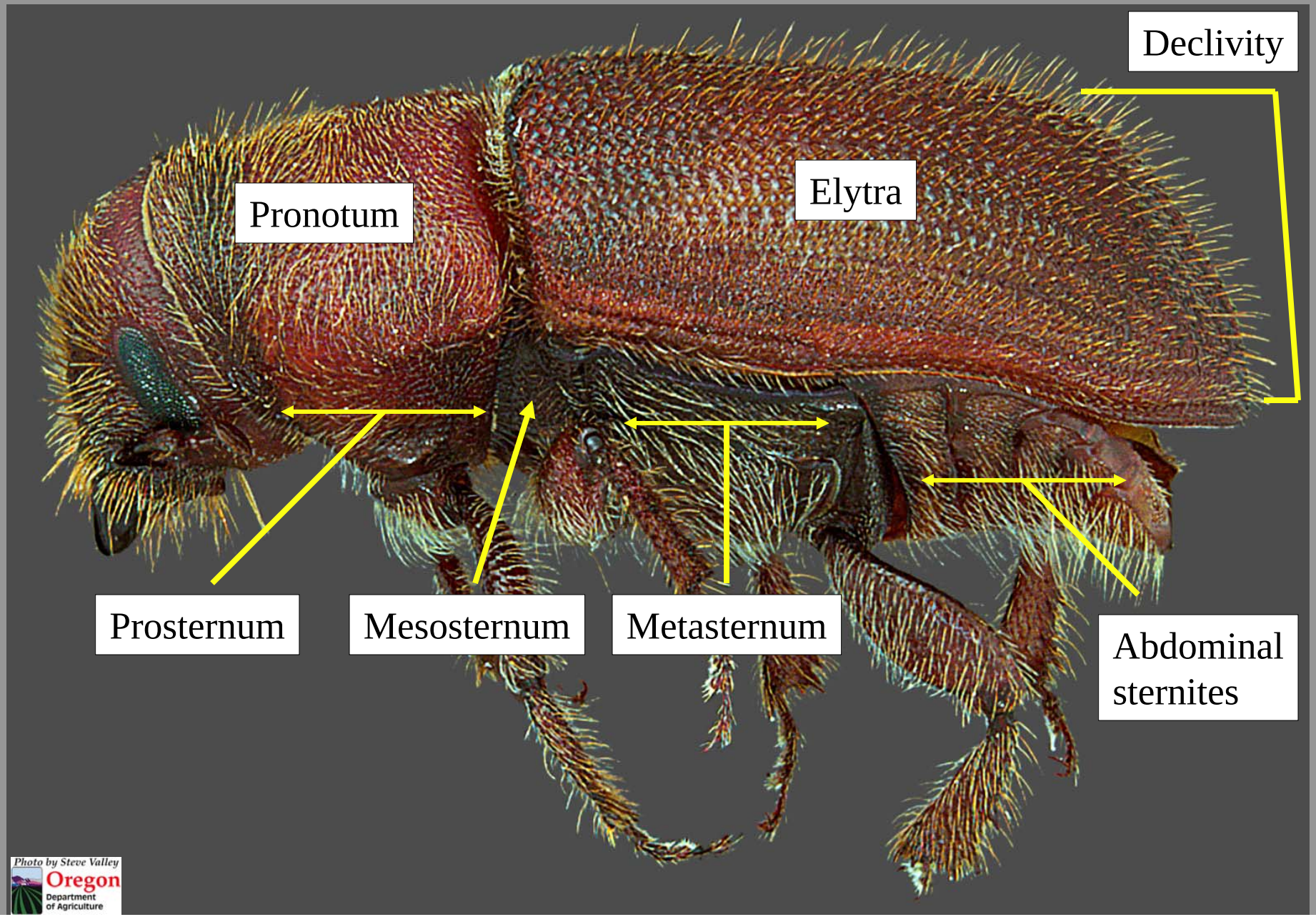
It is intended that this aid be used in conjunction with the services of a taxonomist responsible for the identification of any specimens thought to be other than the “common” species treated. The design of the aid is that any species other than the targets for screening will end at a couplet with “STOP, which equals “STOP, Submit specimen to taxonomist”. “STOP” specimens are NOT unimportant or to be discarded - quite the opposite! Any specimen that does not, in the judgment of the user, appear to be a screening target should be forwarded to a cooperating taxonomist forfurther identification. Furthermore, any specimen keying to an exotic species of regulatory concern should be promptly submitted to a cooperating taxonomist for verification.

Use of This Screening Aid: III

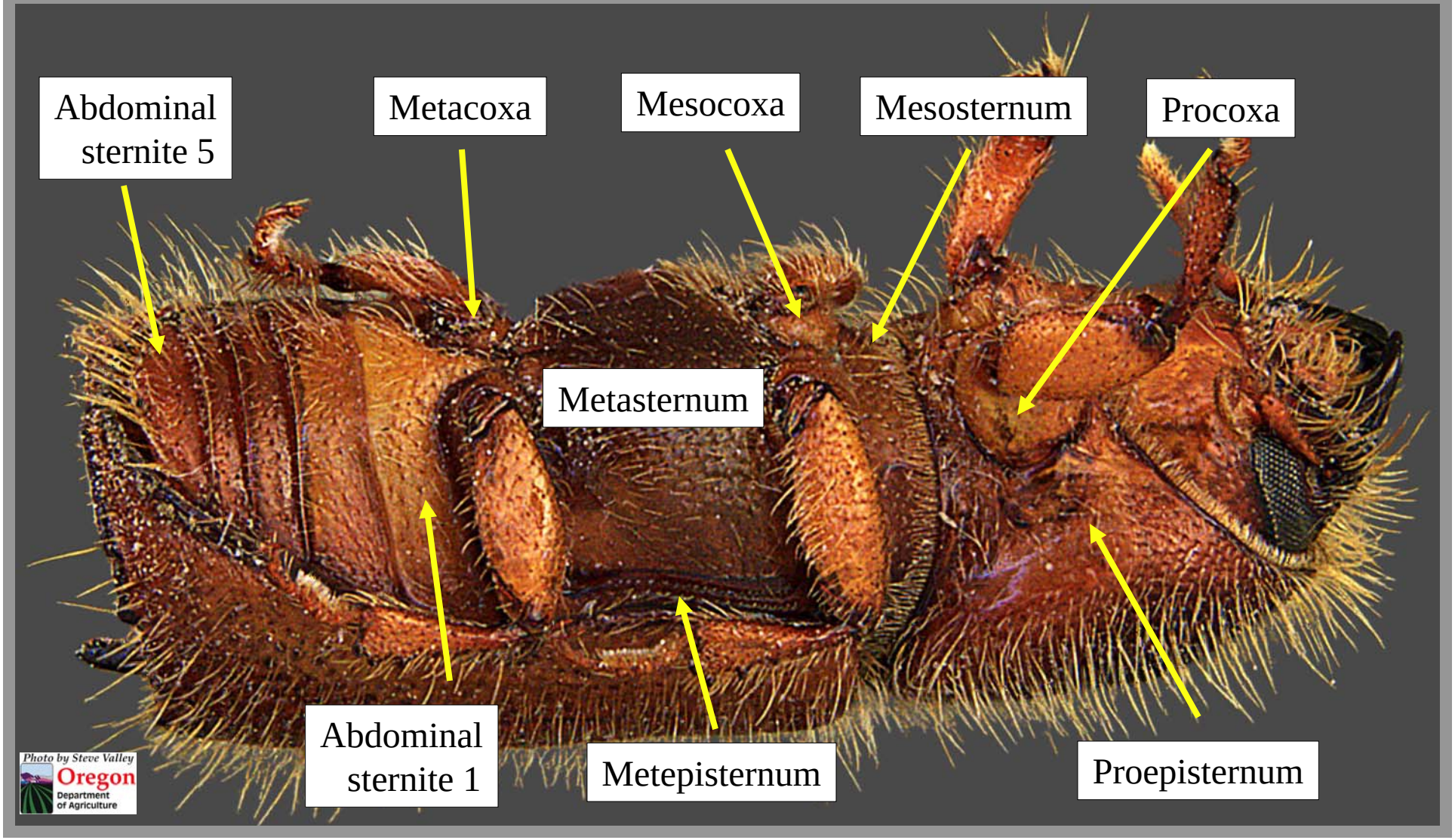
With few exceptions, bark and ambrosia beetles are very small. The characters used in their identification are often portions of body parts and are thus even smaller. Effective identification of this group of insects cannot be conducted without access to a good quality, high powered (preferably with up to 90X) dissecting microscope.

It is also important to maintain a reference collection of identified specimens (hopefully confirmed by a cooperating taxonomist) to ensure correct understanding of the necessary characters. Although the images contained within this screening aid are of very high quality, nothing substitutes for the characters visible on actual specimens.

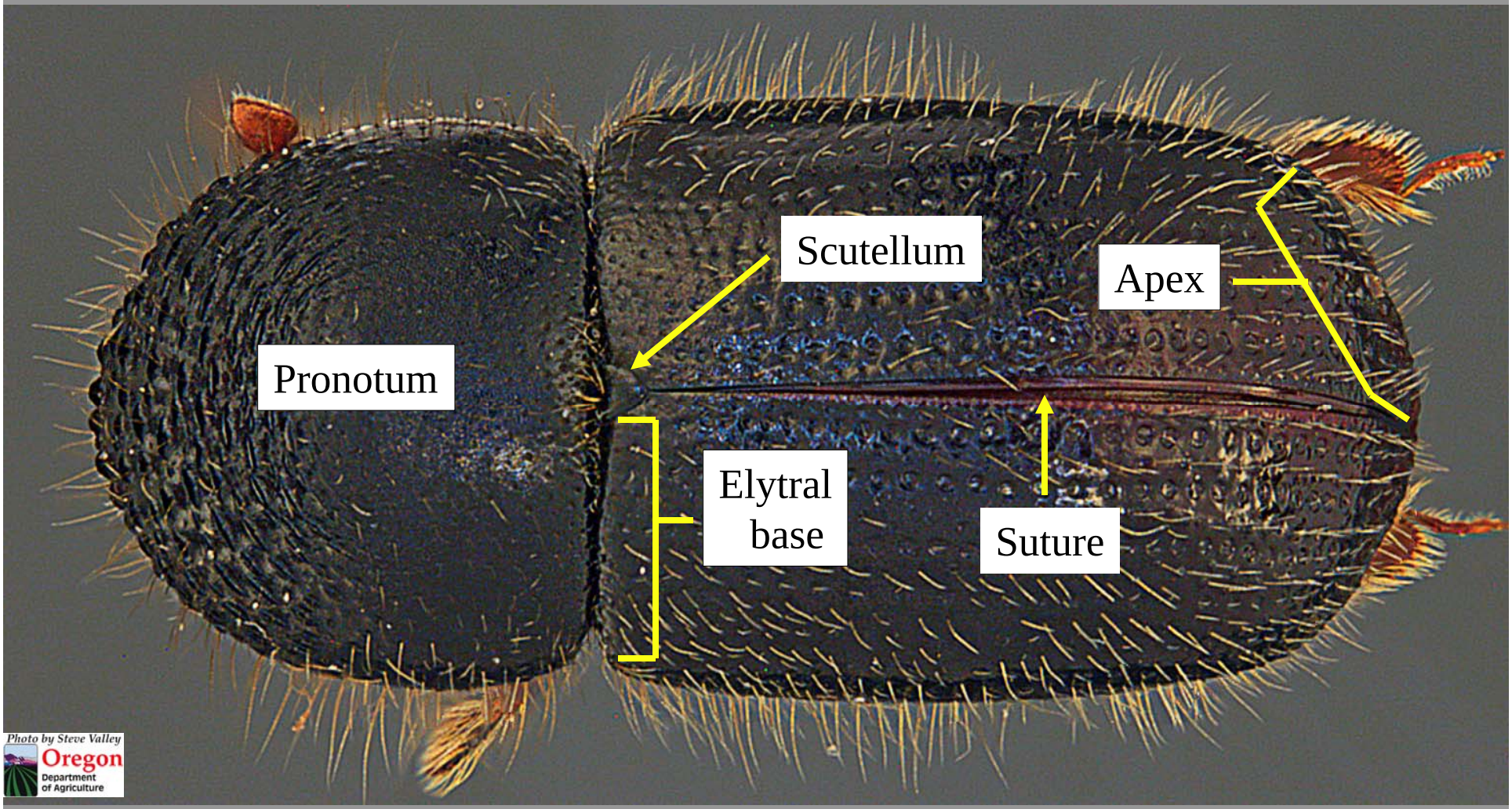
BASIC BODY PARTS OF SCOLYTINAE



BASIC BODY PARTS OF SCOLYTINAE

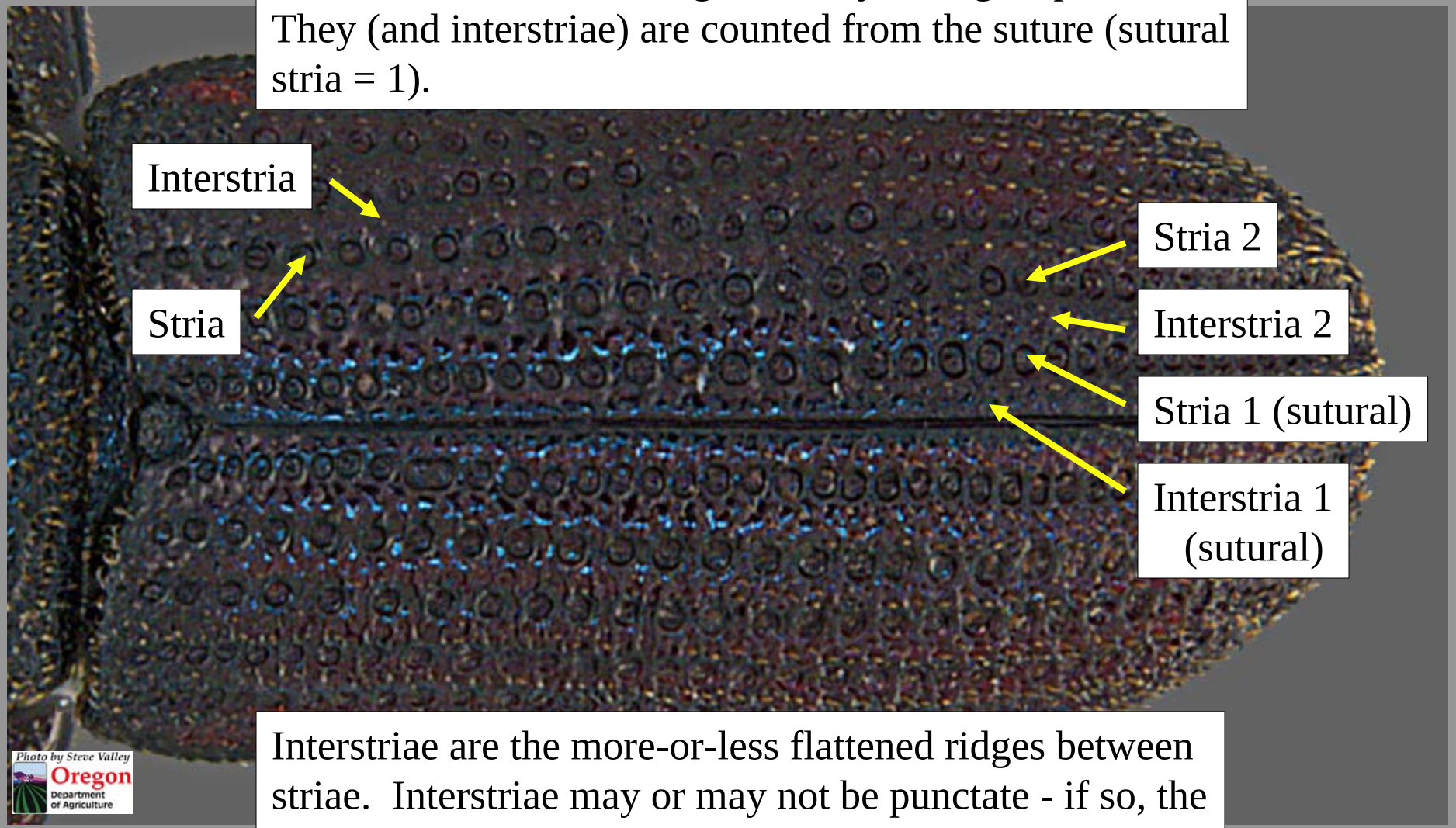


BASIC BODY PARTS OF SCOLYTINAE



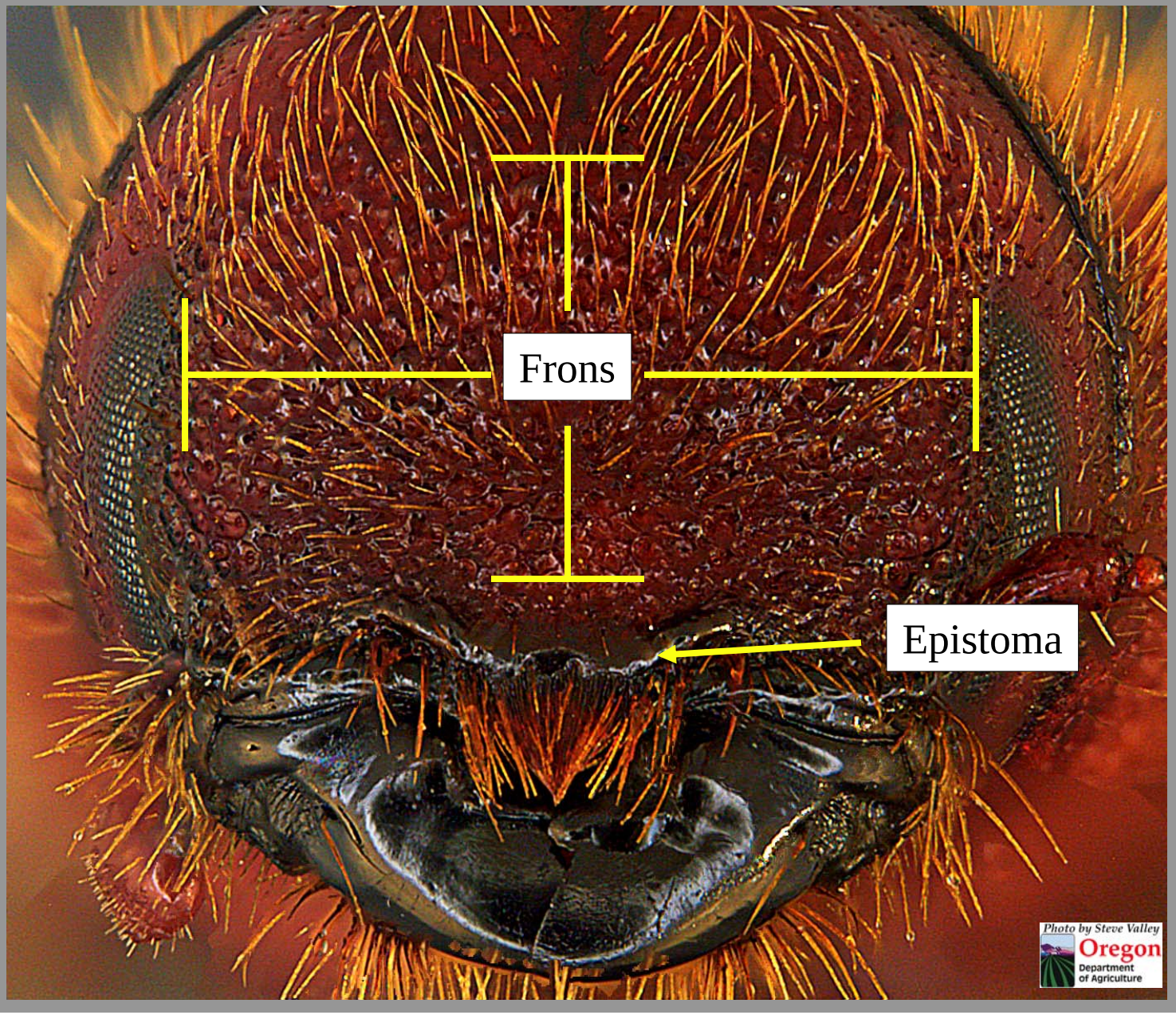
BASIC BODY PARTS OF SCOLYTINAE

Striae are the series of large, linearly arranged, punctures. They (and interstriae) are counted from the suture (sutural stria = 1).



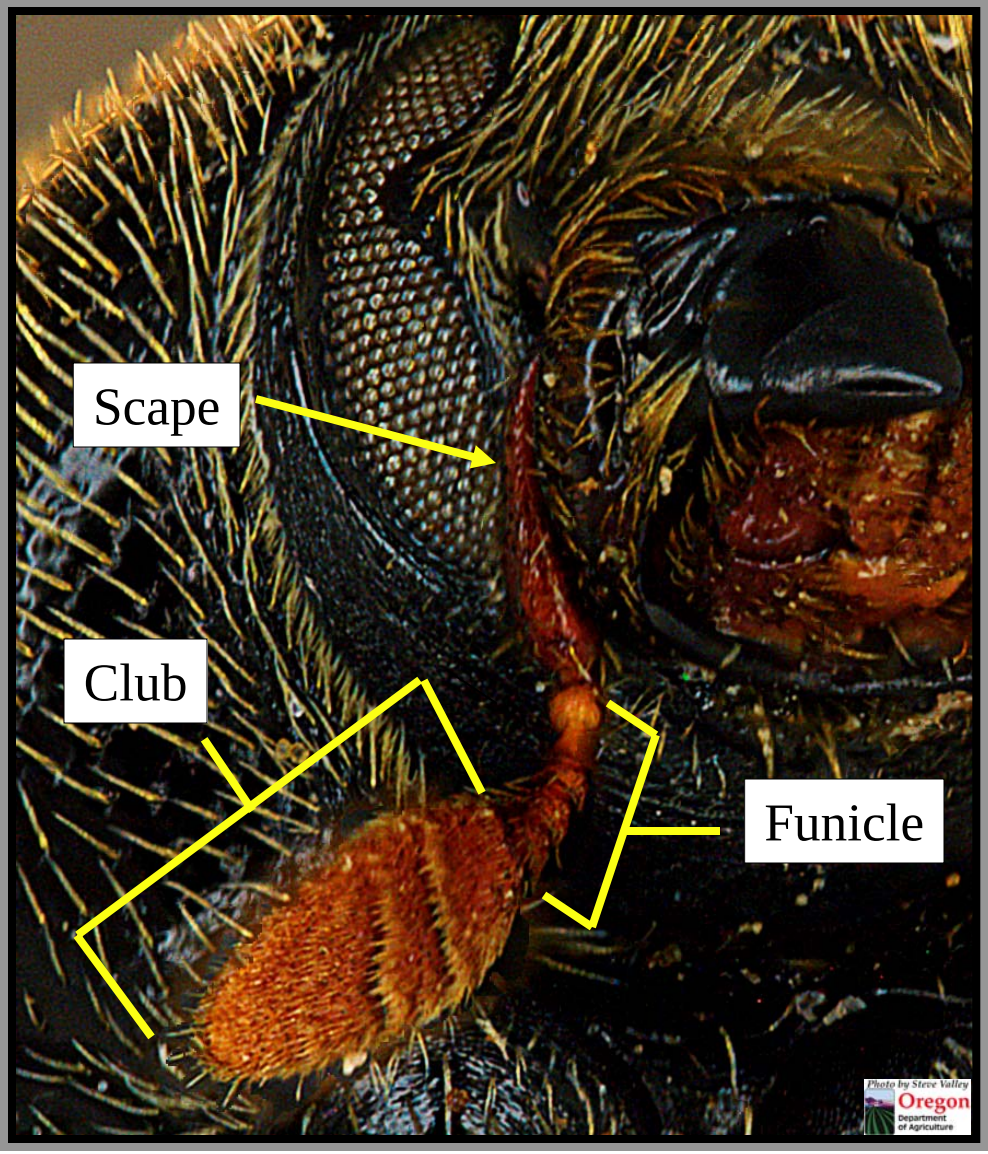
Interstriae are the more-or-less flattened ridges between striae. Interstriae may or may not be punctate - if so, the punctures are normally smaller than those of the striae.

BASIC BODY PARTS OF SCOLYTINAE

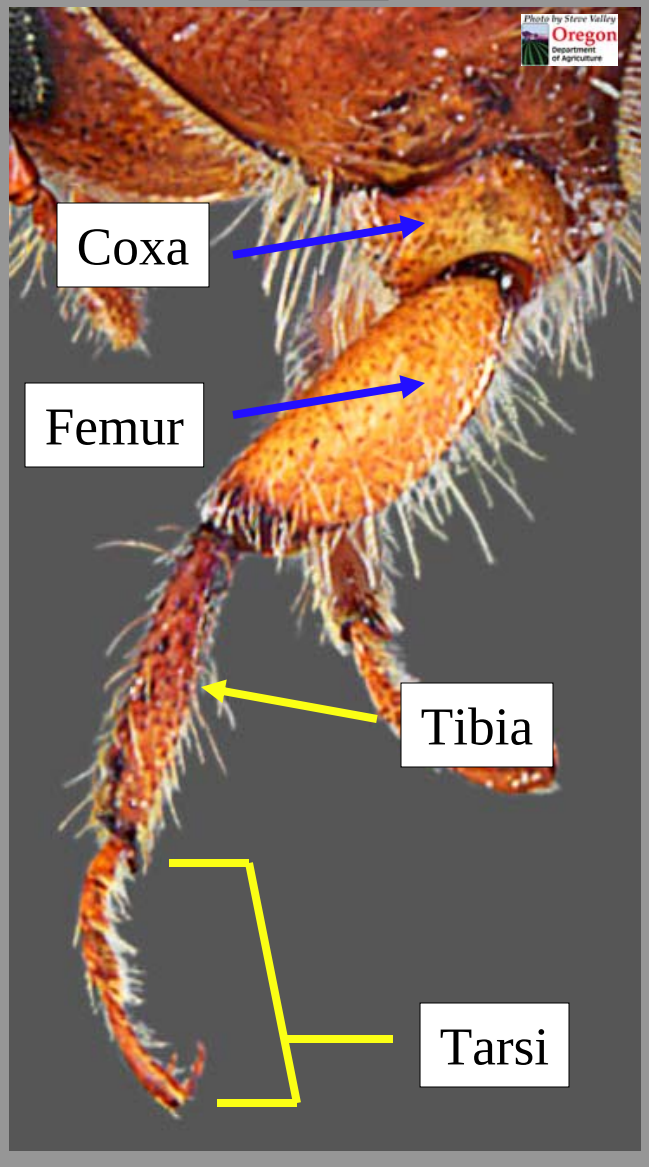


BASIC BODY PARTS OF SCOLYTINAE

Antenna



Leg



A Few Technical Terms

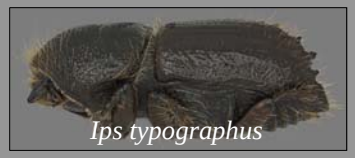
Acuminate: strongly and abruptly tapered to a narrow apex
Asperities: small, sharp elevations or teeth
Contiguous: touching or in contact
Corneous: of a hard, smooth texture
Crenulations: blunt, rounded teeth or scallops
Procurved: curving anteriorly
Recurved: curving posteriorly
Setose: covered with setae
Spine: a thorn-shaped, generally pointed process emerging from a surface, normally longer than wide
Sulcate: channeled or grooved
Tubercle: a bump, a generally rounded process emerging from a surface, generally no longer than wide
Vestiture: a clothing of hairs or scales

Index of Species Exotic to the USA: Select Image of Desired Species

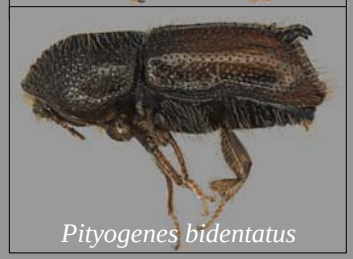

Hylastes opacus


Hylurgus ligniperda


Ips sexdentatus


Ips typographus


Orthotomicus erosus


Pityogenes bidentatus


Pityogenes chalcographus


Tomicus piniperda


Trypodendron domesticum


Xyleborinus alni


Xyleborinus saxesenii


Xyleborus atratus


Xyleborus californicus


Xyleborus pelliculosus


Xylosandrus compactus


Xylosandrus crassiusculus

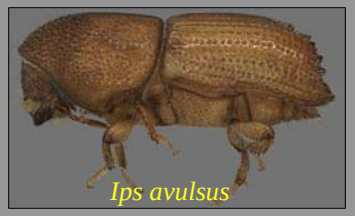

Xylosandrus germanus


Xylosandrus mutilatus

Index of Species Indigenous to the USA: Select Image of Desired Species


Dendroctonus frontalis


Hylastes salebrosus


Ips avulsus


Monarthrum mali


Pityogenes hopkinsi


Dendroctonus terebrans


Hylastes tenuis


Ips calligraphus


Orthotomicus caelatus


Hylurgops rugipennis pinifex


Ips grandicollis


Dendroctonus valens


Hypothenemus spp.


Ips pini


Pityophthorus spp.


Trypodendron lineatum


Euwallacea validus


Gnathotrichus materiarius


Hylastes porculus

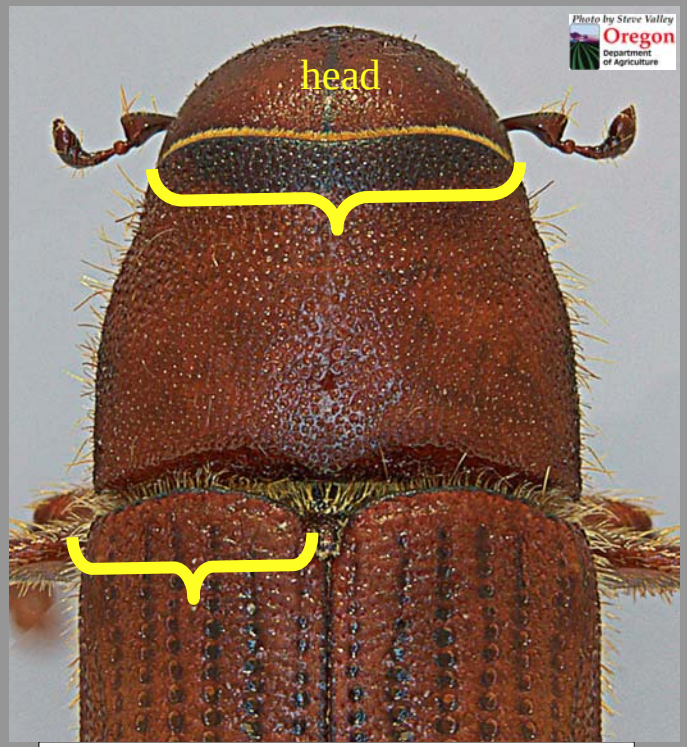

Monarthrum fasciatum


Xyloterinus politus

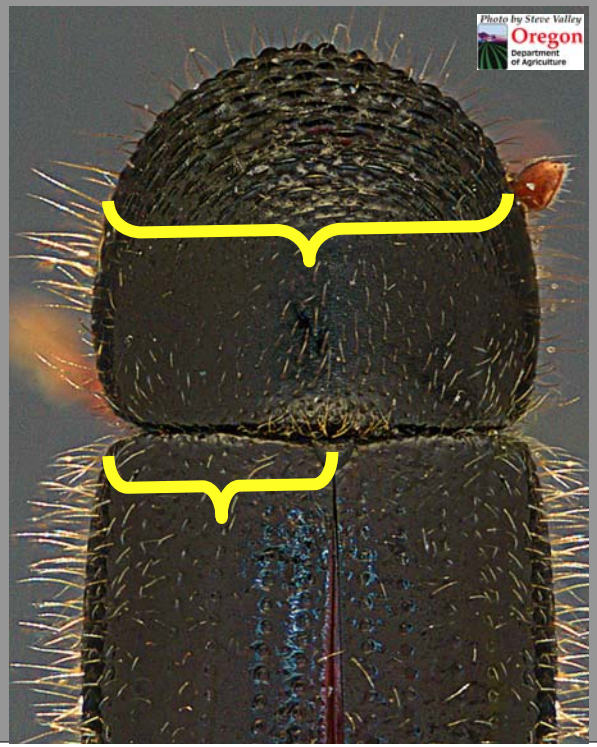
1: Part I

Anterior margins of elytra procurved, with a series of crenulations (**a**); pronotum <u>usually</u> unarmed; head visible from above (**c**)…...……..…2

Anterior margins of elytra truncate and squared off, without crenulations (**b**); pronotum <u>often</u> armed by granules or asperities on at least anterior 1/3; head <u>usually</u> concealed from above (**d**)……18



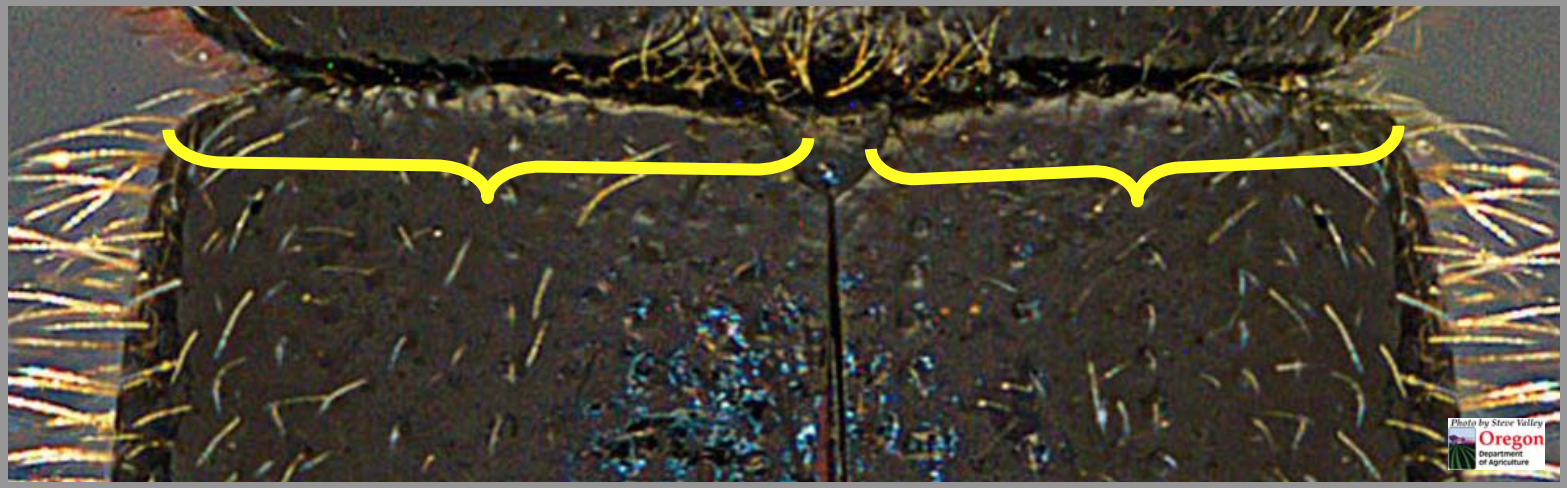
1a: Anterior elytral margins procurved; pronotum unarmed; head visible.



1b: Anterior elytral margins truncate; pronotum armed; head concealed.

1: Part II

1c: Anterior elytral margins procurved, with crenulations.

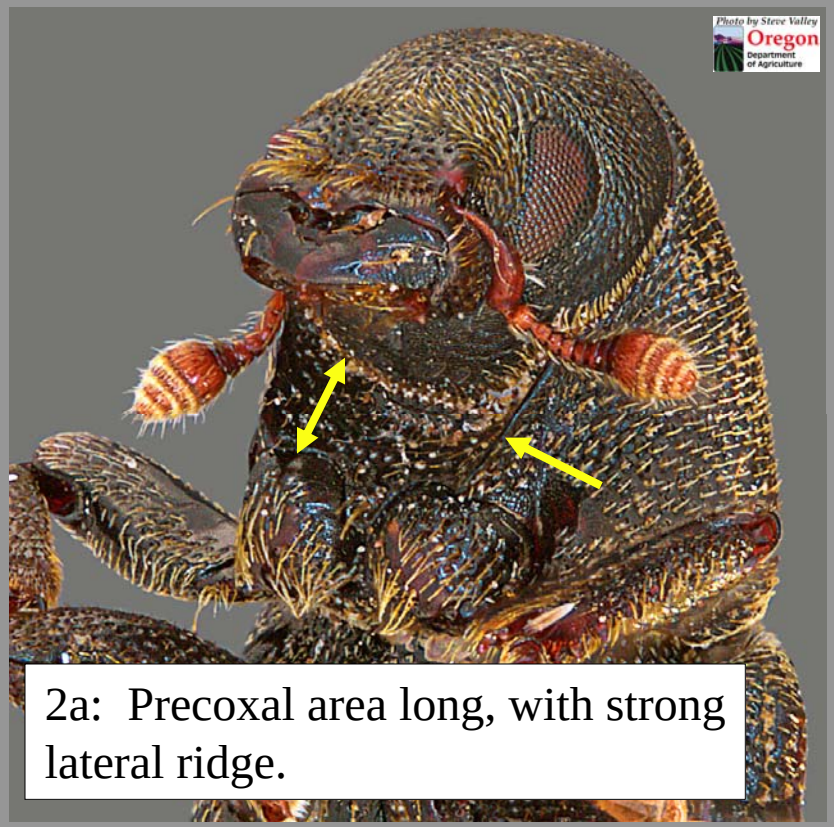


1d: Anterior elytral margins truncate, without crenulations.

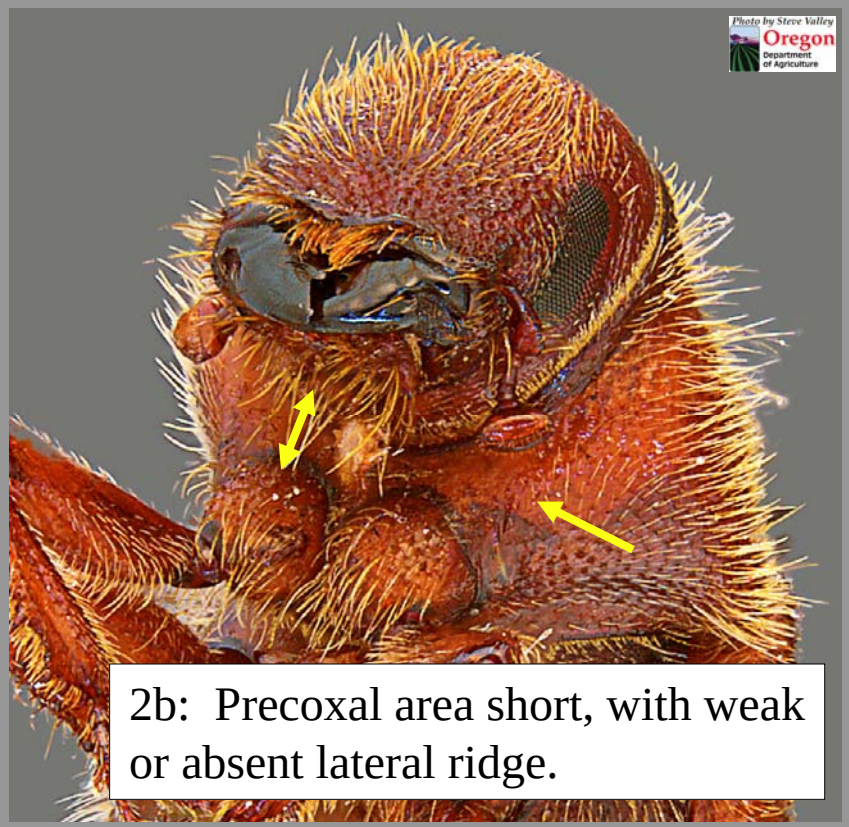
2 (1)

Prothoracic precoxal area long (~ as long as diameter of a procoxa), lateral margin strongly elevated from anterior margin to procoxae (**a**)…..……3

Prothoracic precoxal area short (much shorter than diameter of a procoxa, lateral prosternal ridge poorly developed or absent (**b**)..……..…..……7



2a: Precoxal area long, with strong lateral ridge.

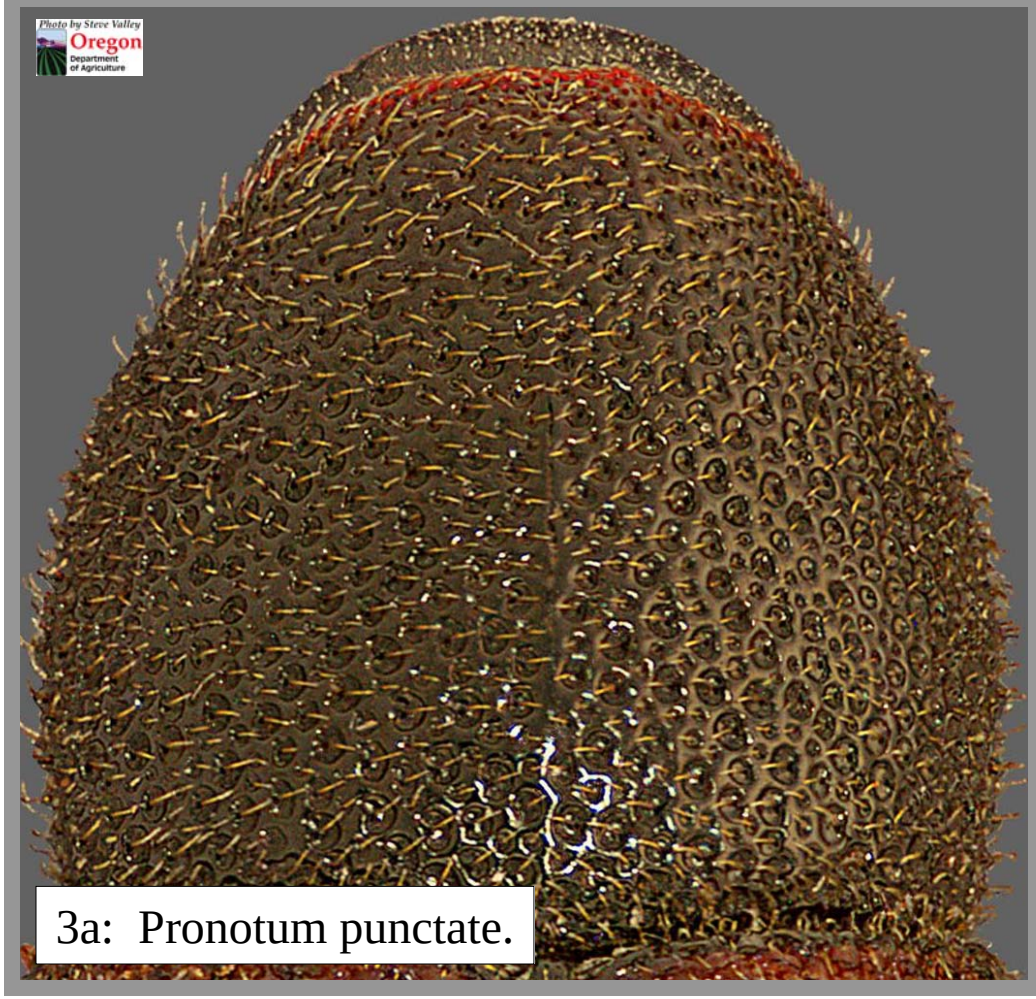


2b: Precoxal area short, with weak or absent lateral ridge.

3 (2): Part I

Dorsum of pronotum punctate (**a**)……..3 Part II

Dorsum of pronotum longitudinally strigose (**b**)……..…STOP



3a: Pronotum punctate.

3b: Pronotum strigose.

3 (2): Part II

Elytra with erect setae in apical half as long or longer than elytral intervals (**c**); pronotal disc with about equal numbers of small and large punctures (**e**); portrait (**g**)…….*Hylurgops rugipennis pinifex* (Fitch) ♎ ☼

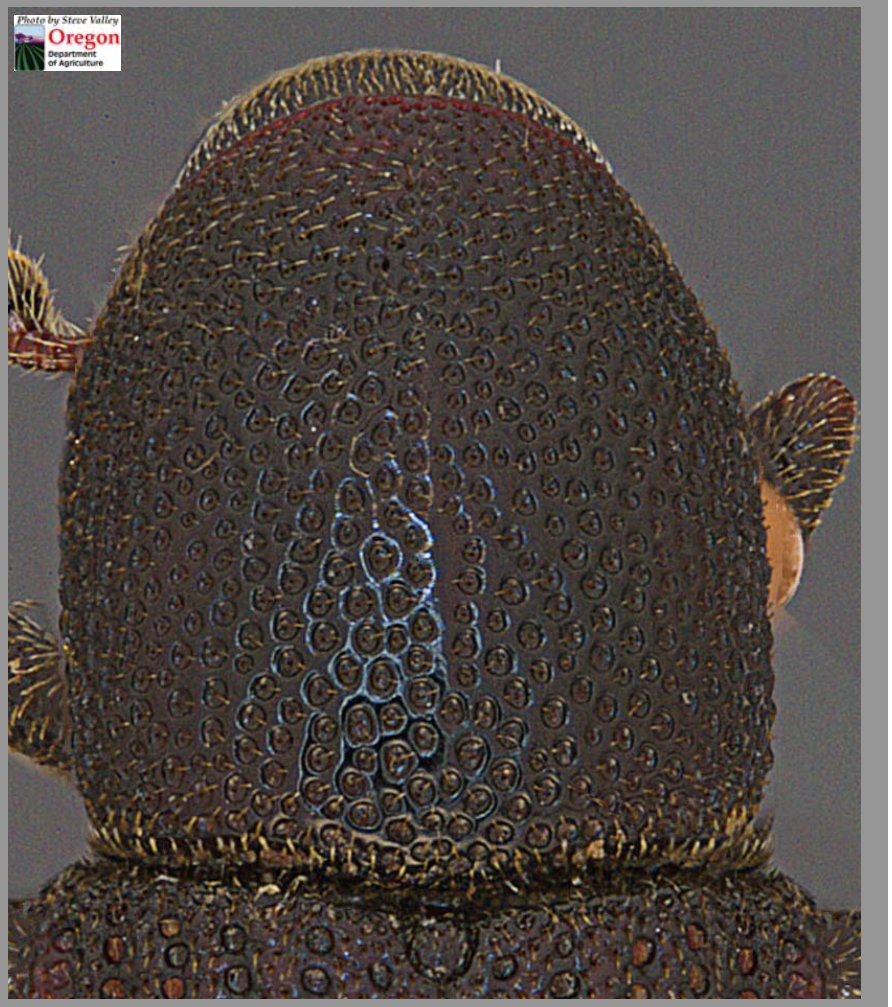
Elytra with recumbant setae in apical half shorter than elytral intervals (**d**); pronotal disc with most punctures uniform in size (a few very small punctures) (**f**)……..……4

3c: Setae erect, long.

3d: Setae recumbant, short.

3 (2): Part III

3e: Pronotum with mixed puncture sizes.



3f: Pronotum with (mostly) uniform-size punctures.

3 (2): Part IV

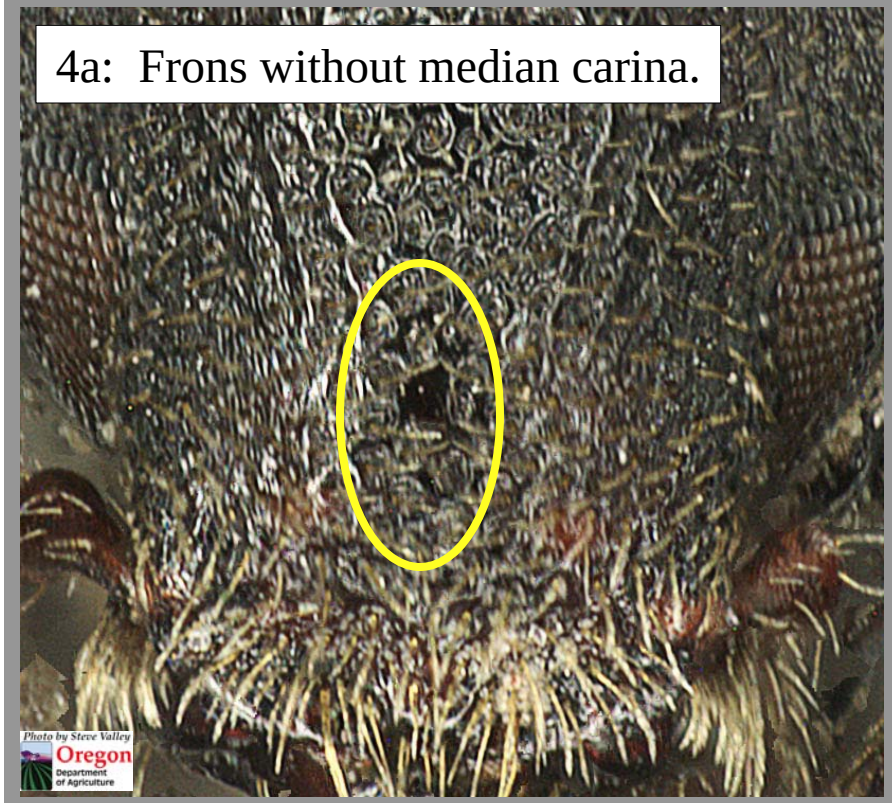
Hylurgops rugipennis pinifex (Fitch) ♎ ☼

3g.

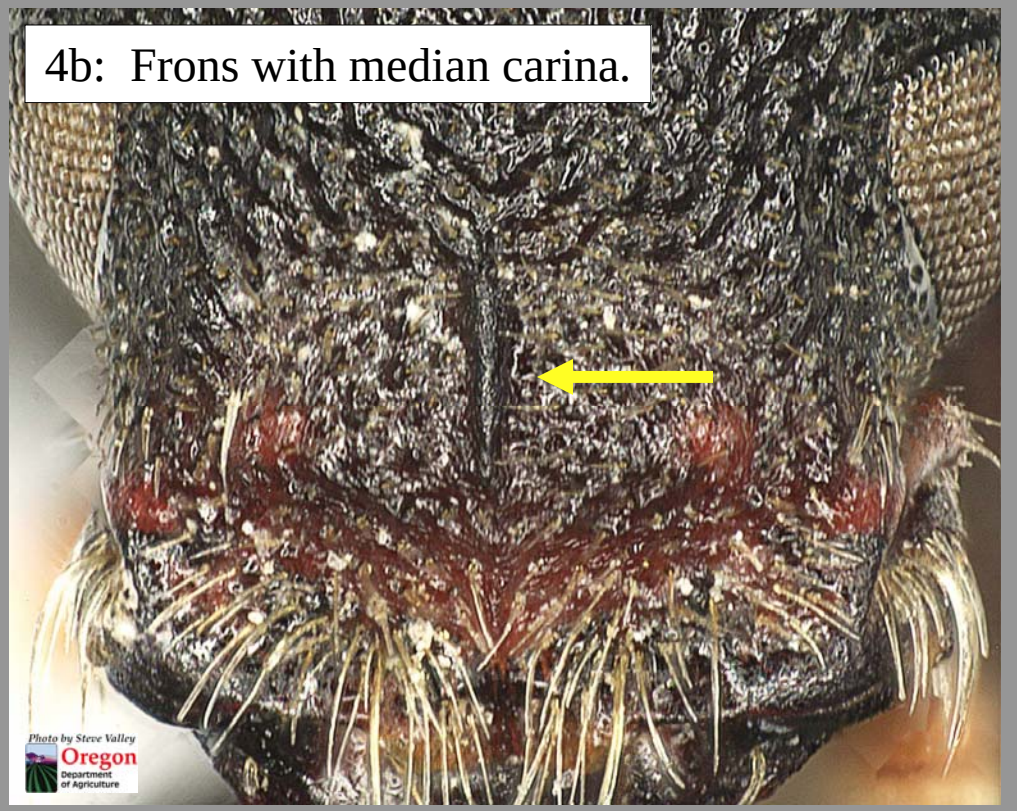
4 (3)

Frons entirely devoid of median carina (**a**); mostly smaller (generally less than 3.0 mm in length…….……..……..……..5

Frons with definite median carina (**b**); mostly larger (generally greater than 3.3 mm in length)..……..……..……..6



4a: Frons without median carina.

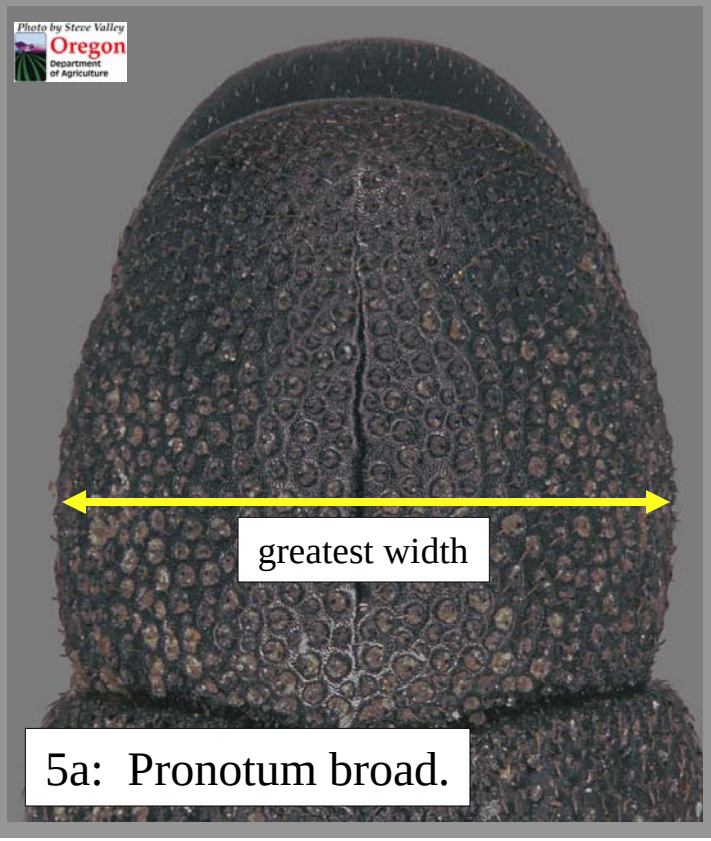


4b: Frons with median carina.

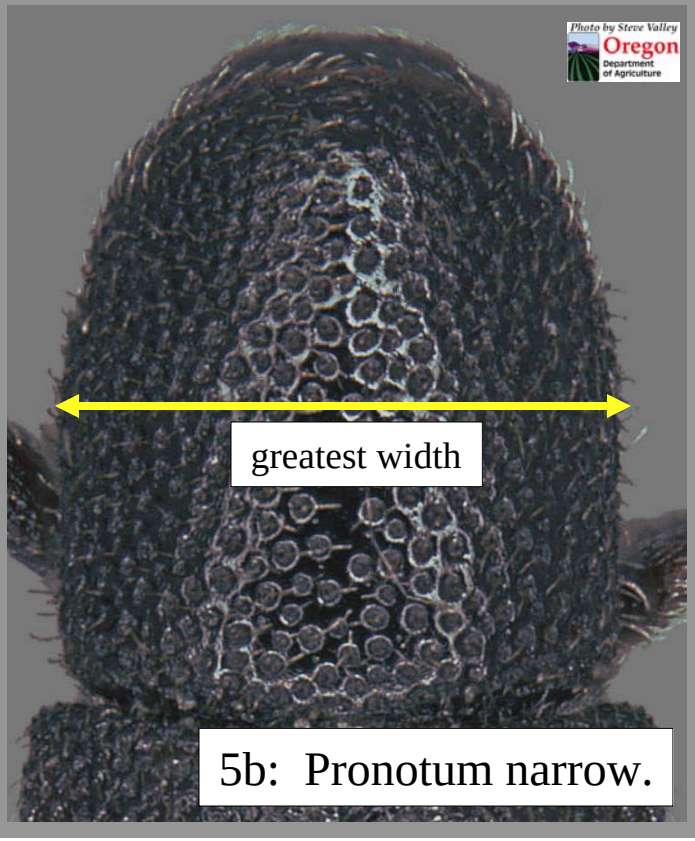
5 (4): Part I

Pronotum broad, widest posterior of middle, sides arcuate (**a**); inter-striae flattened, each with a median row of shining, dark, setiferous tubercles (**c**); portrait (**e**)……..……*Hylastes opacus* Erichson ☹ ♎

Pronotum narrow, widest near middle, sides ± parallel (**b**); interstriae narrowly convex, without median row of setiferous tubercles (**d**); portrait (**f**)……..……..……*Hylastes tenuis* Eichoff ☼



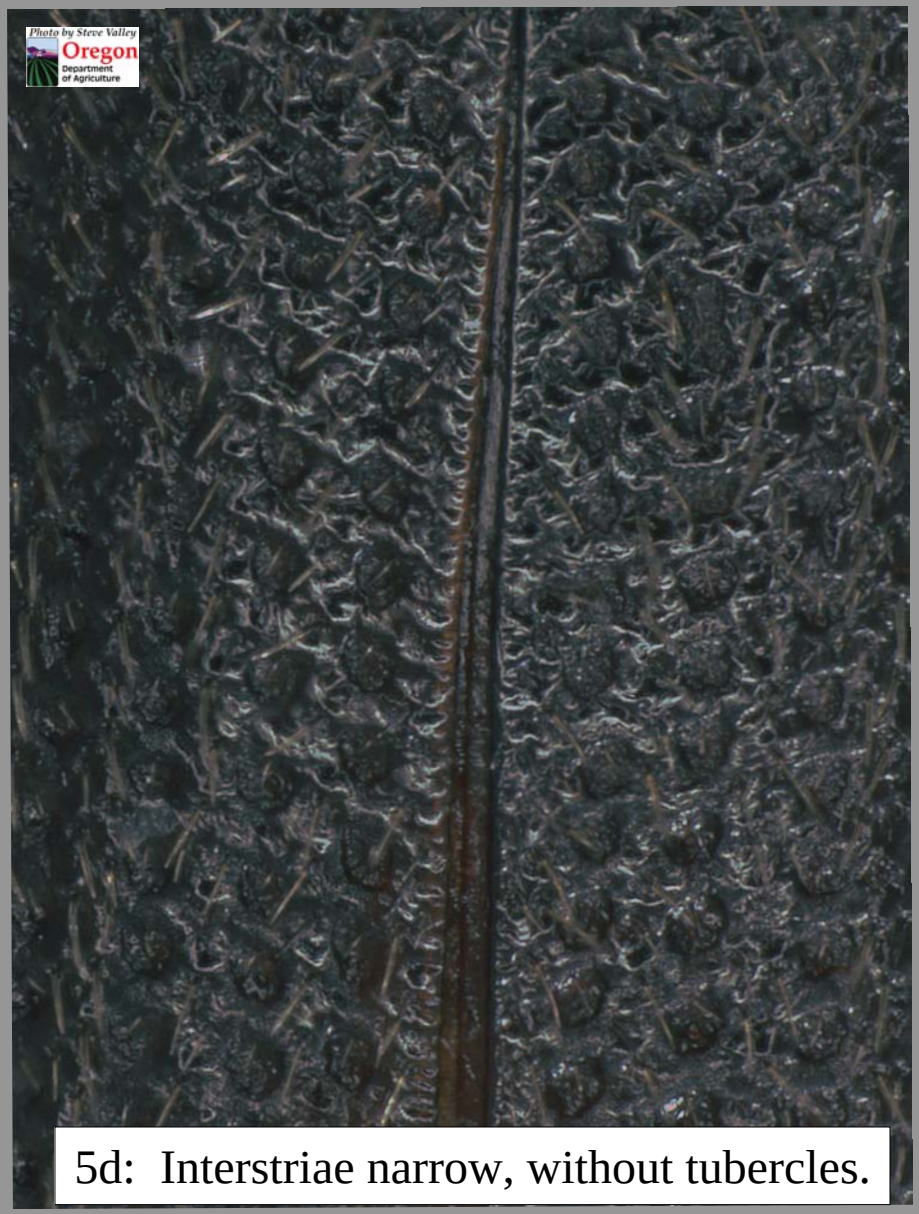
5a: Pronotum broad.



5b: Pronotum narrow.

5 (4): Part II

5c: Interstriae flattened, with tubercles.



5d: Interstriae narrow, without tubercles.

5 (4): Part III

Hylastes opacus Erichson ☹ ♎

5e.

Photo by Steve Valley
Oregon
Department of Agriculture

5 (4): Part IV

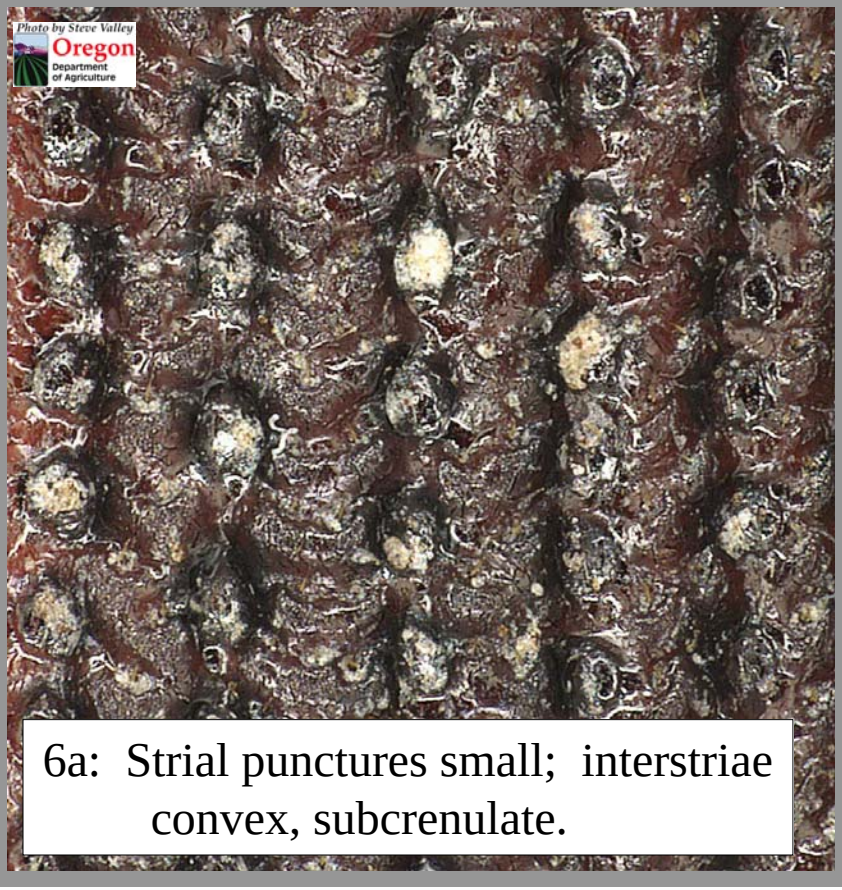
Hylastes tenuis Eichoff ☼

5f.

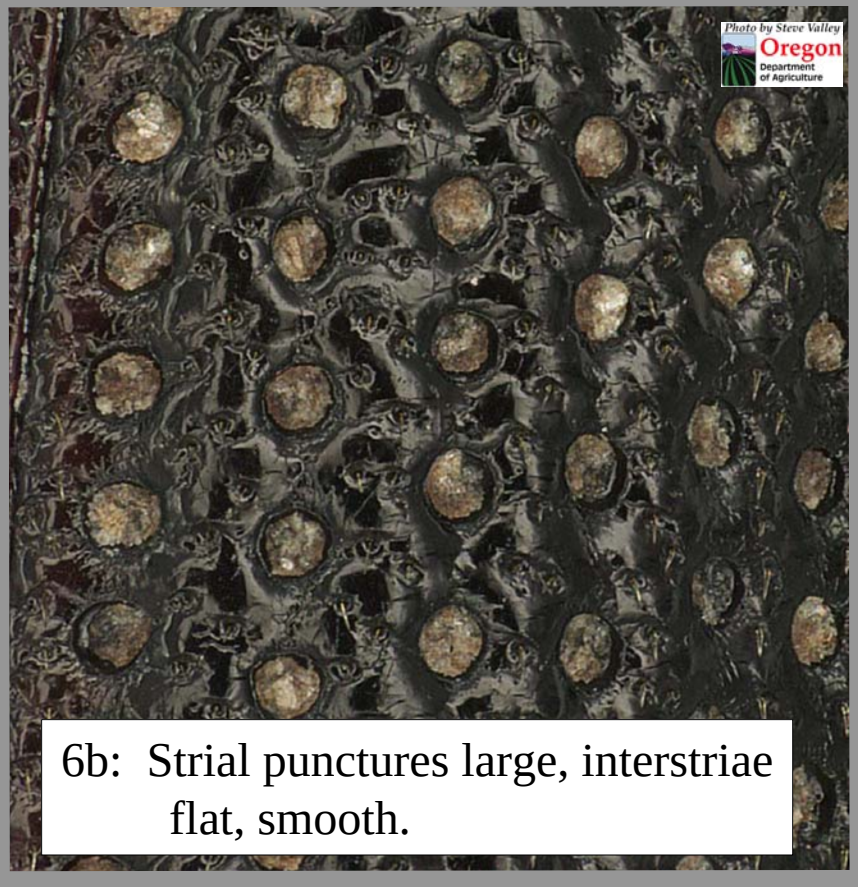
6 (4): Part I

Strial punctures on elytra small, indistinct; interstriae convex, subcrenulate (**a**); portrait (**c**)……*Hylastes salebrosus* Eichoff ☼

Strial punctures on elytra large, distinct; interstriae flat, smooth (**b**); portrait (**d**)……*Hylastes porculus* Erichson ☼ ♎



6a: Strial punctures small; interstriae convex, subcrenulate.



6b: Strial punctures large, interstriae flat, smooth.

6 (4): Part II

Hylastes salebrosus Eichoff ✡

Photo by Steve Valley
Oregon Department of Agriculture

6c.

6 (4): Part III

Hylastes porculus Erichson ☼ ♎

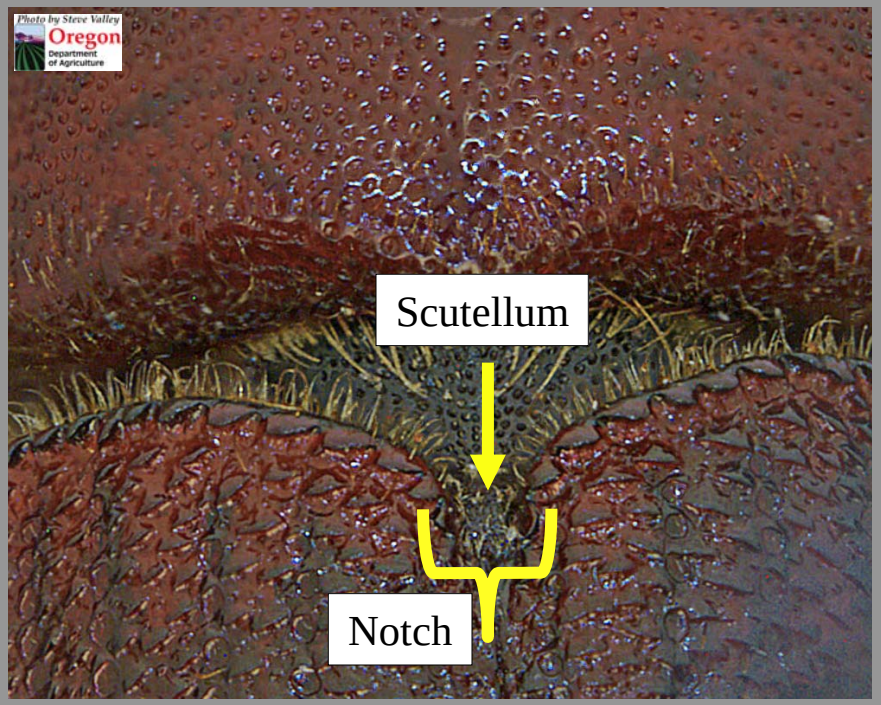
Photo by Steve Valley
Oregon Department of Agriculture

6d.

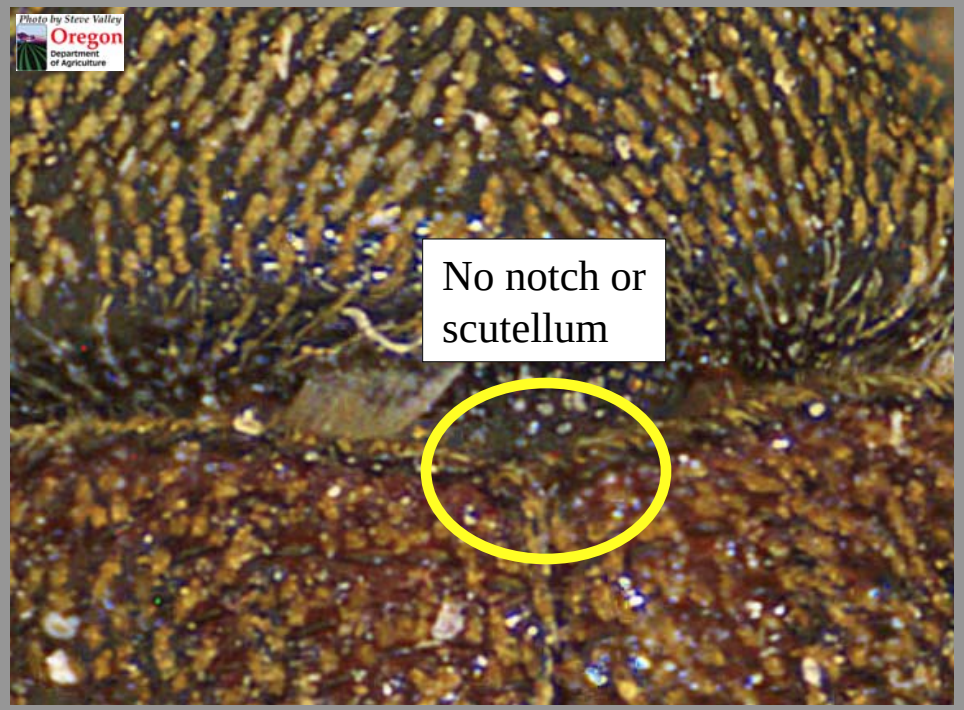
7 (2)

Scutellum visible, elytral bases notched for its reception (**a**)……..……....8

Scutellum not visible, elytral bases NOT notched for its reception (**b**)…STOP



7a: Scutellum visible, elytra notched.

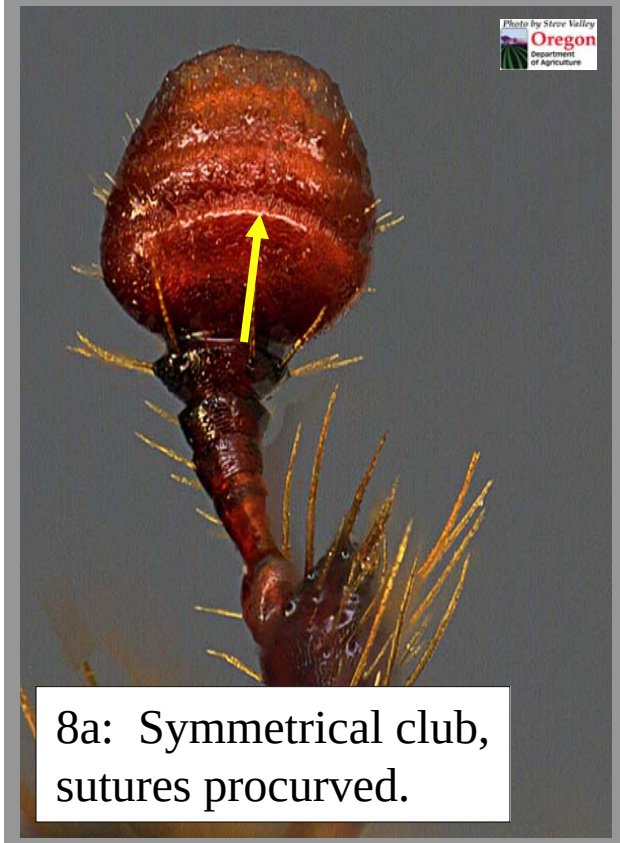


7b: Scutellum not visible, elytra not notched.

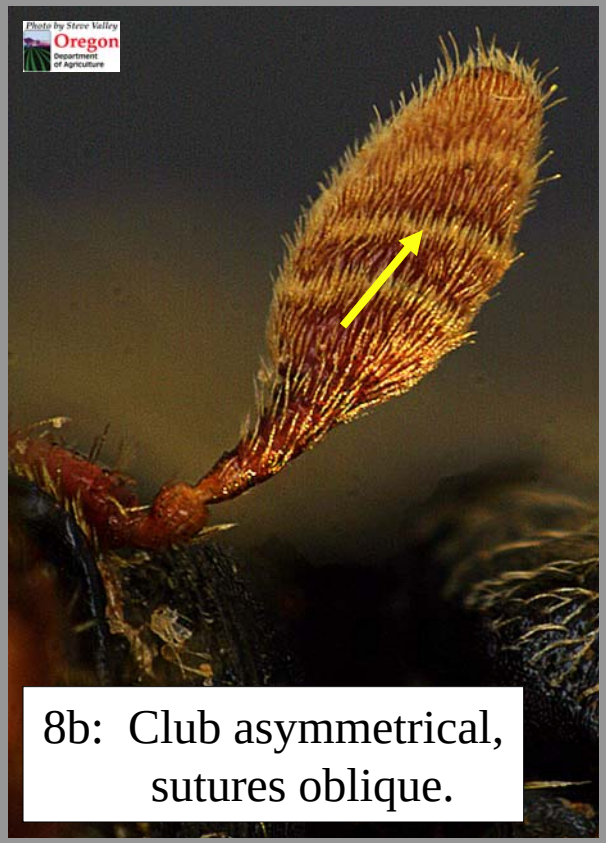
8 (7)

Antennal club symmetrical, sutures transverse or slightly procurved (**a**)……9

Antennal club asymmetrical (**b**) or pseudolamellate (**c**), sutures oblique or absent……STOP



8a: Symmetrical club, sutures procurved.



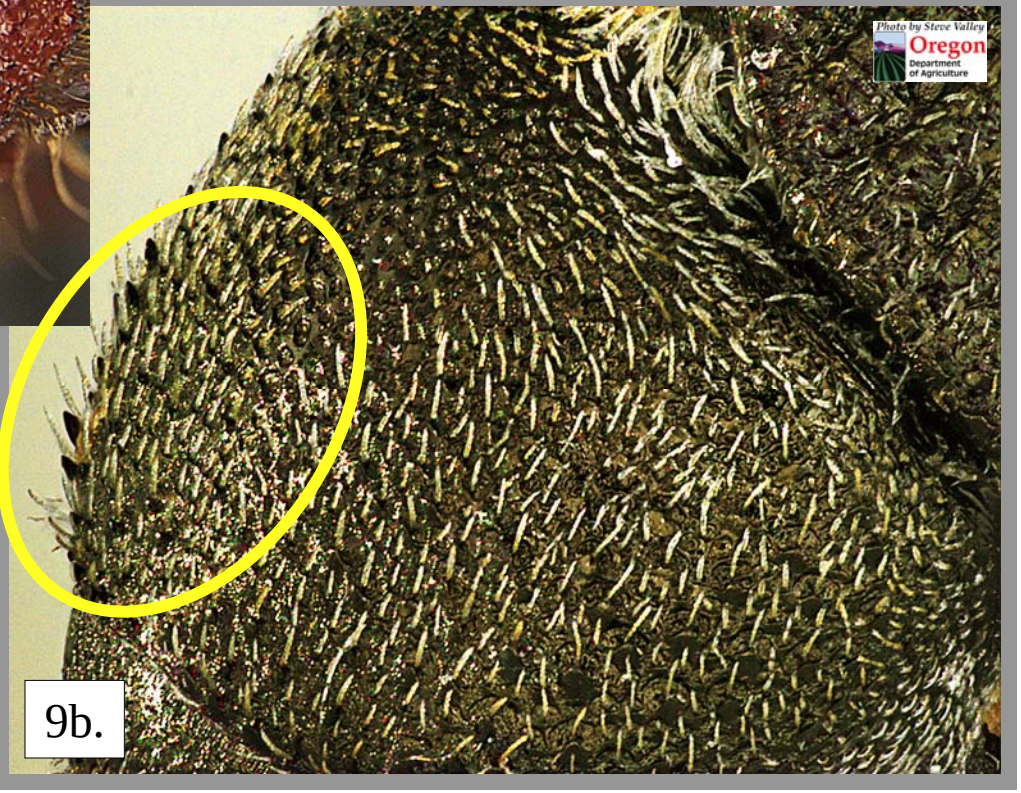
8b: Club asymmetrical, sutures oblique.

8c: Pseudolamellate club.

9 (8)

Pronotum not asperate antero-laterally (**a**)……....10

Pronotum asperate on anterolateral areas (**b**)……..…STOP

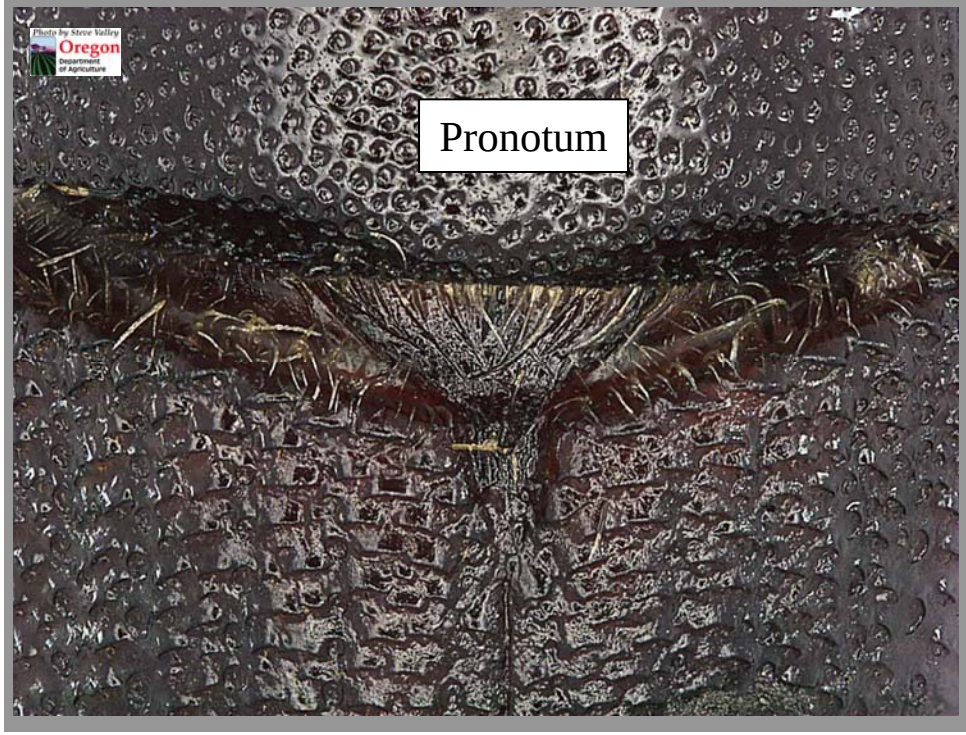


10 (9): Part I

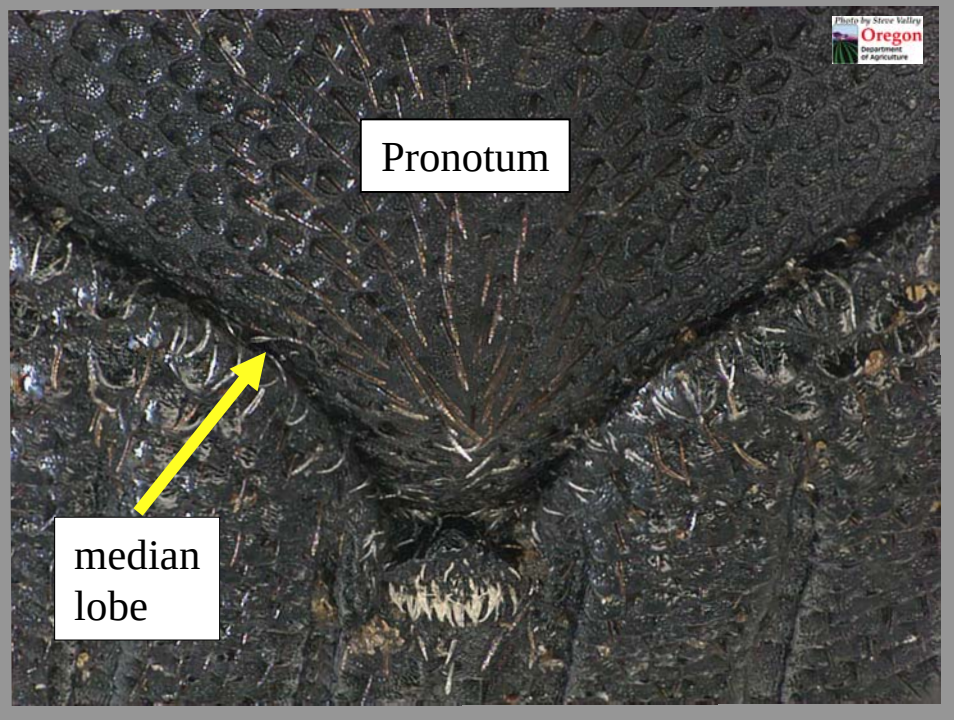
Posterior margin of pronotum not prolonged as a triangular lobe (**a**); elytra not extended anteriorly over pronotum (**c**); setae on frons shorter, not curving in to meet medially (**e**)……..…11

Posterior margin of pronotum prolonged as a triangular lobe (**b**); elytra extended anteriorly over pronotum (**d**); frons with long setae curving in from the sides to meet medially (**f**)…..……..……..…STOP

10a: Posterior margin of pronotum not prolonged as a triangular lobe.



10b: Posterior margin of pronotum prolonged as a triangular lobe.

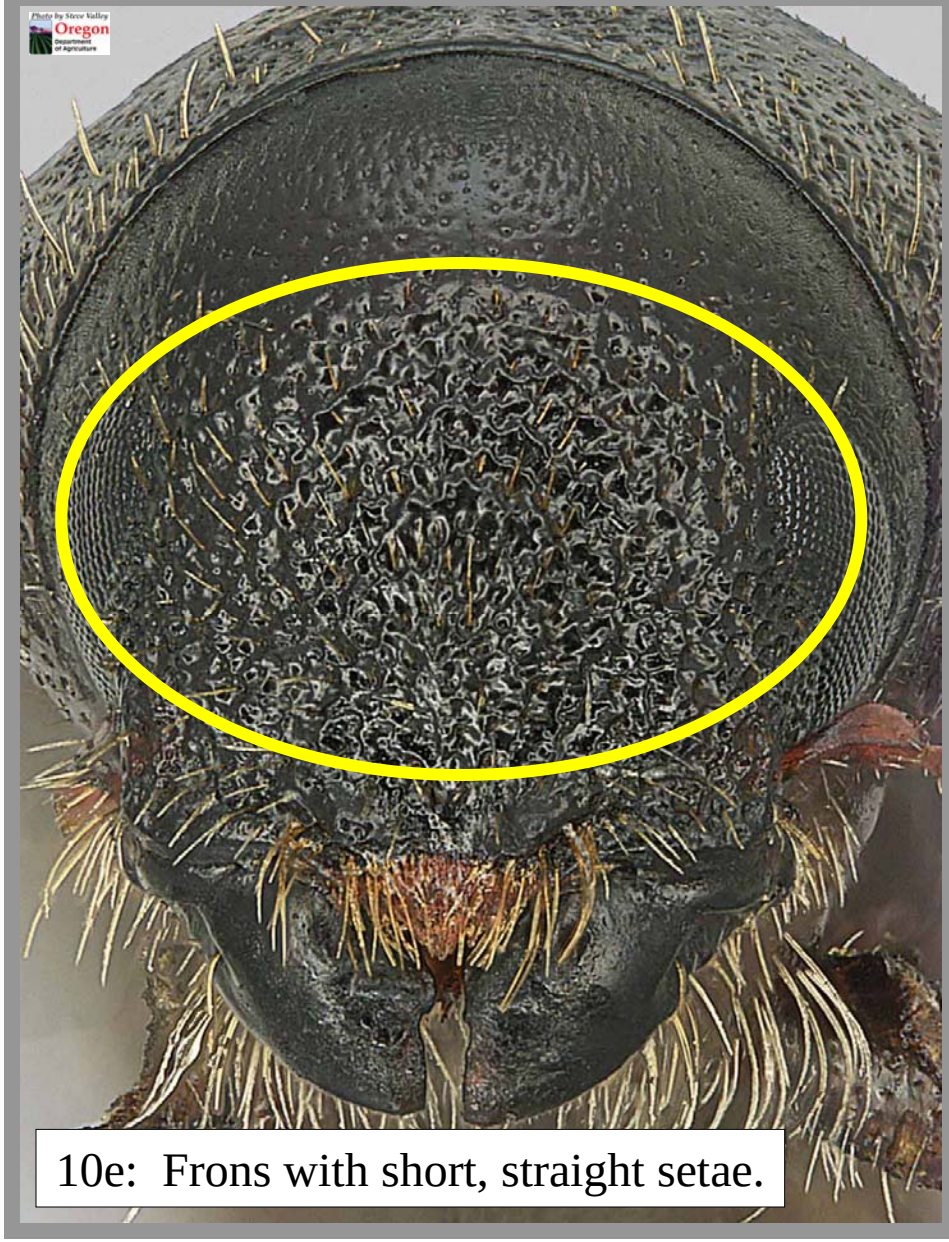


10 (9): Part II

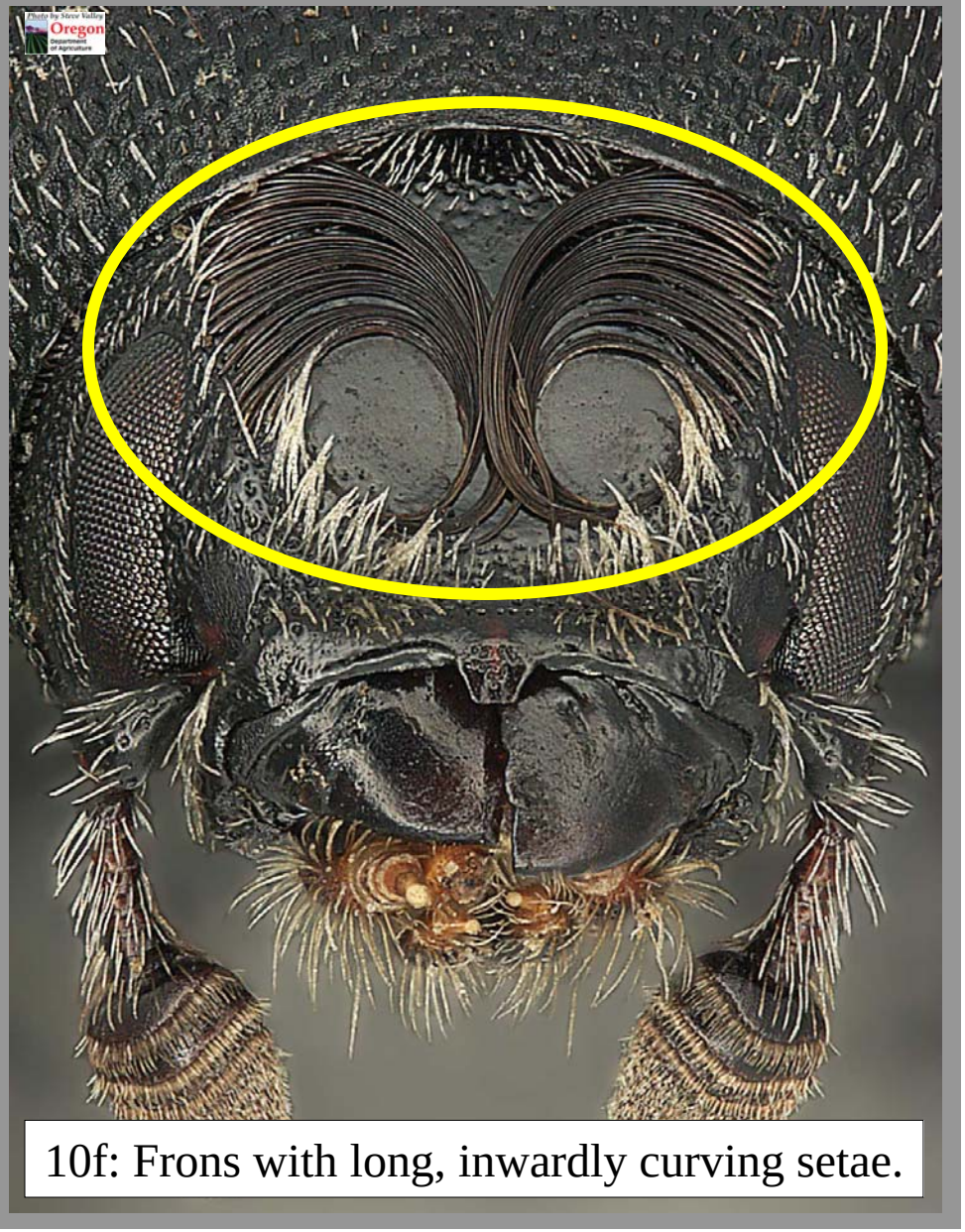
10c: Elytra not extending over pronotum.

10d: Elytra extending over pronotum.

10 (9): Part III



10e: Frons with short, straight setae.

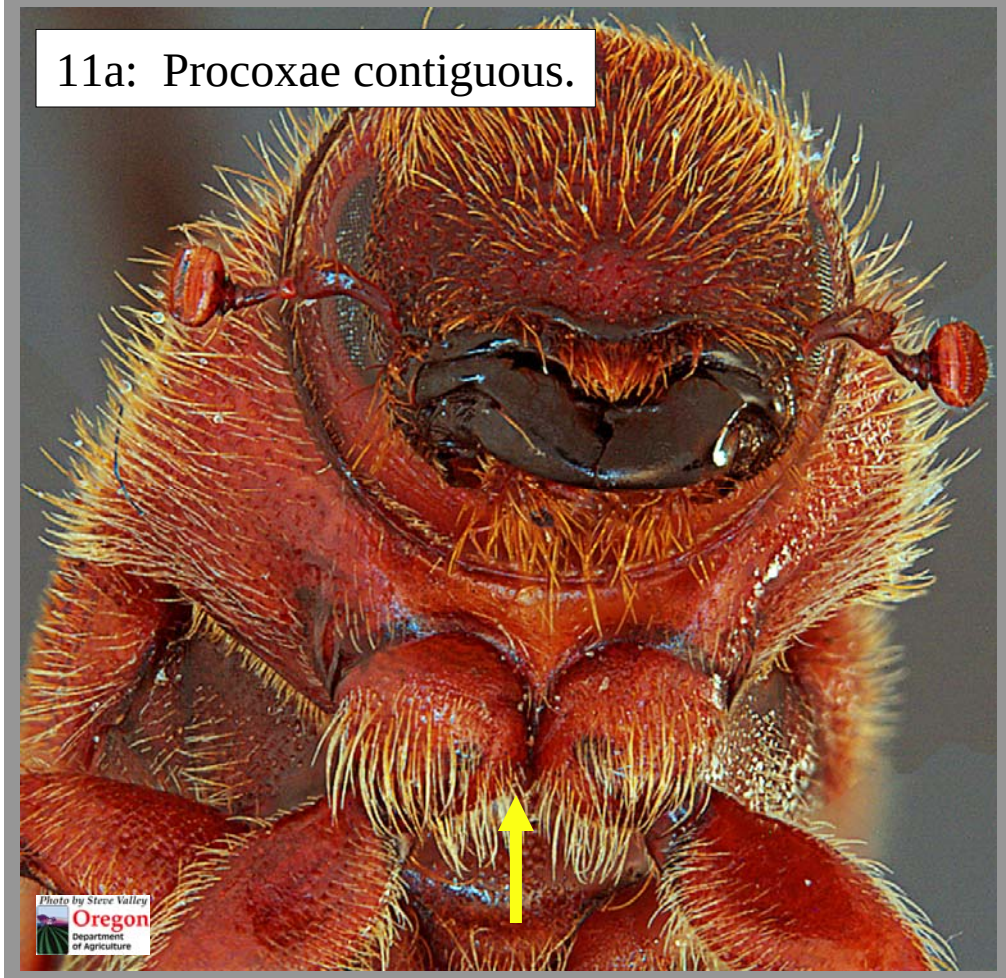


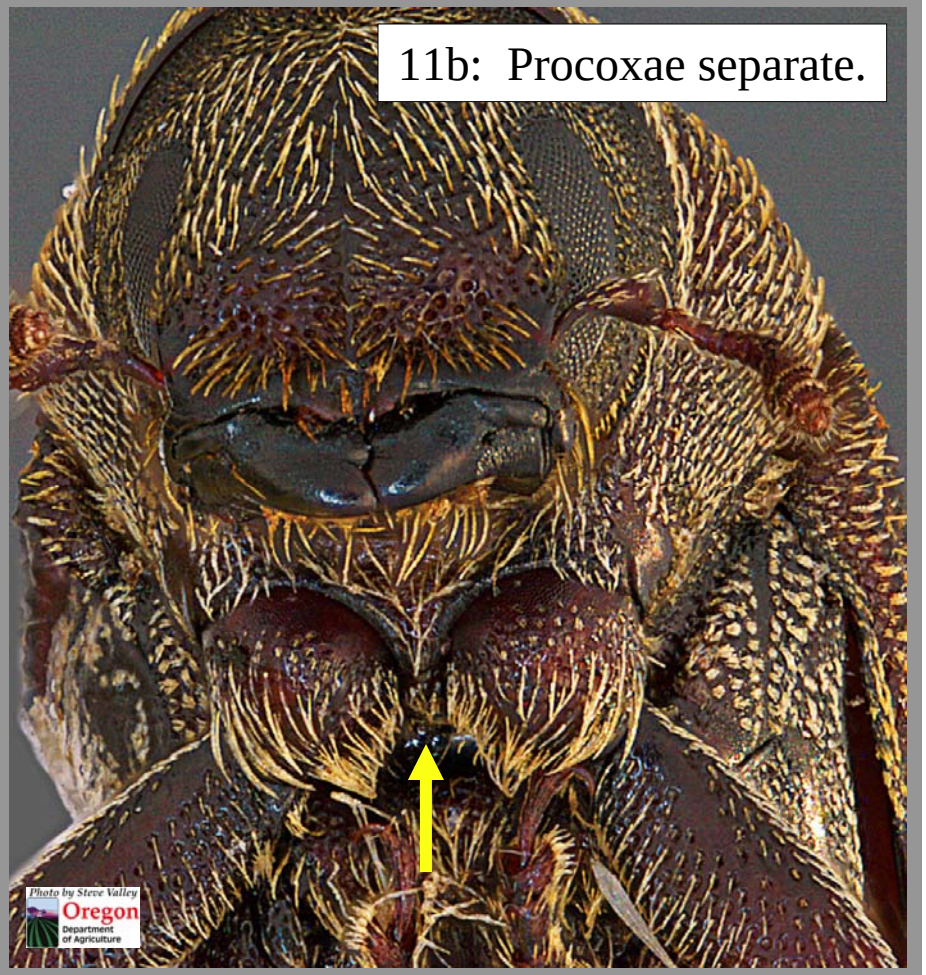
10f: Frons with long, inwardly curving setae.

11 (10)

Procoxae contiguous or at most very narrowly separate (**a**)……12

Procoxae distinctly separate (**b**)……STOP

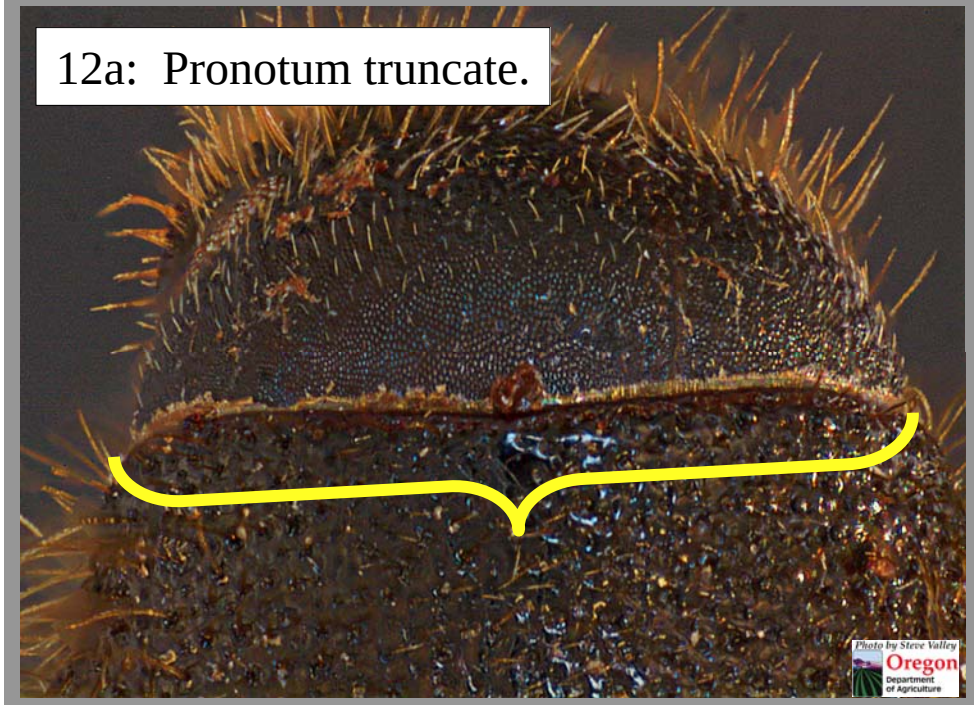




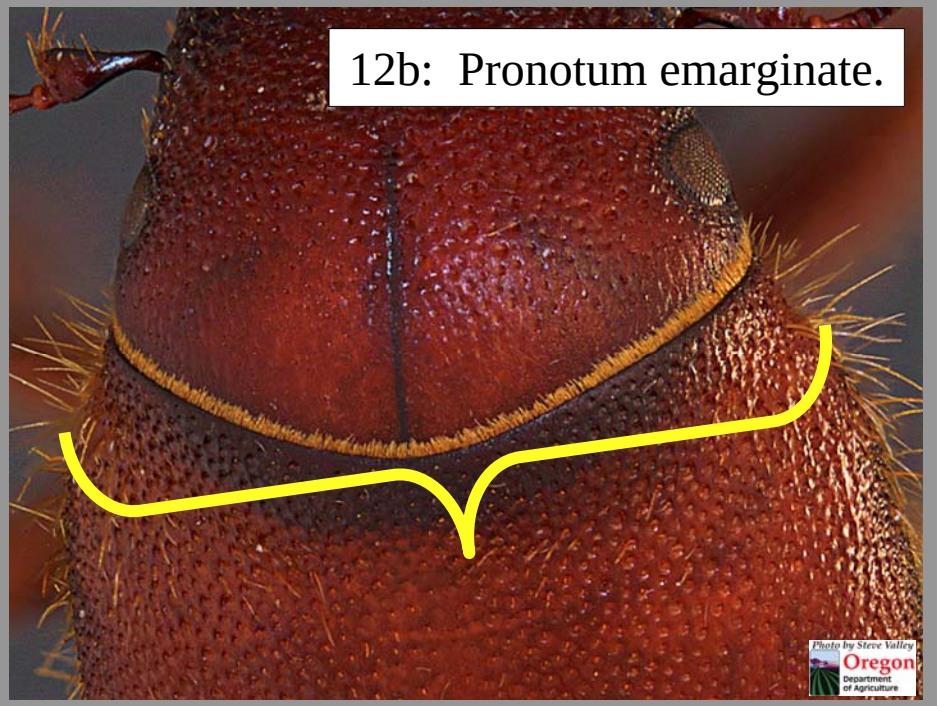
12 (11): Part I

Anterior margin of pronotum truncate (**a**); antennal funicle with 6 segments (**c**); antennal club sutures transverse (**c**)……..13

Anterior margin of pronotum distinctly emarginate (**b**); antennal funicle with 5 segments (**d**); antennal club sutures slightly procurved (**d**)..……14

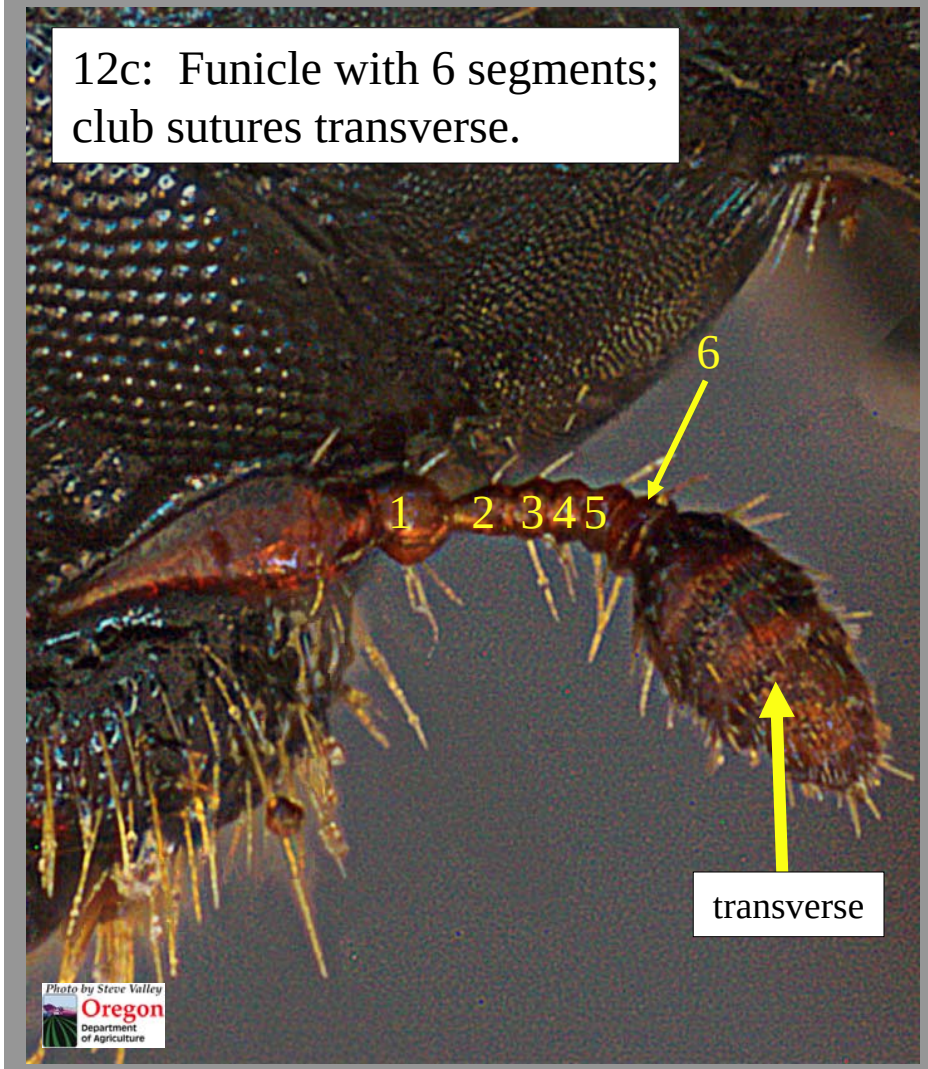


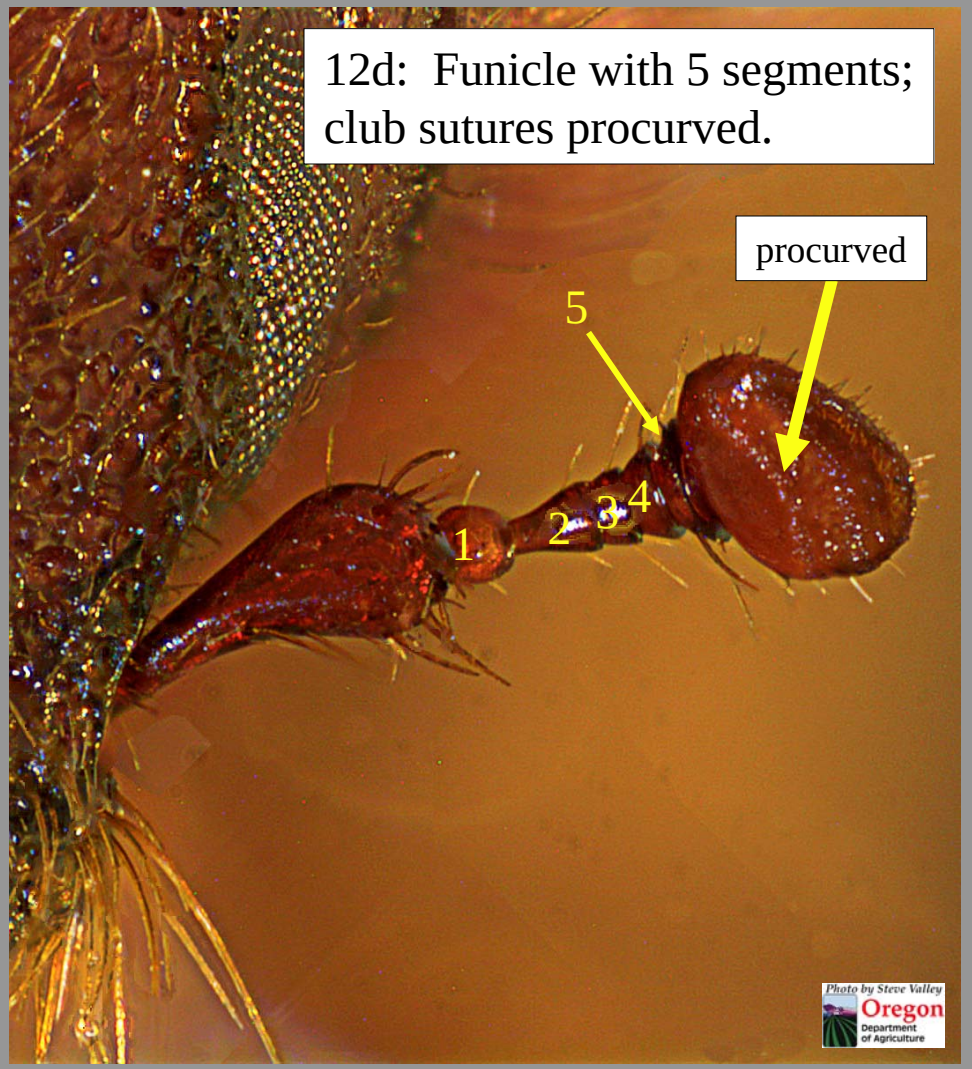
12a: Pronotum truncate.



12b: Pronotum emarginate.

12 (11): Part II


12c: Funicle with 6 segments; club sutures transverse.
6
1 2 3 4 5
transverse
Photo by Steve Valley
Oregon
Department of Agriculture

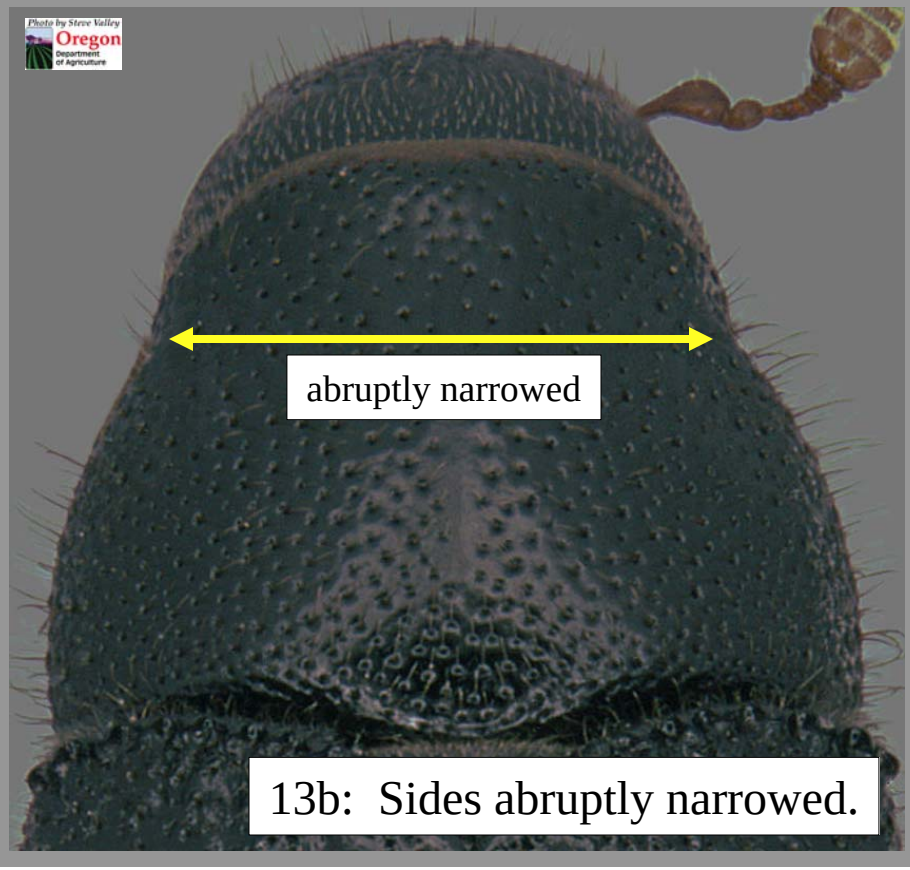

12d: Funicle with 5 segments; club sutures procurved.
procurved
5
1 2 3 4
Photo by Steve Valley
Oregon
Department of Agriculture

13 (12): Part I

Sides of pronotum weakly arcuate throughout (**a**); elytral interstriae roughened, with multiple rows of setae (**c**)……..……*Hylurgus ligniperda* (Fabricius) ☹ ♎

Sides of pronotum strongly abruptly narrowed anterior of middle (**b**); elytral interstriae ± smooth, with uniseriate setae (**d**) …*Tomicus piniperda* (Linnaeus) ☹ ♎

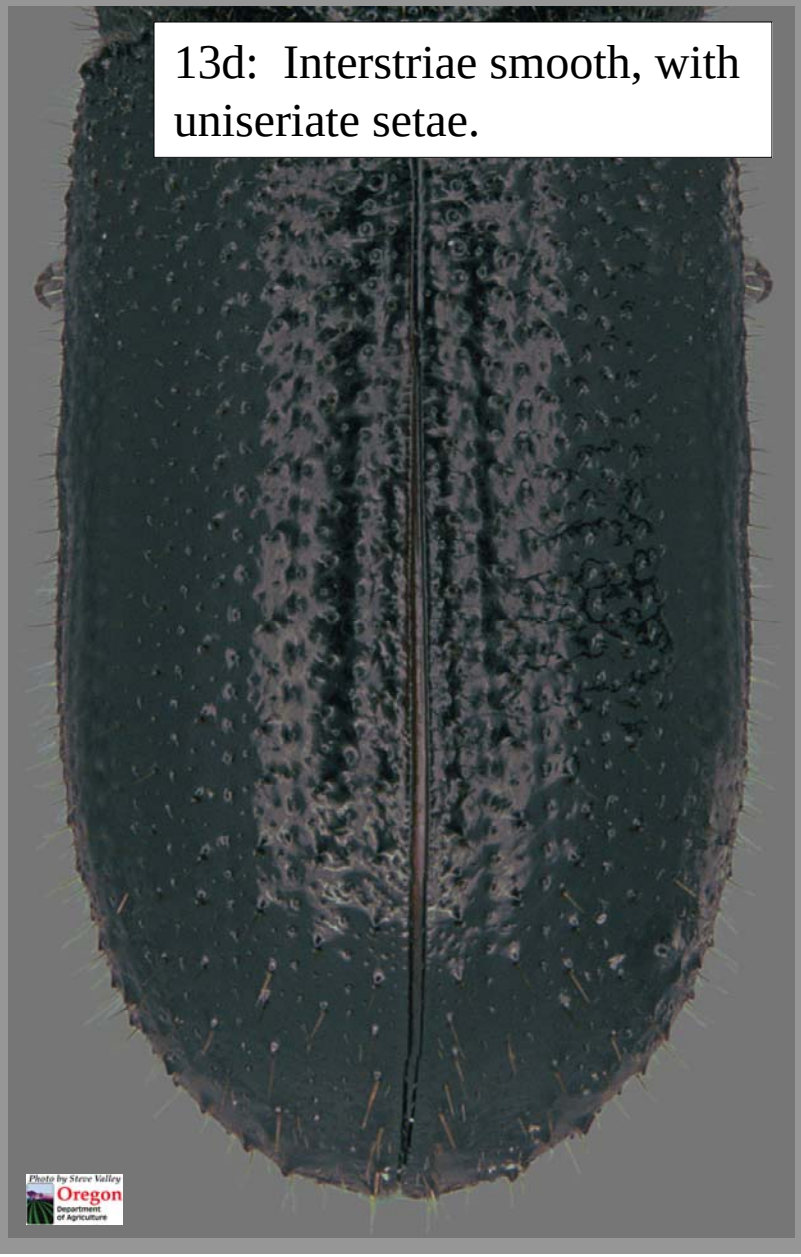
13a: Sides not abruptly narrowed.



13b: Sides abruptly narrowed.

13 (12): Part II

13c: Interstriae rough, with multiple rows of setae.



13d: Interstriae smooth, with uniseriate setae.

13 (12): Part III

Hylurgus ligniperda (Fabricius) ☹ ♎

13e.

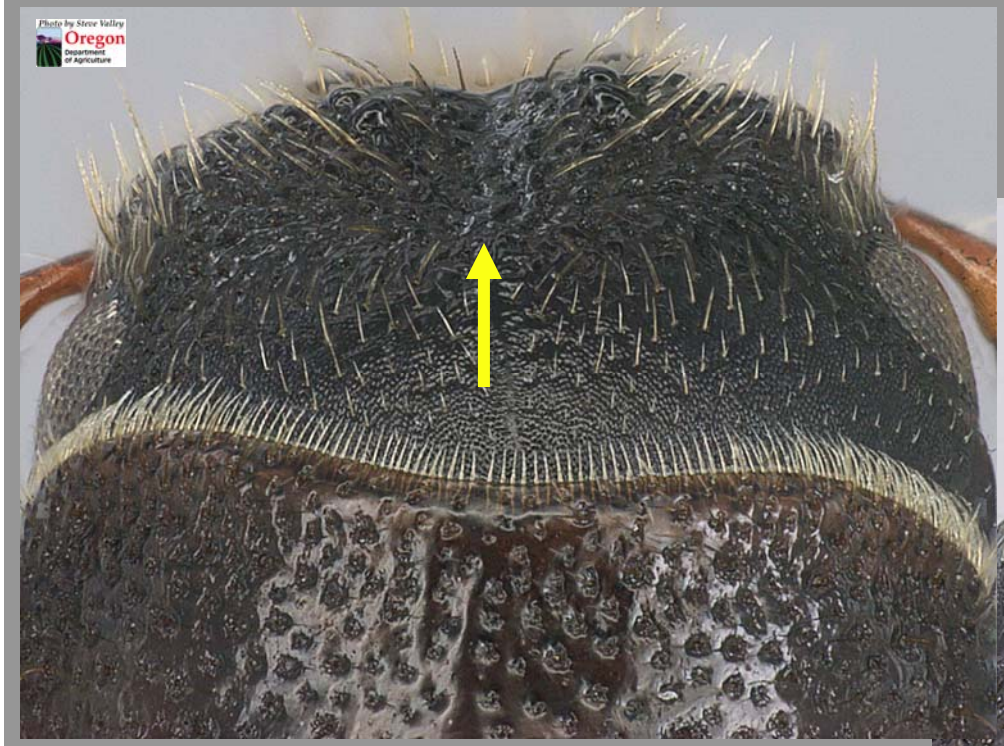
13 (12): Part IV

Tomicus piniperda (Linnaeus) ☹ ♎

14 (12): Part I

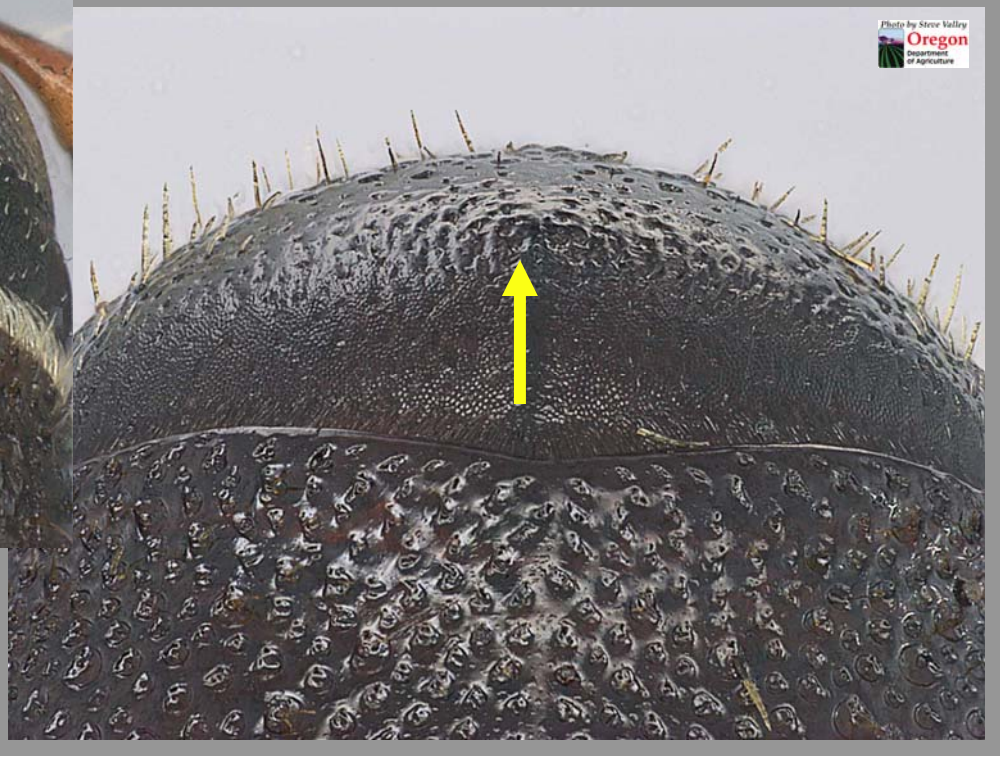
Frons with deep, narrow, median groove between eyes (**a**); dorsal vestiture of elytra shorter and dense (**c**); portrait (**e**)…*Dendroctonus frontalis* Zimmerman ☼

Frons without deep median groove between eyes (**b**); dorsal vestiture of elytra longer and less dense (**d**)……15



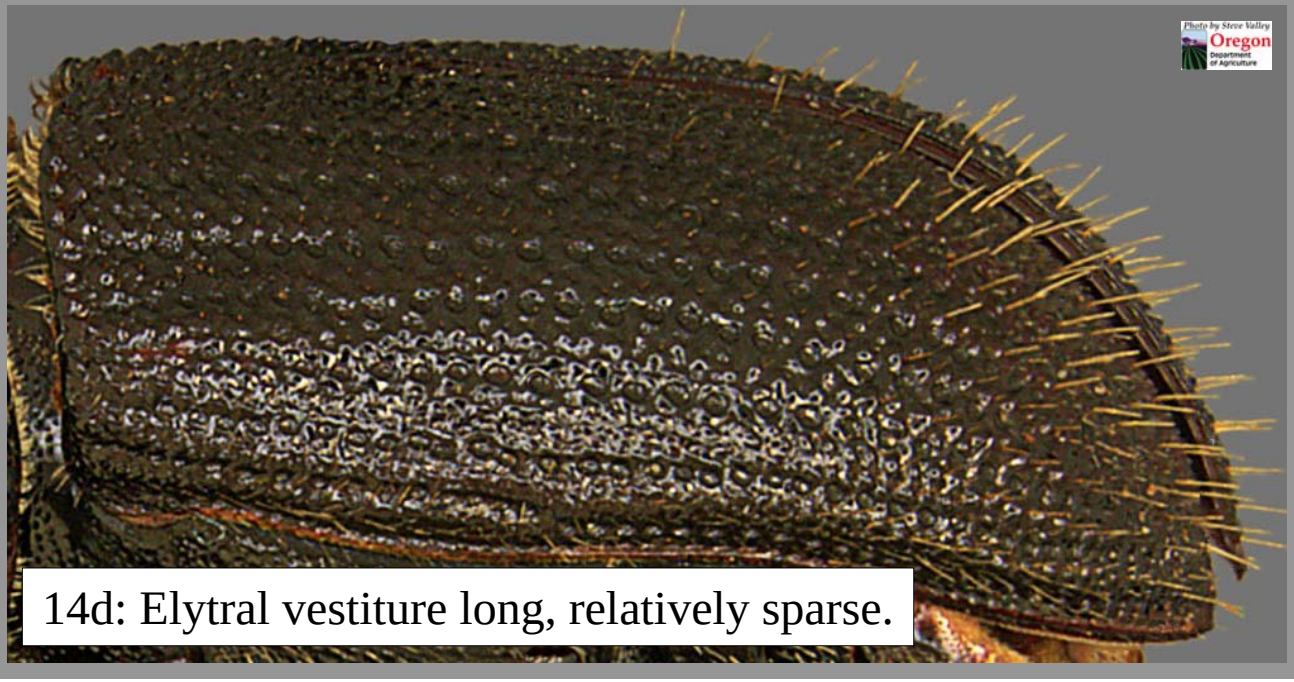
14a: Frons with median groove (dorsal view).

14b: Frons without median groove (dorsal view).



14 (12): Part II

14c: Elytral vestiture short, dense.



14d: Elytral vestiture long, relatively sparse.

14 (12): Part III

Dendroctonus frontalis Zimmerman ☼

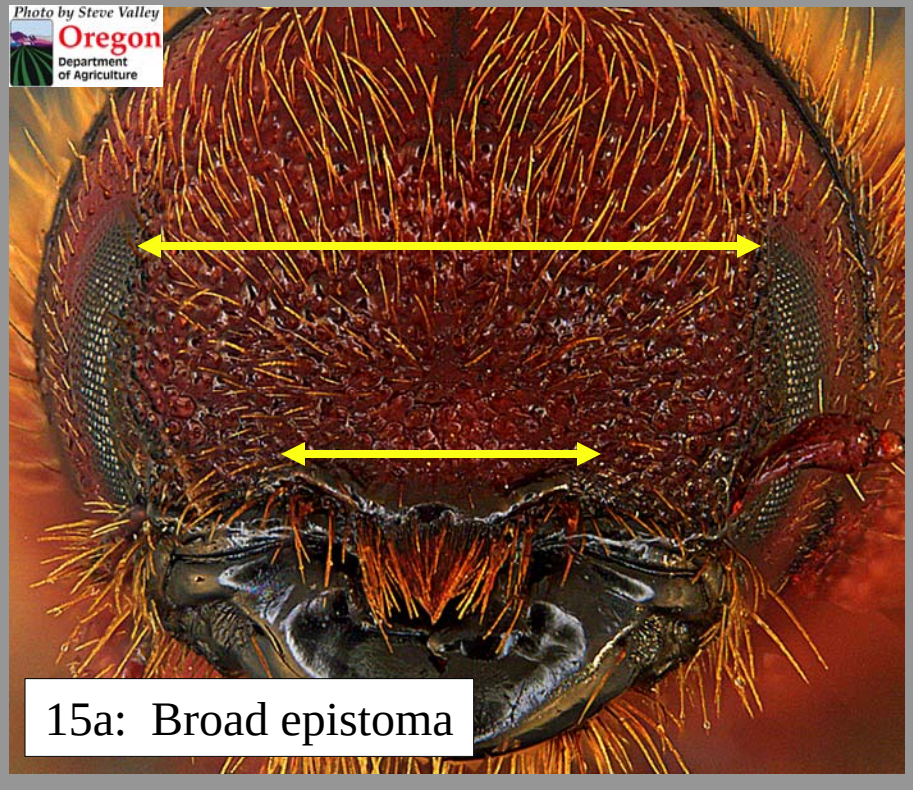
14e.

Photo by Steve Valley
Oregon
Department of Agriculture

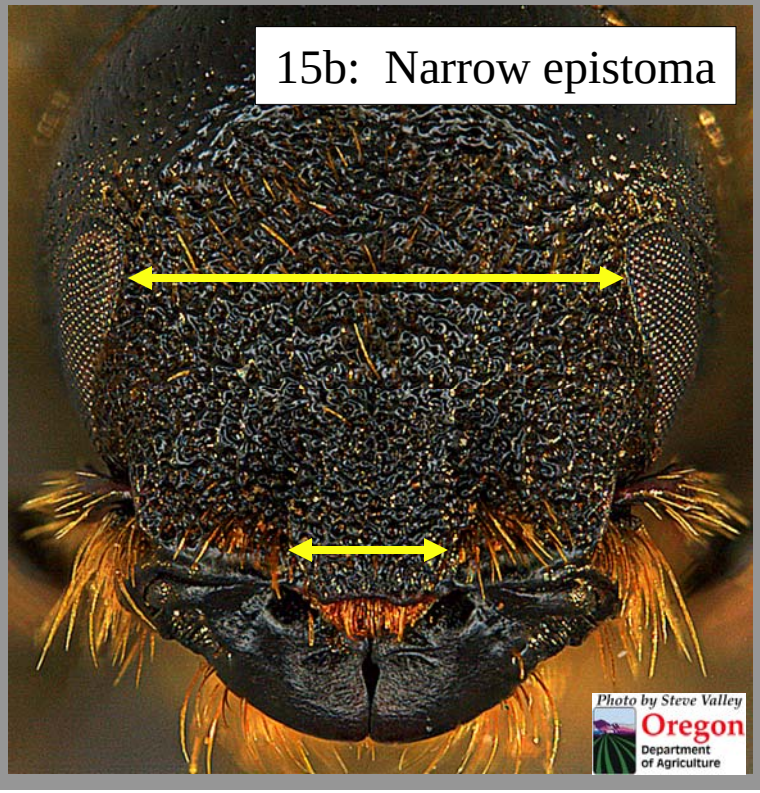
15 (14): Part I

Epistomal process broader, distance between eyes about 2X its basal width (**a**); elytral declivital interstriae dull (usually rugulose) (**c**) or, if shining, punctures virtually all granulate (**d**) ……..……..……..……....16

Epistomal process narrower, distance between eyes about 3X its basal width (**b**); elytral declivital interstriae smooth and shining, most punctures impressed (sometimes a few granulate) (**e**)……..……STOP

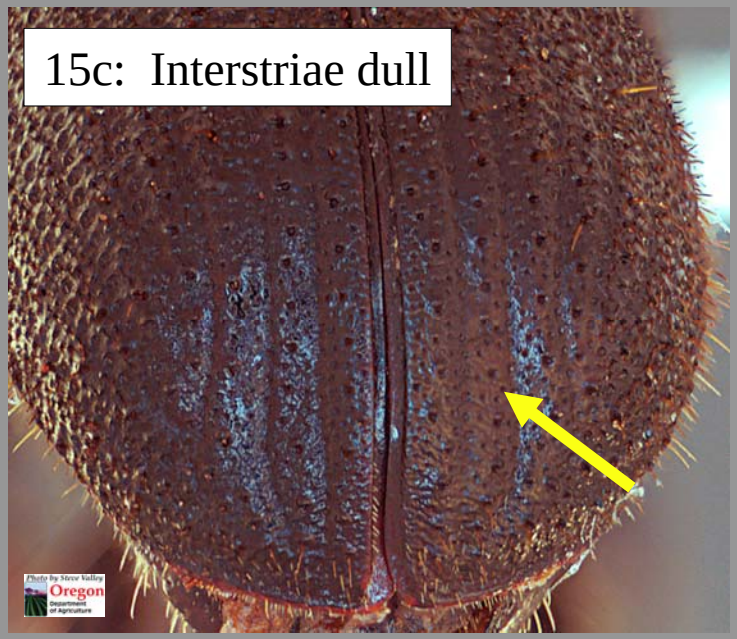


15a: Broad epistoma

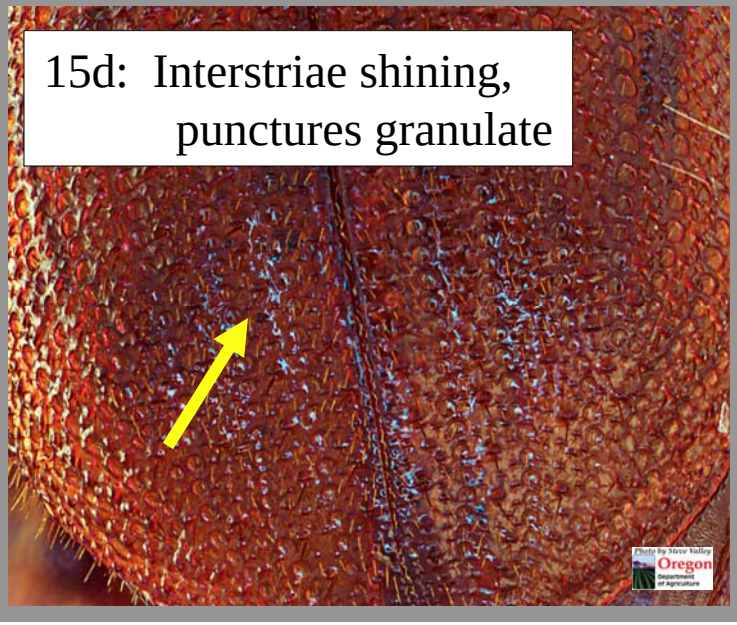


15b: Narrow epistoma

15 (14): Part II



15c: Interstriae dull



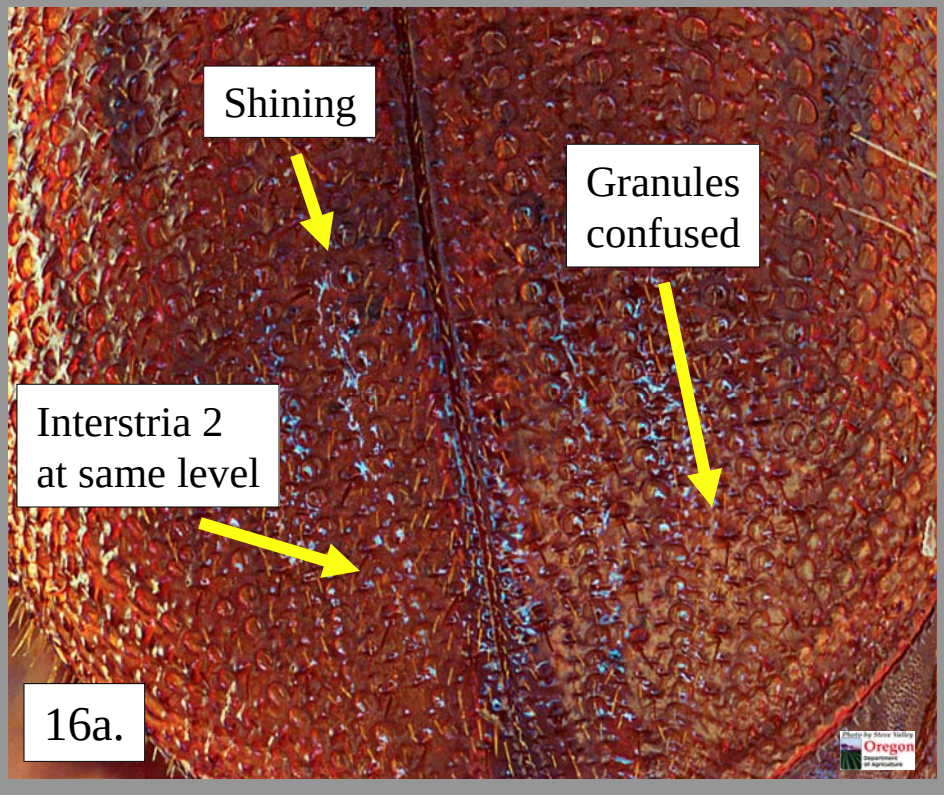
15d: Interstriae shining, punctures granulate

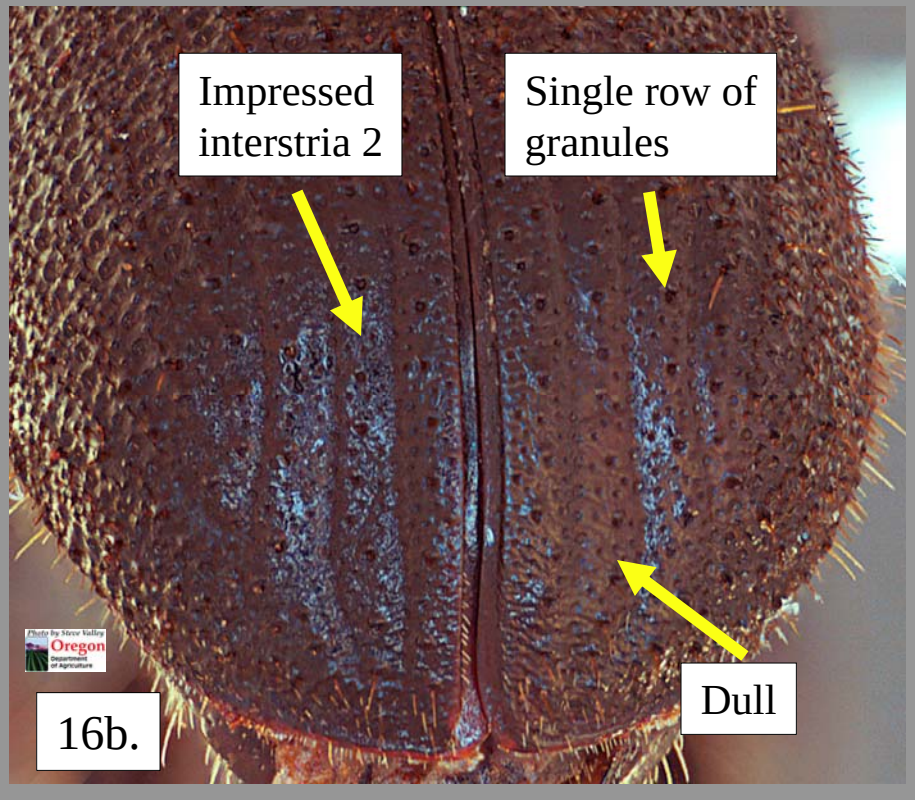
15e: Interstriae smooth, shining, punctures impressed

16 (15)

Surface of elytral declivity shining; declivital interstriae all at same level; granules of declivital interstriae numerous and confused, NOT forming a single row (**a**)…..……17

Surface of elytral declivity dull; declivital interstriae 2 impressed, usually flat, interstriae 1 strongly elevated; granules of declivital interstriae usually in a single, distinct row (**b**)……STOP





17 (16): Part I

Mature color black or dark brown (**a**); punctures on disc of pronotum larger (**c**); portrait (**e**)……..……*Dendroctonus terebrans* (Olivier) ☼

Mature color reddish brown (**b**); punctures on pronotum smaller (**d**); portrait (**f**)……..……..*Dendroctonus valens* LeConte ♎

17a: Color black or dark brown

17b: Color reddish brown

17 (16): Part II

17c: Punctures larger.

17d: Punctures smaller.

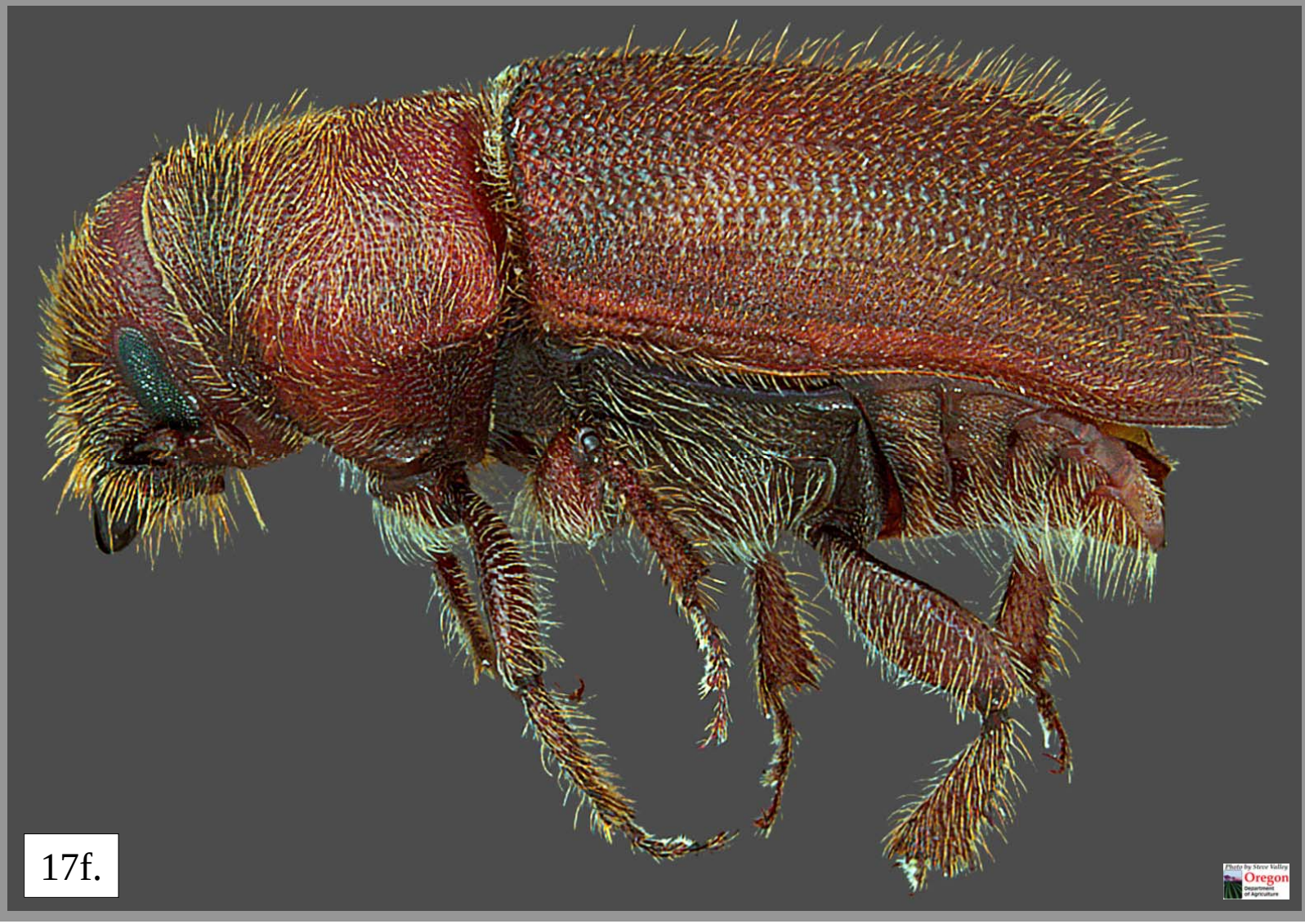
17 (16): Part III

Dendroctonus terebrans (Olivier) ☼

17e.

17 (16): Part IV

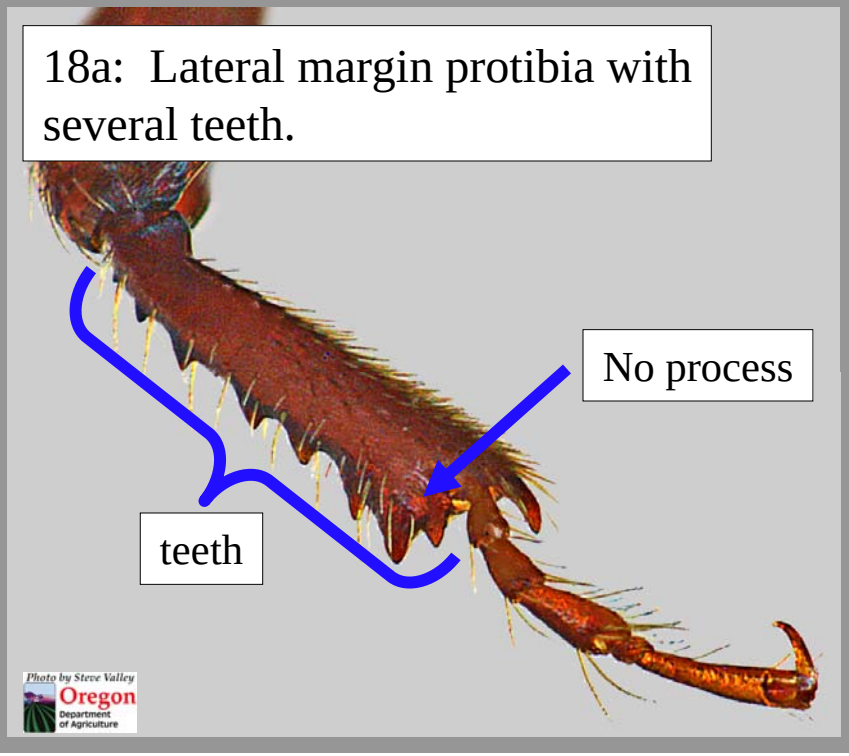
Dendroctonus valens LeConte ♎

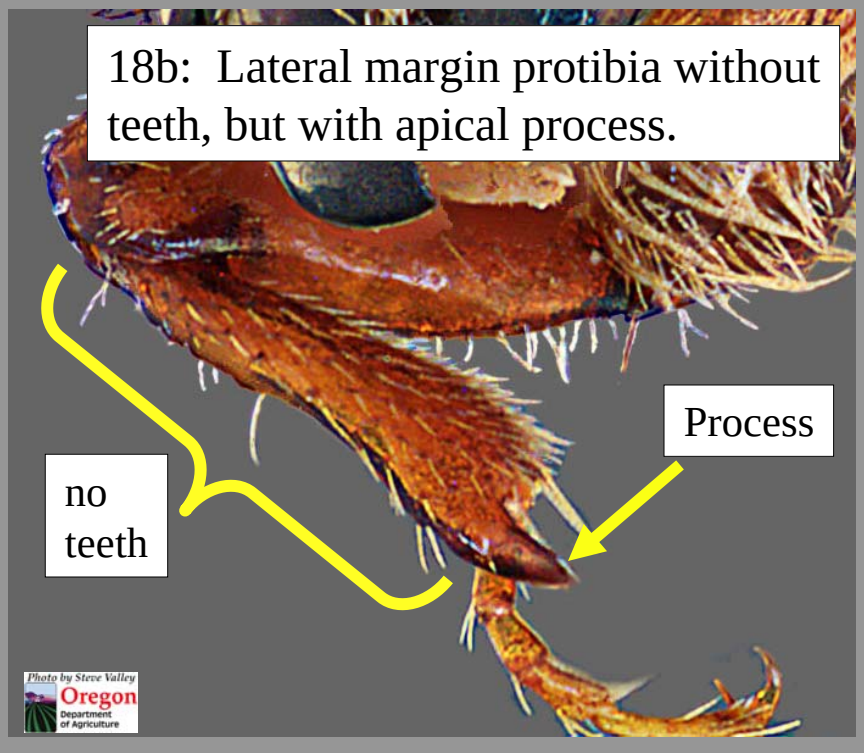


18 (1): Part I

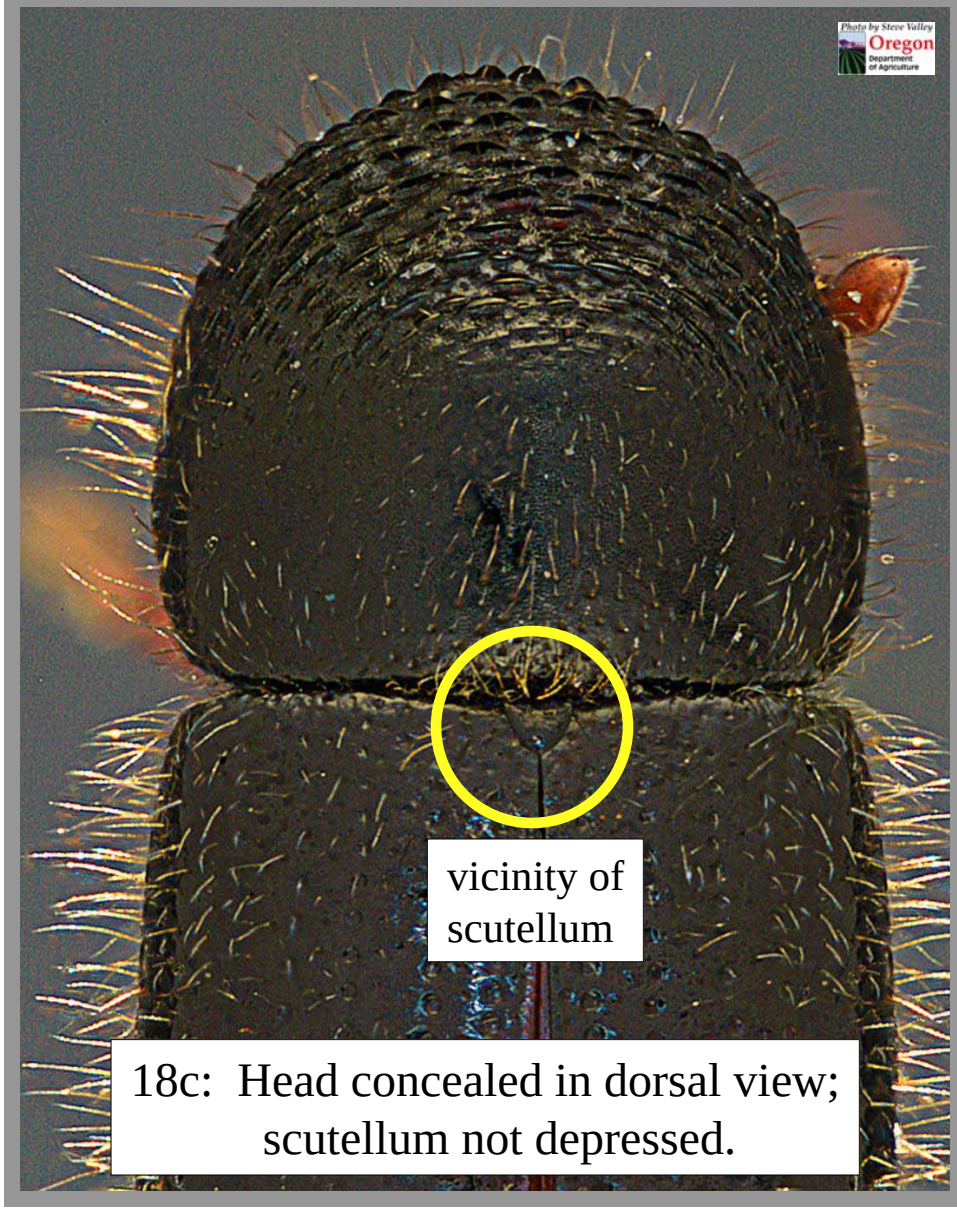
Lateral margin of protibia armed by several teeth, none of which curve toward the inner process of the inner apical angle (**a**); head not visible in dorsal view (**c**); scutellum flush with elytral surface (**c**); elytral declivity rather steep, descending to meet horizontal abdomen (**e**)……..……..19

Lateral margin of protibia unarmed except for a single curved process at outer apical angle that curves toward and extends beyond process of inner apical angle (**b**); head visible in dorsal view (**d**); scutellum depressed (**d**); elytra slightly, if at all, declivous, abdomen ascending to meet them (**f**)..……...STOP

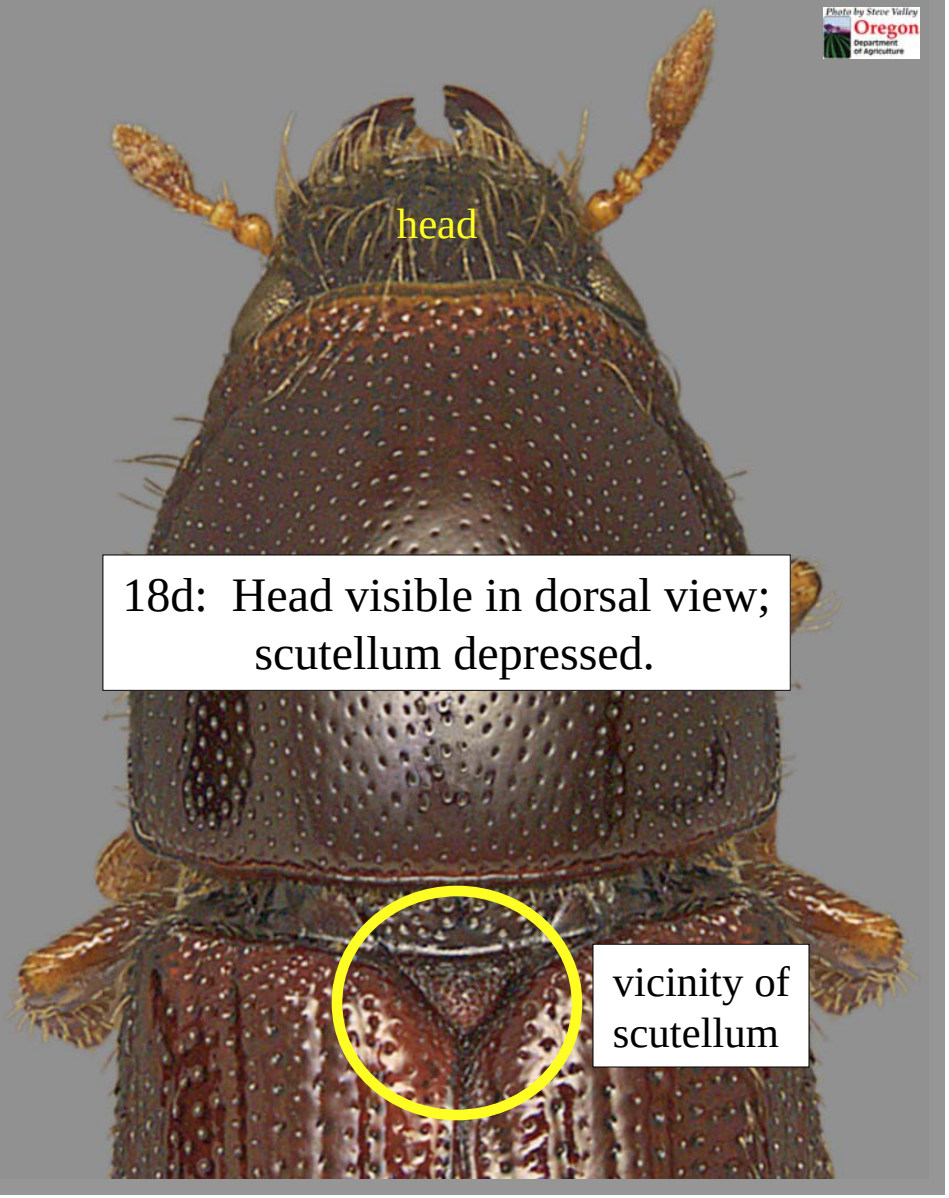




18 (1): Part II

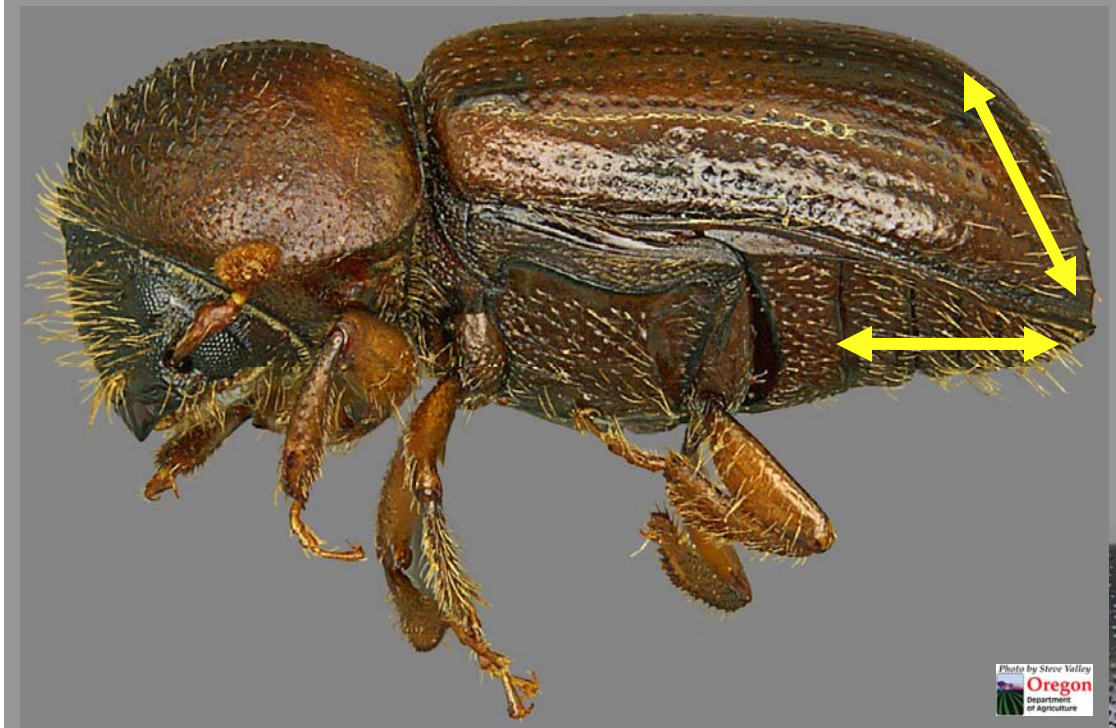


18c: Head concealed in dorsal view; scutellum not depressed.



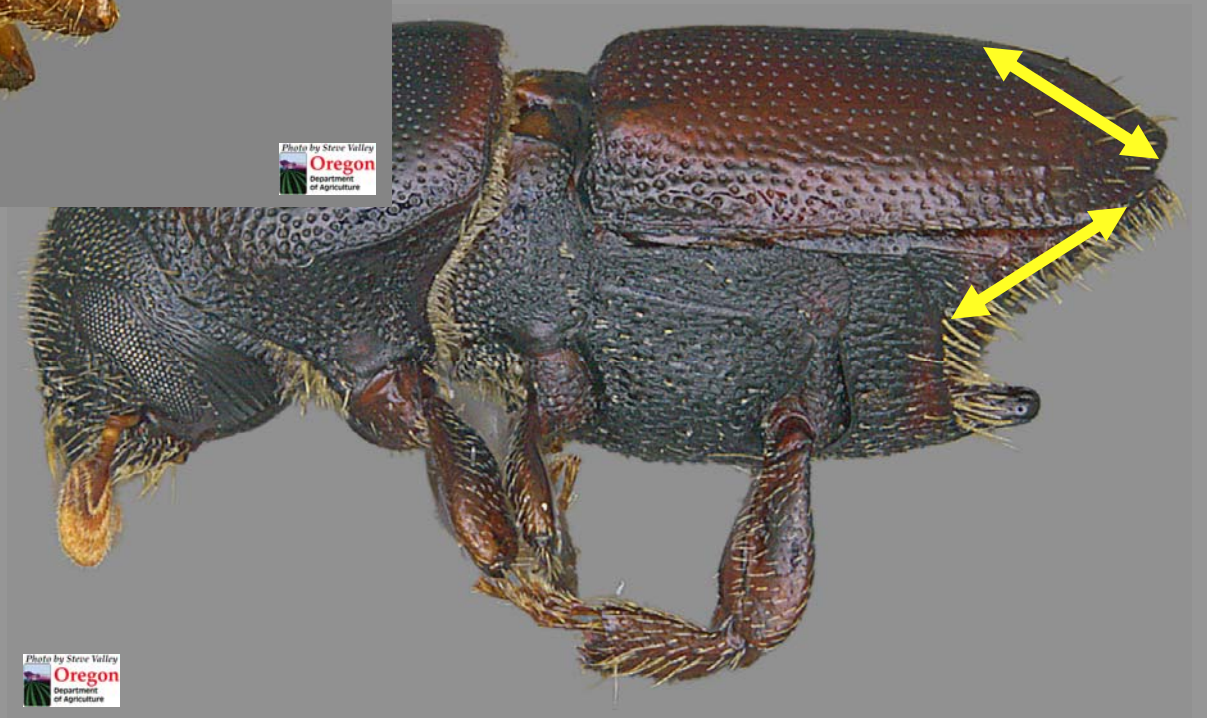
18d: Head visible in dorsal view; scutellum depressed.

18 (1): Part III



18e: Elytra steeply declivous, descending to meet horizontal abdomen.

18f: Elytra slightly declivous, abdomen ascending to meet them.

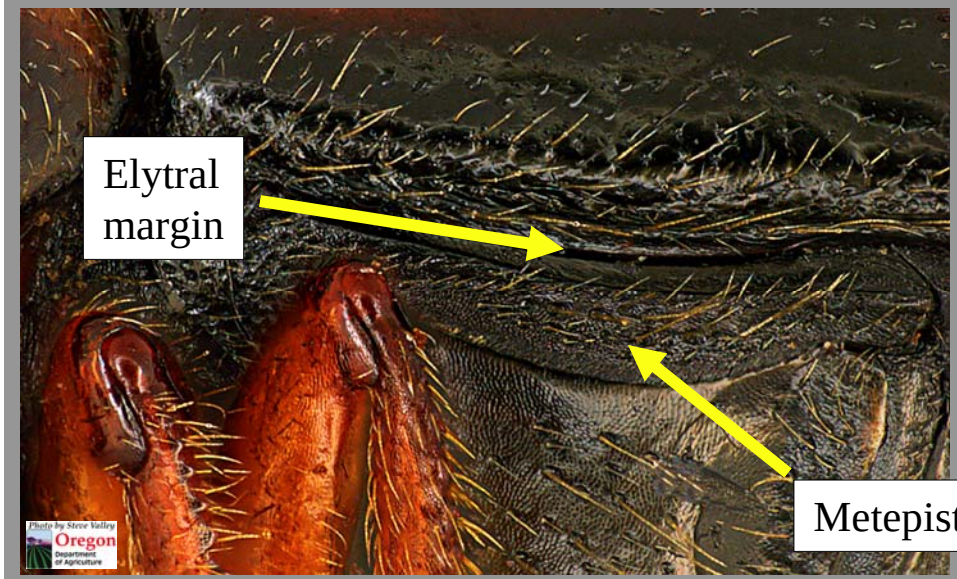


19 (18): Part I

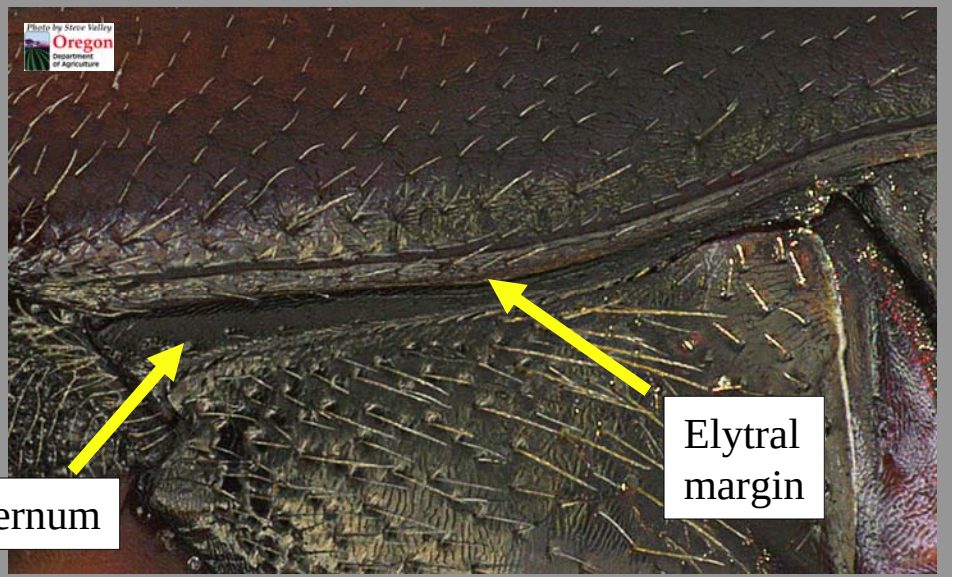
Metepisternum fully visible throughout its length (if the elytra are slightly displaced, this character may be difficult to assess) (**a**); antennal club varying from flat**(c, d**) to obliquely truncate (**e**)……20

Metepisternum largely covered by elytra, fully visible only in its anterior portion (**b**); antennal club strongly flattened with sutures on both sides, those on posterior surface not strongly displaced apically (**f, g, h**)……73

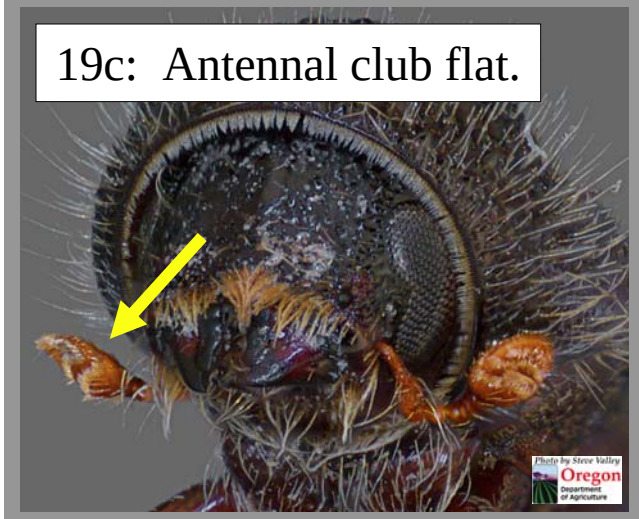
19a: Metepisternum visible

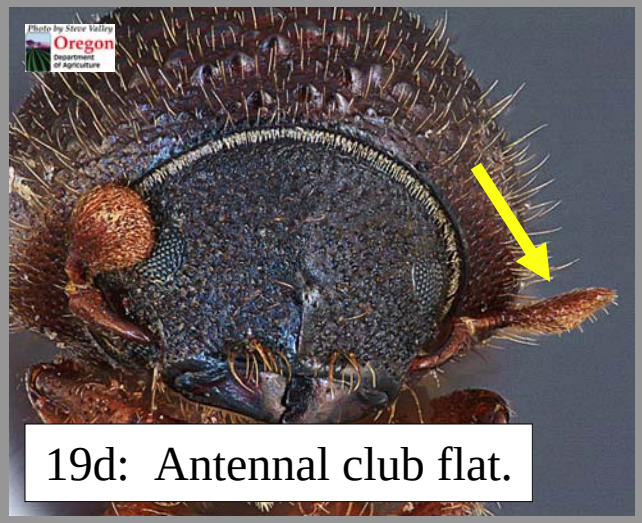


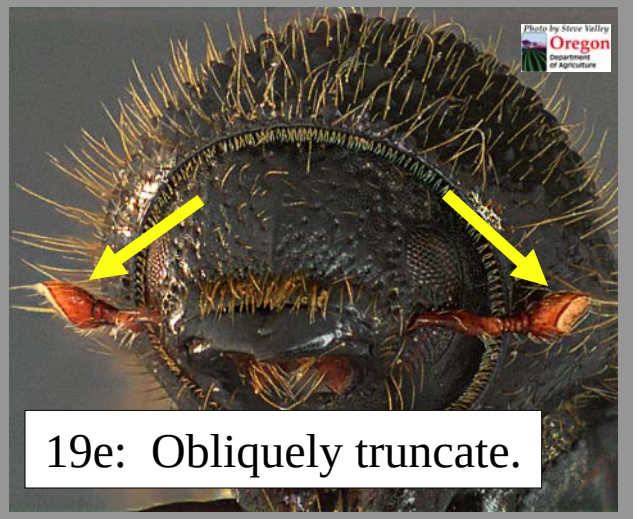
19b: Metepisternum obscured



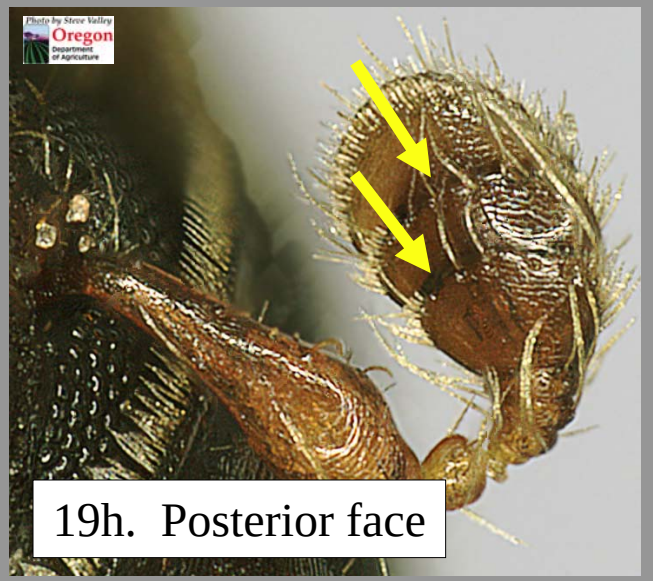
19 (18): Part II





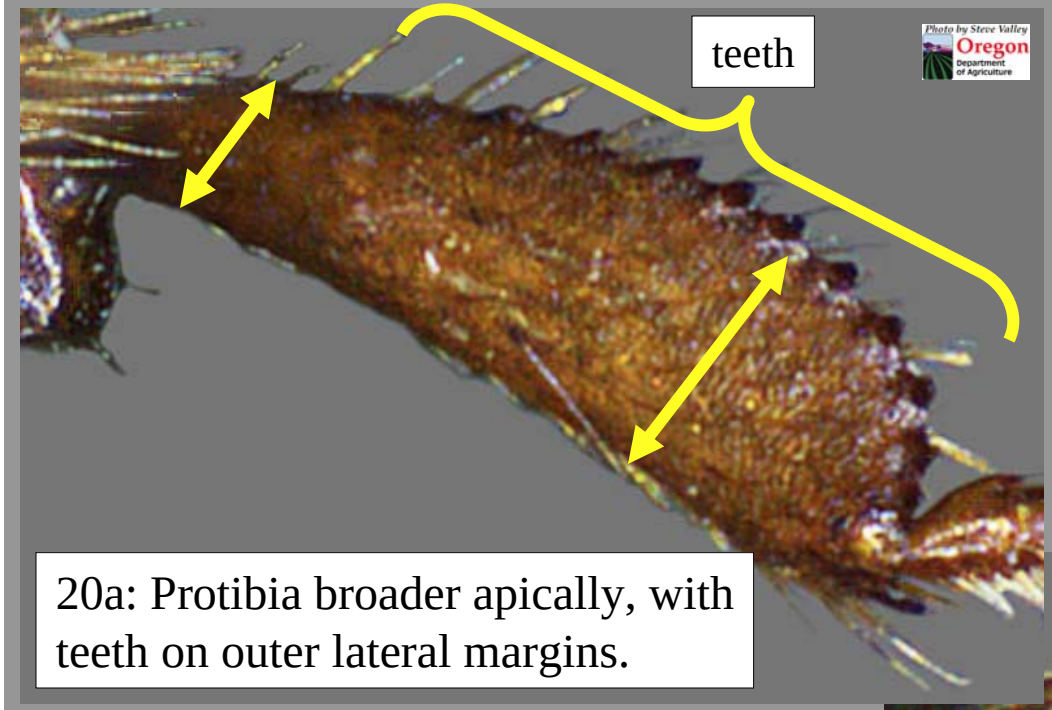


19f: Antennal club strongly flattened.



Club with sutures on both faces, not displaced apically.

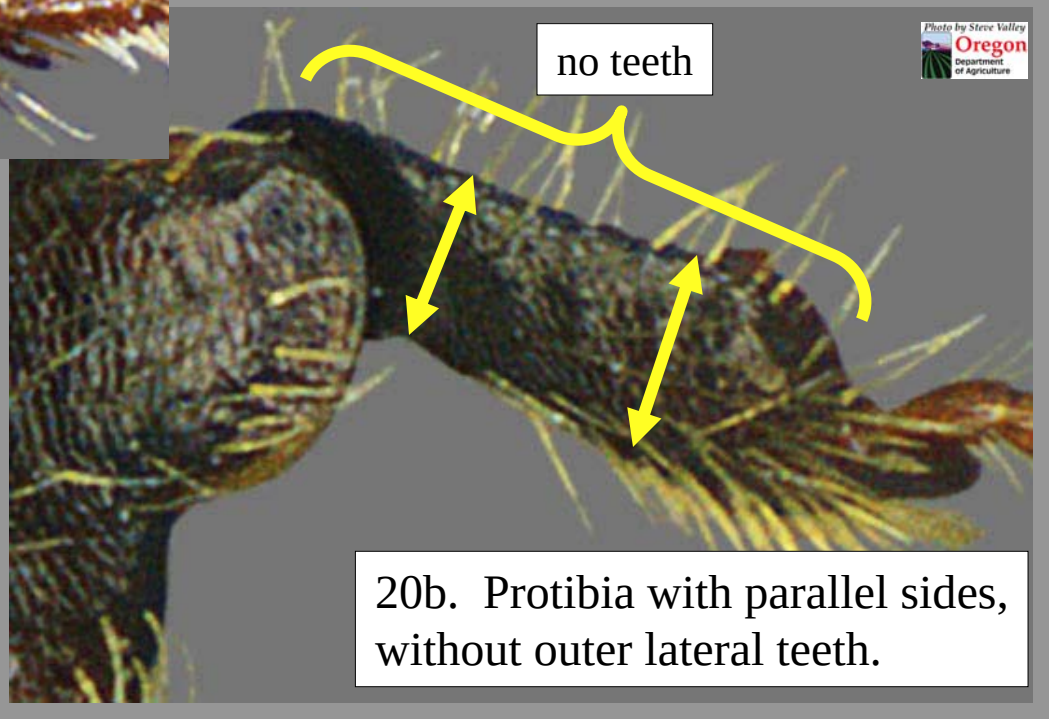
20 (19): Part I



20a: Protibia broader apically, with teeth on outer lateral margins.

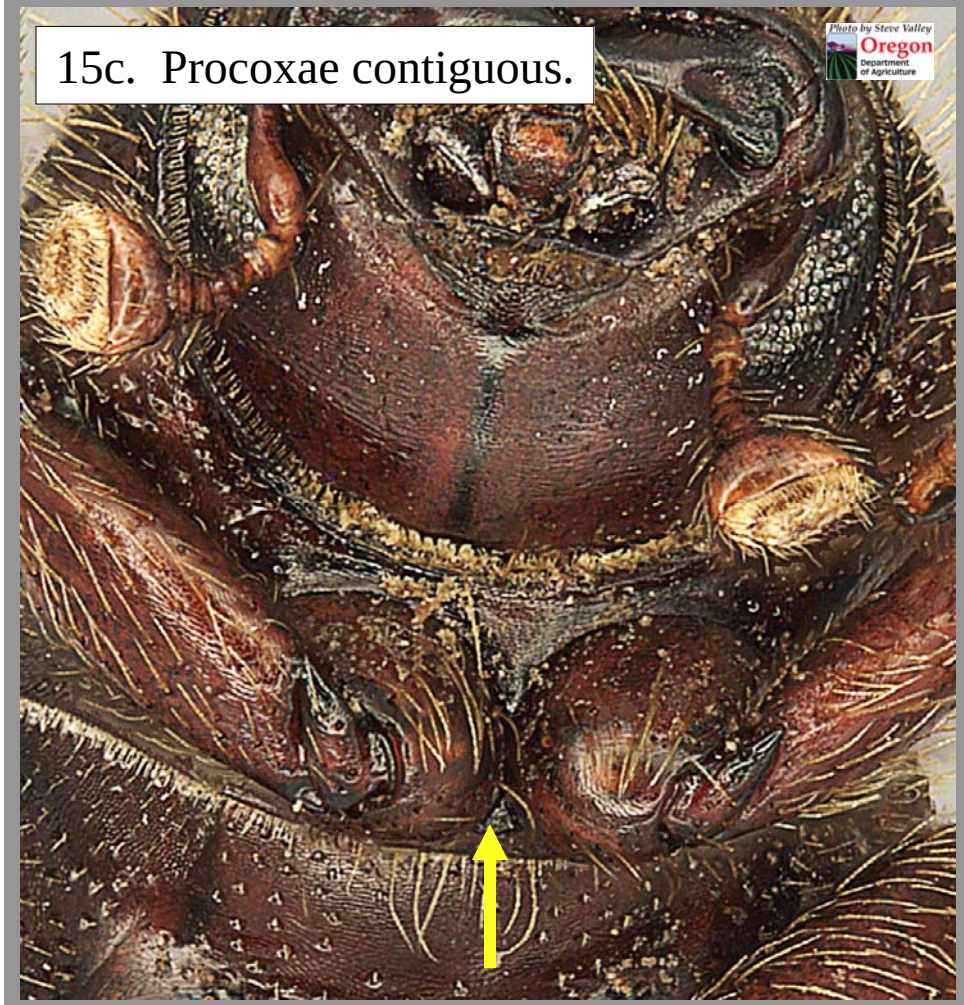
Protibiae broader apically, with teeth on outer lateral margins (**a**); procoxae contiguous (**c**); (EXCEPT *Xylosandrus*)……21

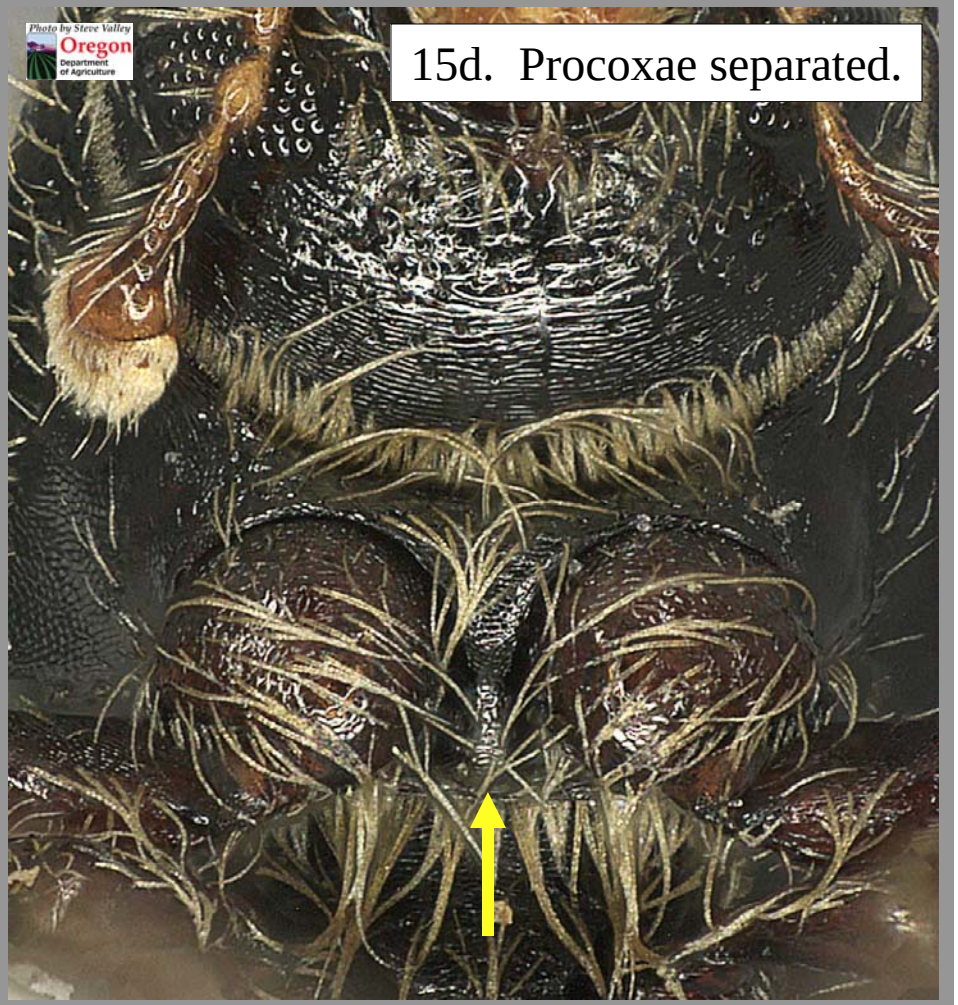
Protibiae with parallel sides, without outer lateral teeth (**b**); procoxae separated (**d**)….STOP



20b. Protibia with parallel sides, without outer lateral teeth.

20 (19): Part II


15c. Procoxae contiguous.
Photo by Steve Valley
Oregon
Department of Agriculture

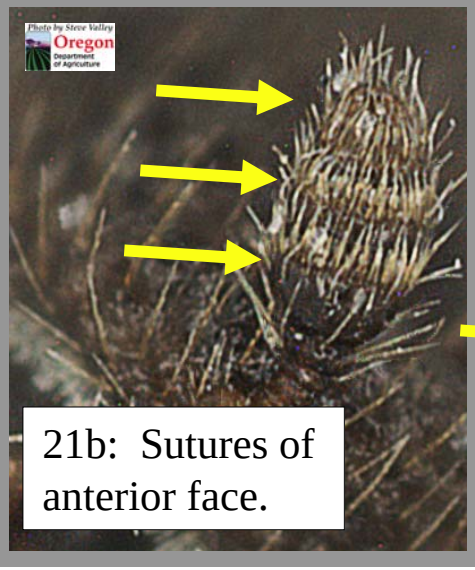

15d. Procoxae separated.
Photo by Steve Valley
Oregon
Department of Agriculture

21 (20): Part I

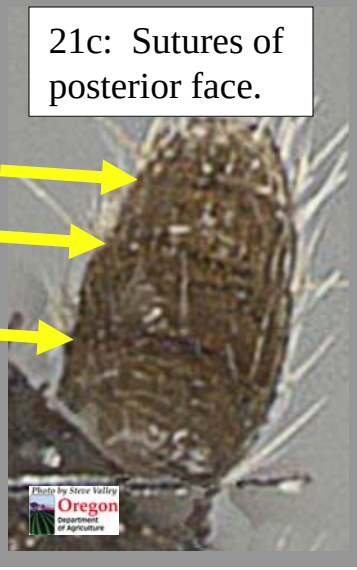
Antennal club more strongly flattened (**a**), with sutures on neither face displaced to apical 1/4 (**b, c**); costal margins of elytra slightly ascending posteriorly and vestiture scale-like (**j**); usually less than 2.0 mm in total length……..…22

Antennal club obliquely truncate **(d)** or with sutures of posterior face restricted to less than apical 1/4 (**e**) or with no sutures on either face (**f-i**); costal margins of elytra descending posteriorly and vestiture setose (**k**); usually greater than 2.0 mm in total length……..……..…..……23

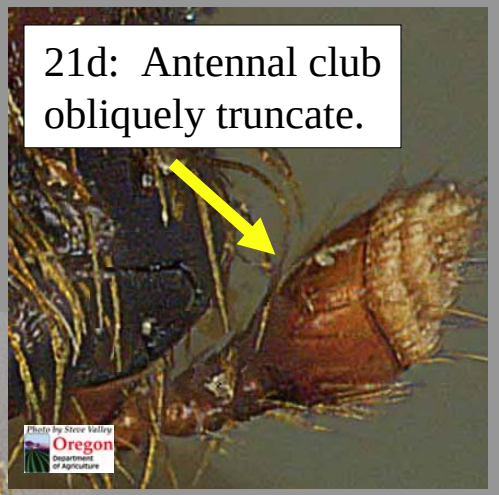
21a: Antennal club flattened.



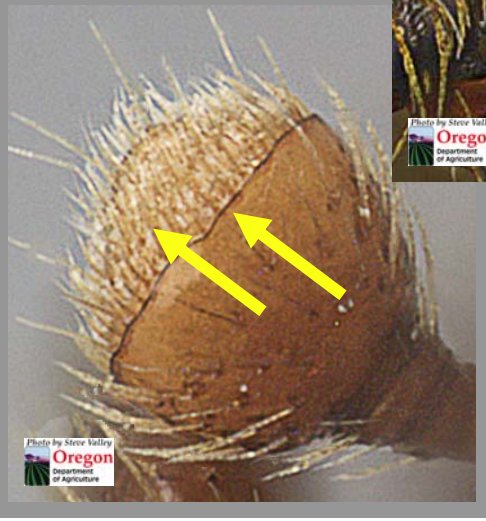
21b: Sutures of anterior face.



21c: Sutures of posterior face.



21d: Antennal club obliquely truncate.



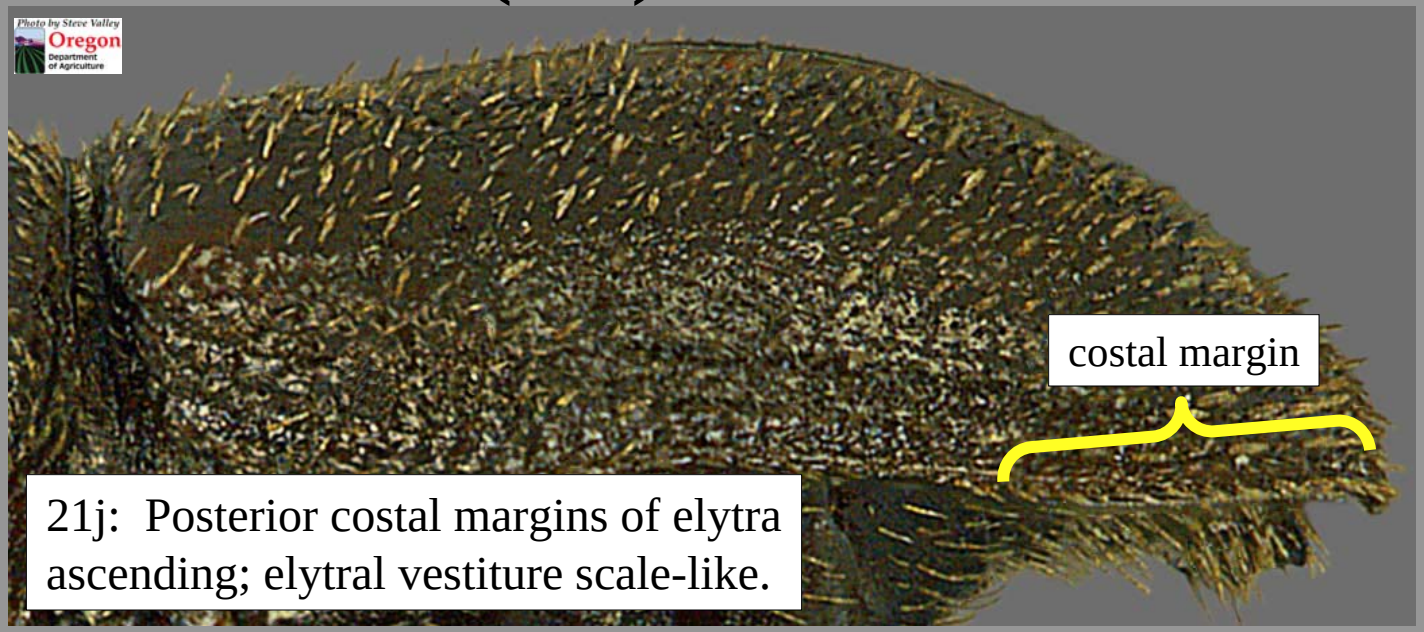
21e: Posterior face with anteriorly displaced sutures.

21 (20): Part II

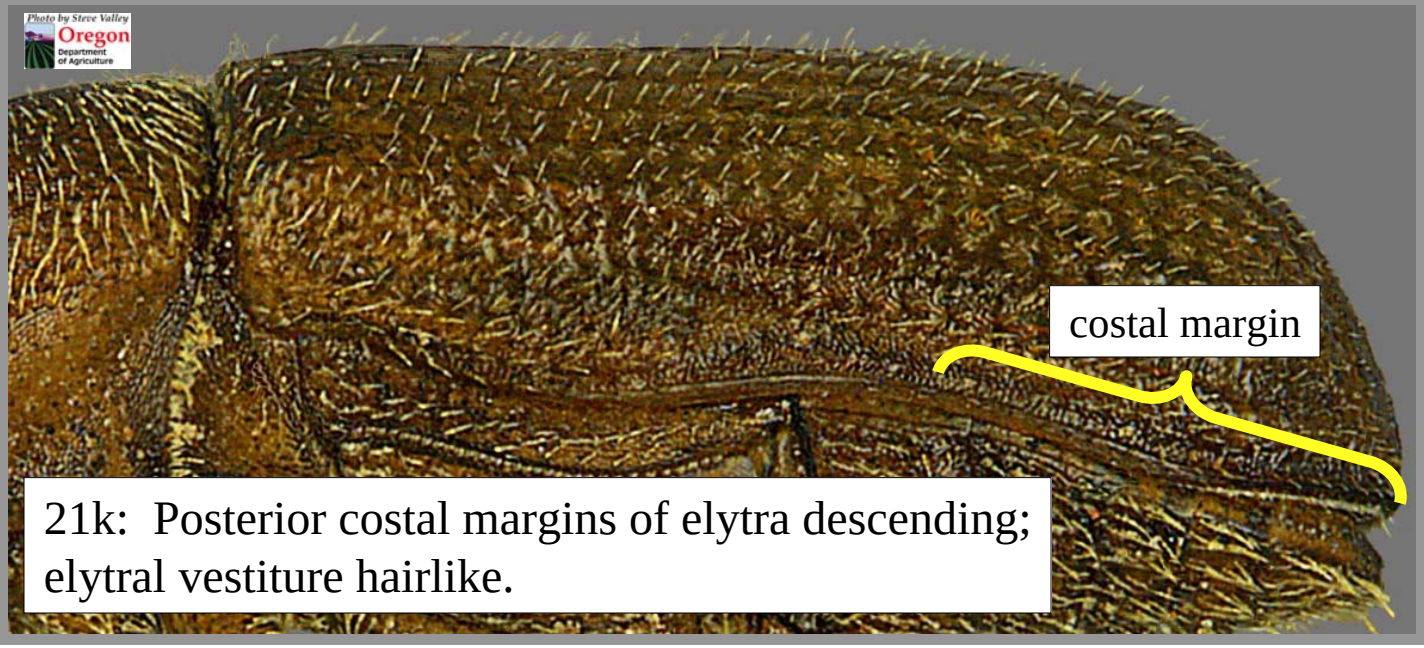
21f, g: No sutures visible on anterior face of antennal club.

21h, i: No sutures visible on posterior face of antennal club.

21 (20): Part III



21j: Posterior costal margins of elytra ascending; elytral vestiture scale-like.

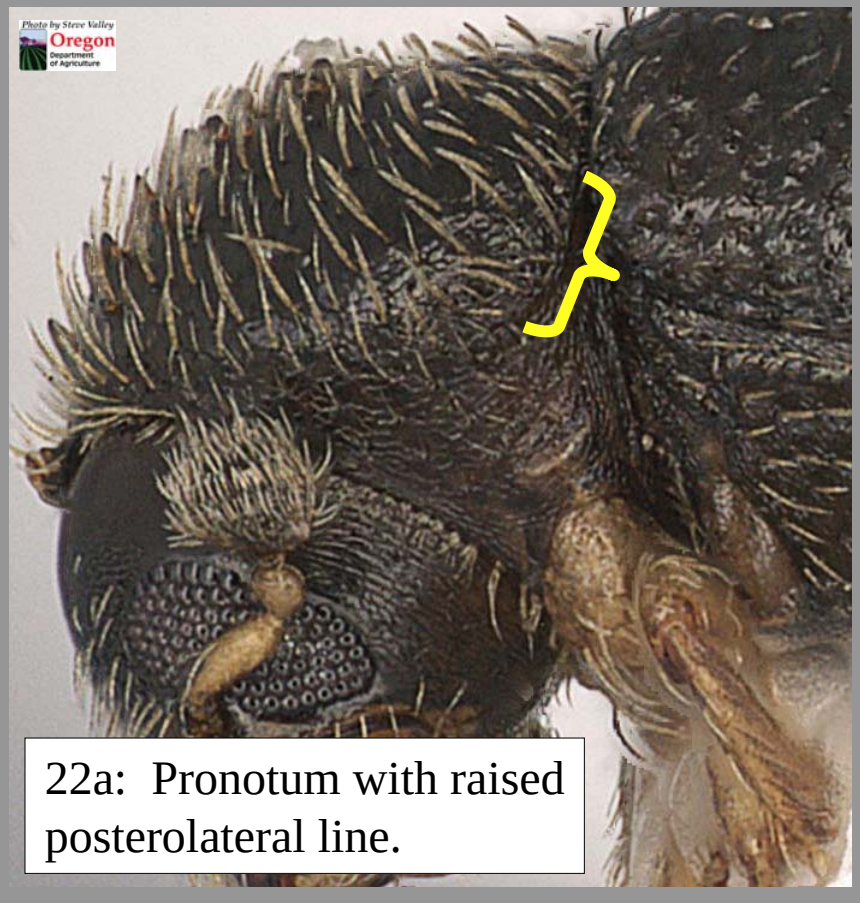


21k: Posterior costal margins of elytra descending; elytral vestiture hairlike.

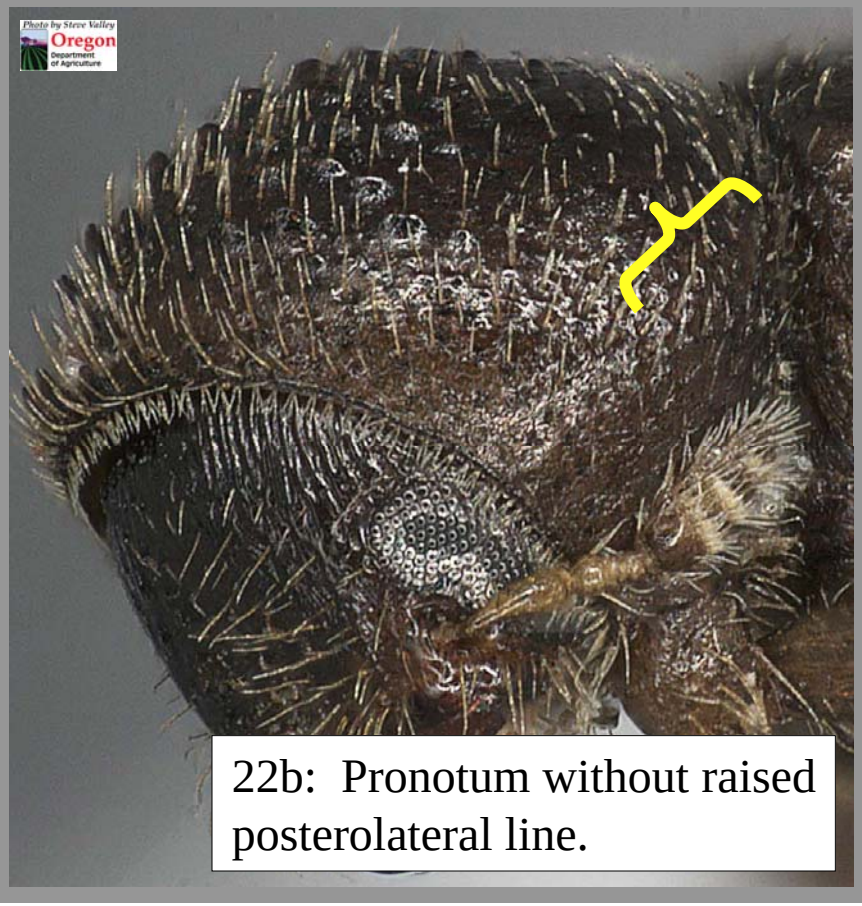
22 (21): Part I

Pronotum acutely margined at sides and with fine, raised line at least on posterolateral 1/3 (**a**); anterior margin of eye distinctly emarginate (**c**); antennal club about as long as broad (**e**); portraits (**g**)……..…..…..*Hypothenemus* spp. ♎ ☼

Pronotum without fine, raised posterolateral line (**b**); anterior margin of eye at most shallowly emarginate (**d**); antennal club longer than broad (**f**)…..…..……..….STOP



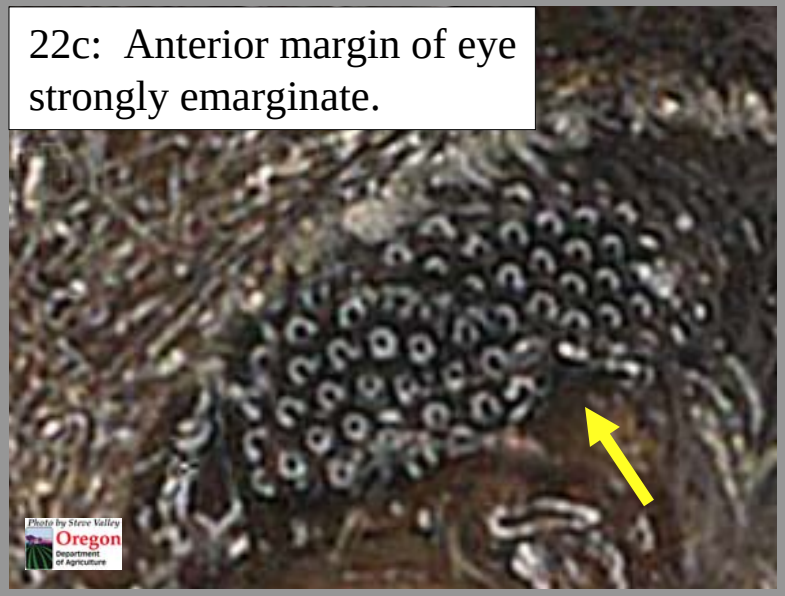
22a: Pronotum with raised posterolateral line.



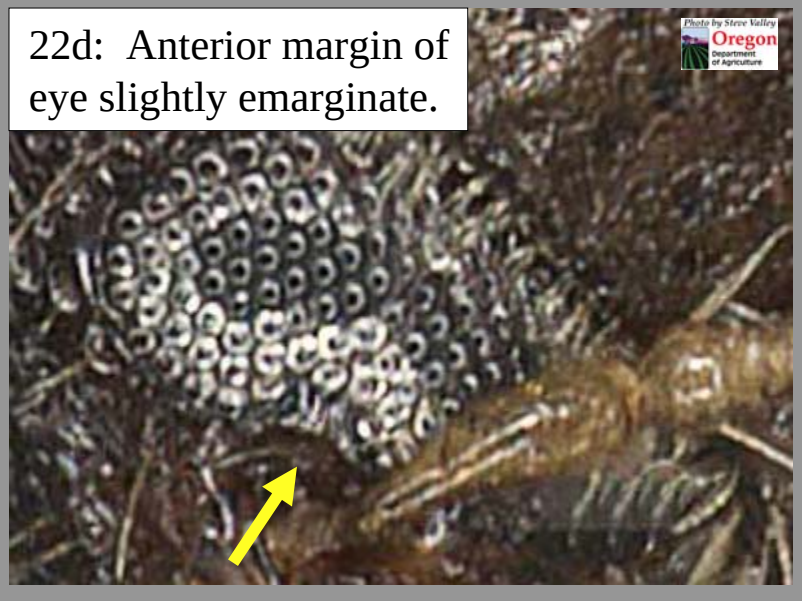
22b: Pronotum without raised posterolateral line.

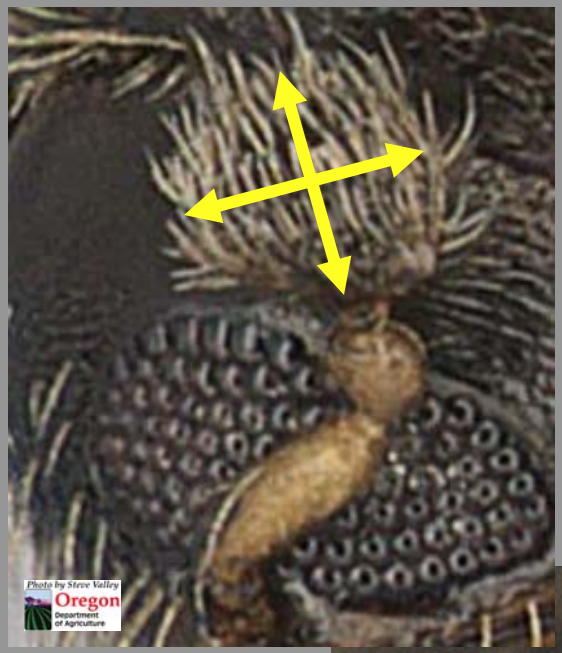
22 (21): Part II

22c: Anterior margin of eye strongly emarginate.



22d: Anterior margin of eye slightly emarginate.





22e: Antennal club as broad as long.

22f: Antennal club longer than broad.

22 (21): Part III

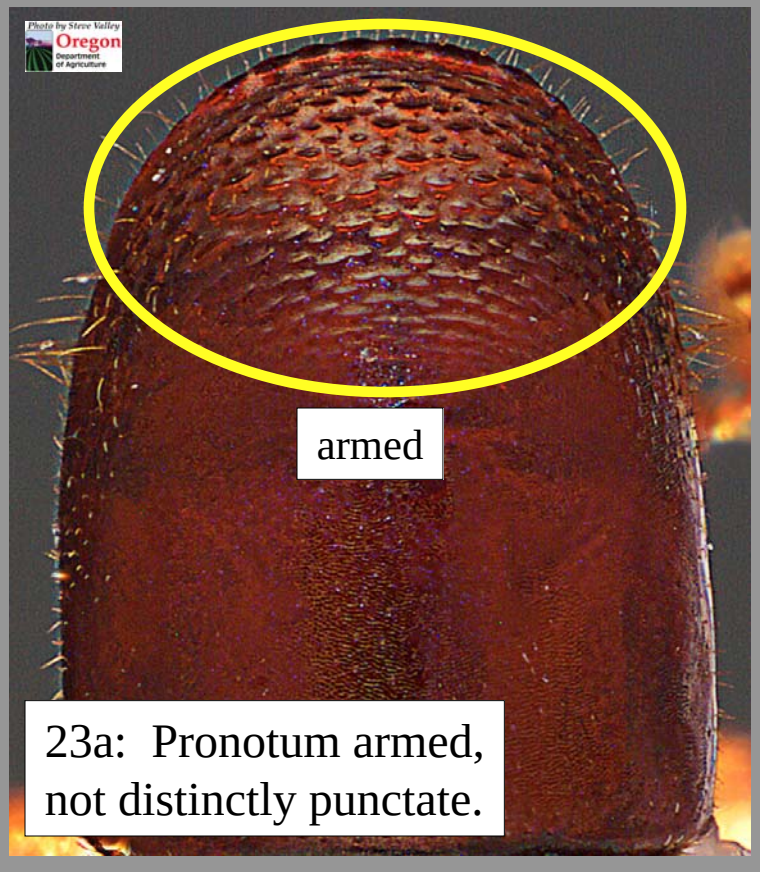
Hypothenemus spp. ♎ ☼

22g.

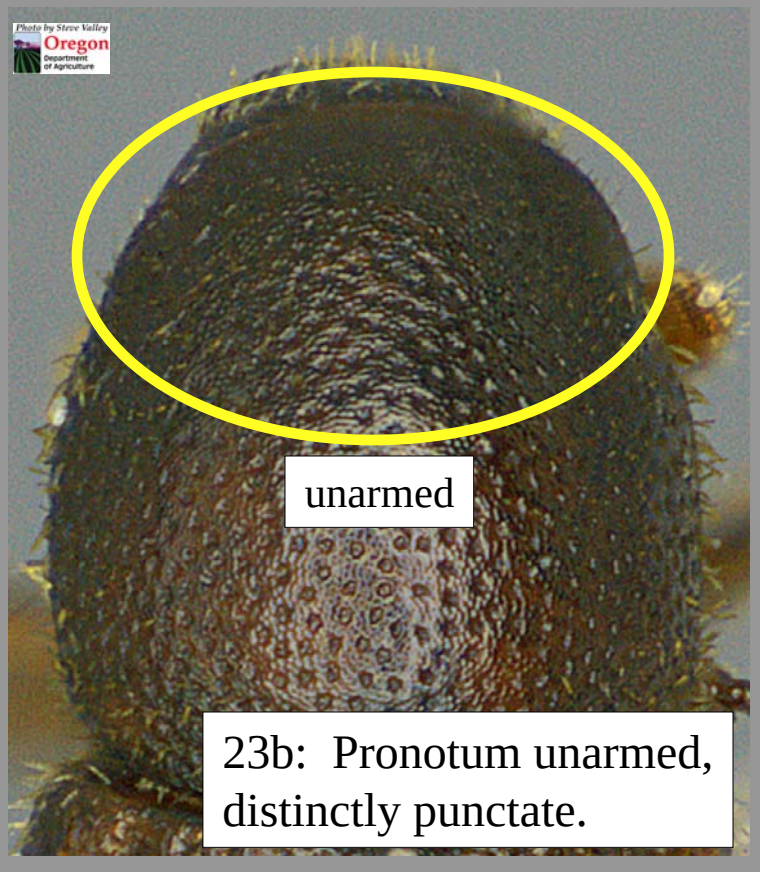
23 (21): Part I

Pronotum usually armed anteriorly with granules or asperities (**a**), if unarmed, lateral line sharply raised (**c**), at most finely punctate on unarmed surface; antennal funicle 4- (**e**) or 5-segmented (**f**); length usually over 2.0 mm.…….24

Pronotum unarmed, punctured over entire surface (**b**), lateral line not sharply raised (**d**); antennal funicle 2- (not illustrated) or 3-segmented (**g**); length 2.0 mm or less……..……STOP



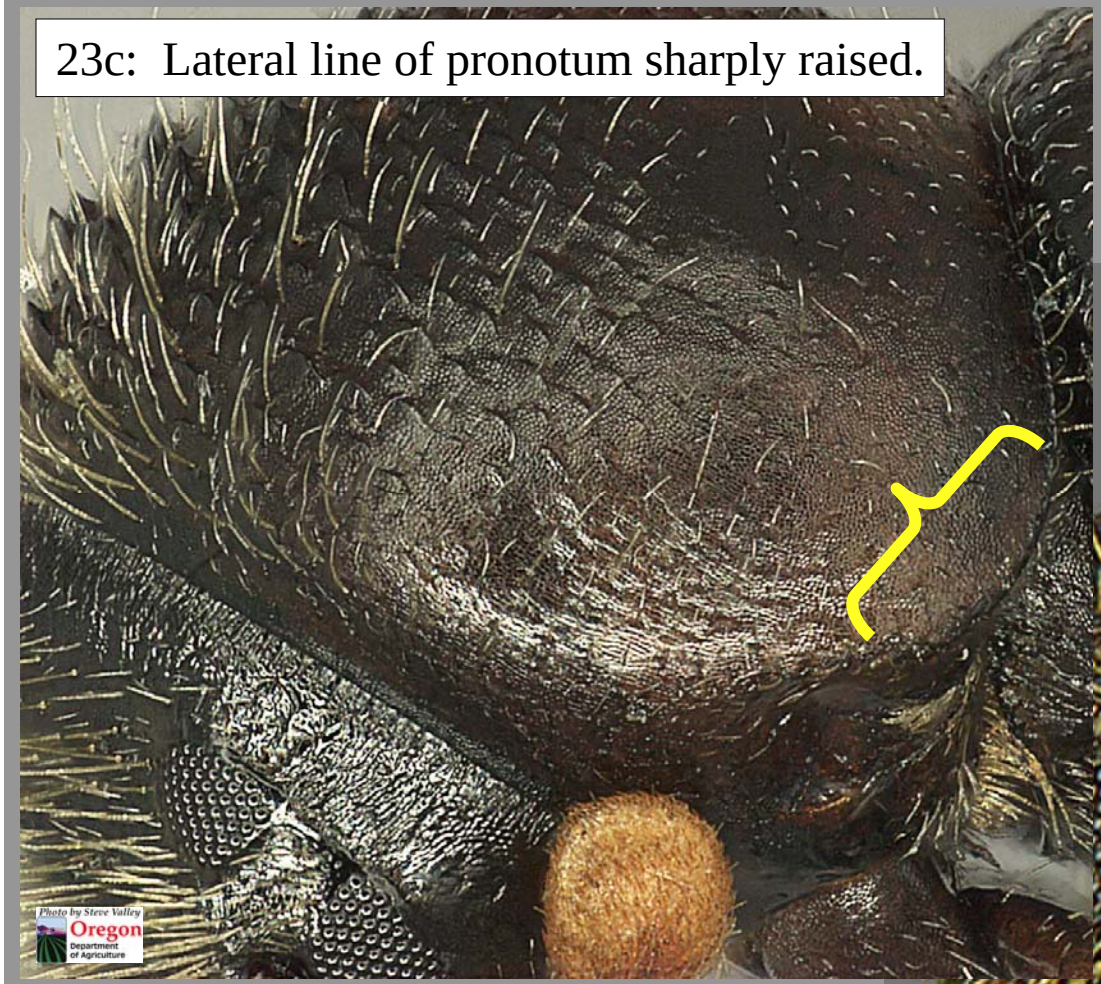
23a: Pronotum armed, not distinctly punctate.

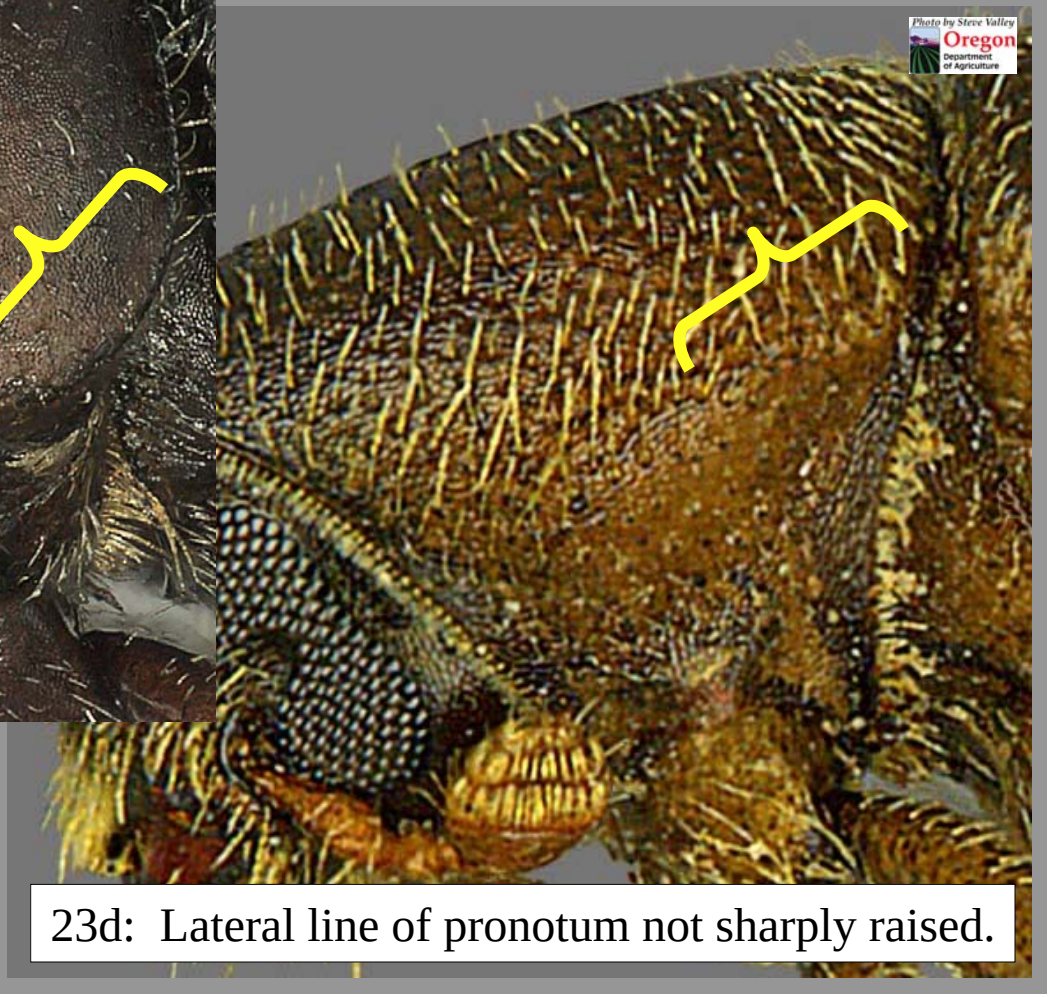


23b: Pronotum unarmed, distinctly punctate.

23 (21): Part II

23c: Lateral line of pronotum sharply raised.

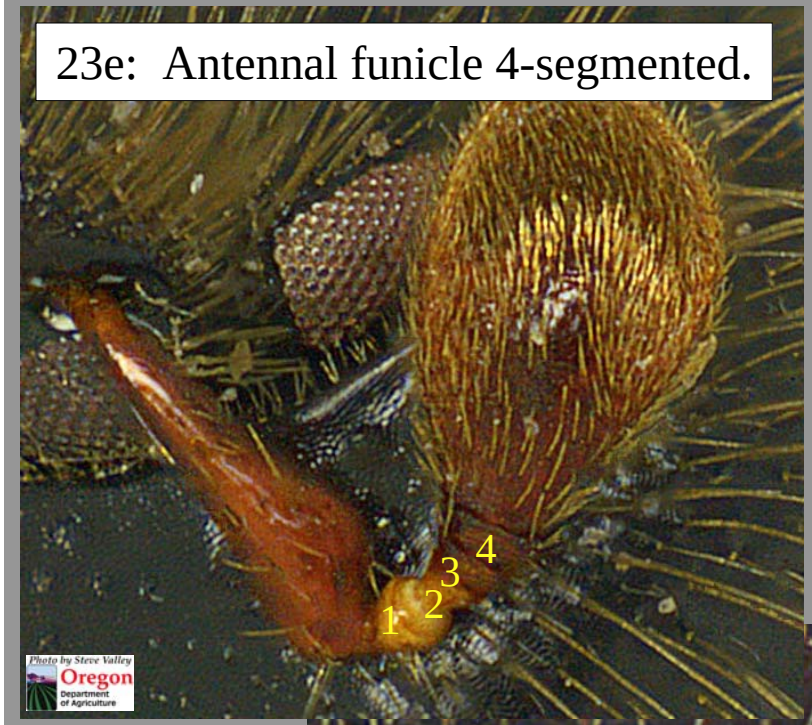


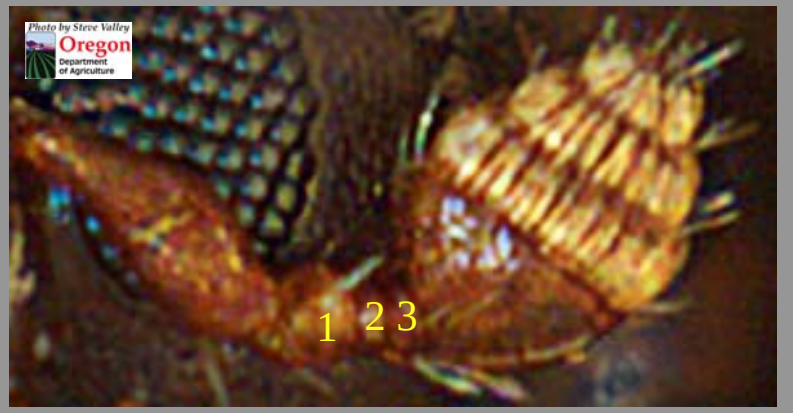


23d: Lateral line of pronotum not sharply raised.

23 (21): Part III

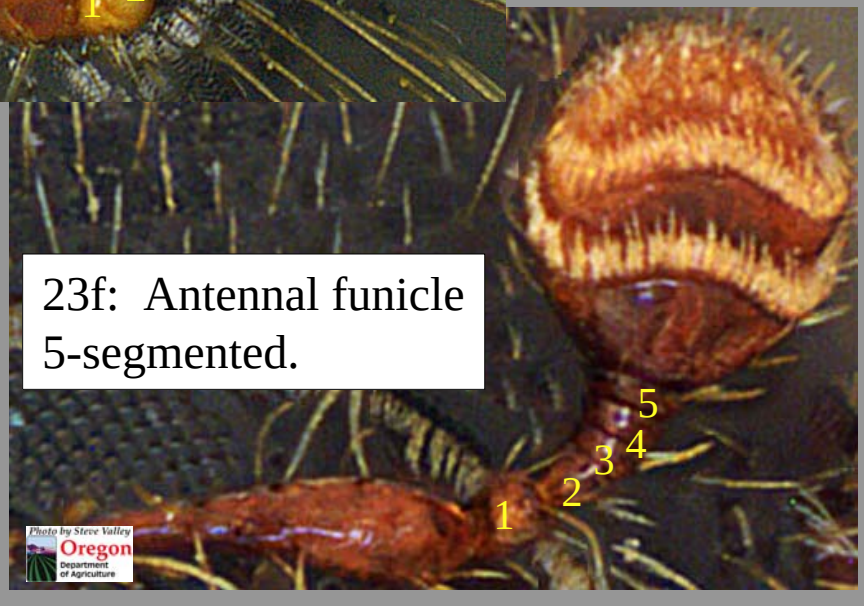
23e: Antennal funicle 4-segmented.





23g: Antennal funicle 3-segmented (2-segmented not illustrated).

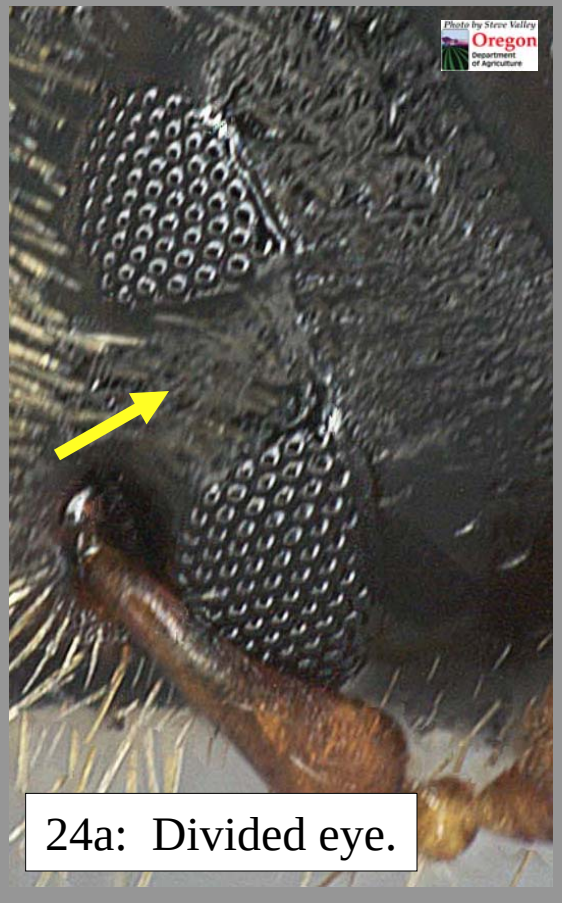
23f: Antennal funicle 5-segmented.



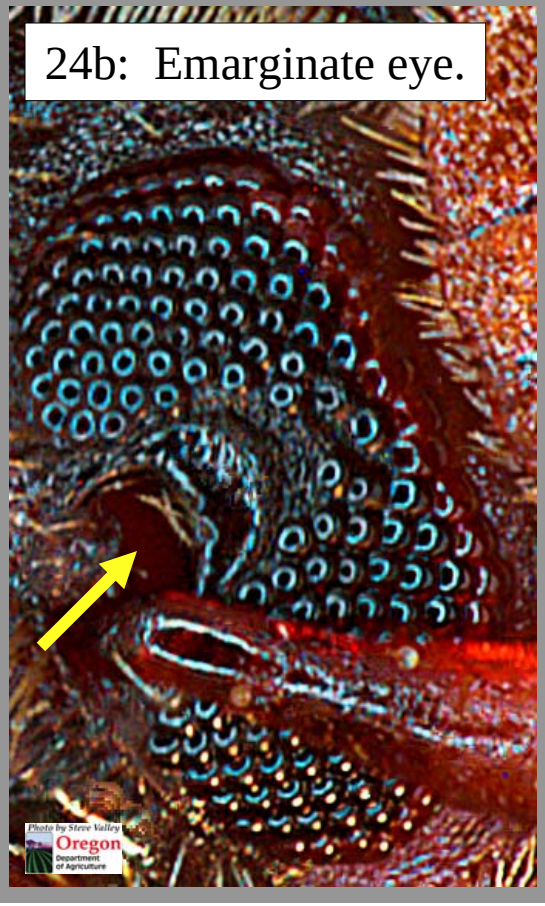
24 (23): Part I

Eye completely divided into two halves (**a**); anterior face of antennal club without distinct sutures (other than at apex of basal segment) (**c, d**)……25

Anterior margin of eye sinuate or emarginate, never completely divided (**b**); anterior face of antennal club usually with distinct sutures (**e, f**)……..…35



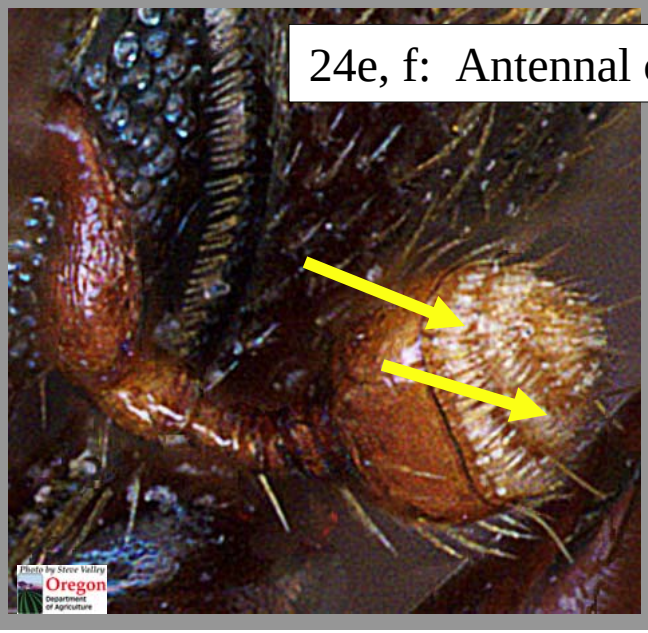
24a: Divided eye.

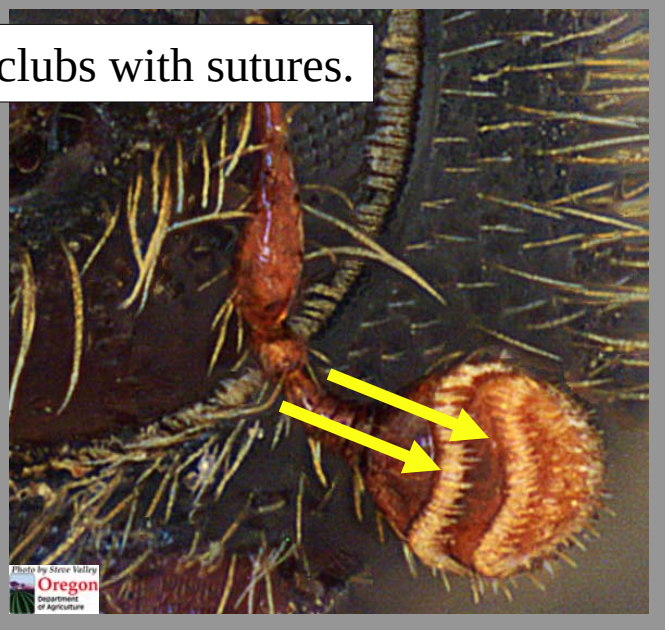


24b: Emarginate eye.

24 (23): Part II

24c, d: Antennal clubs without sutures.





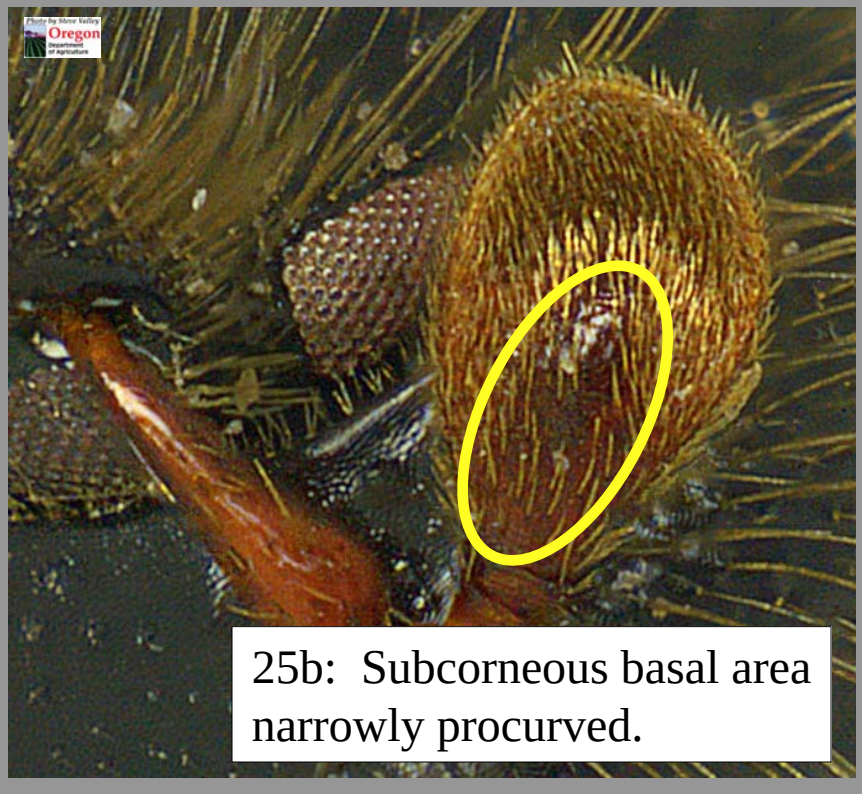
24e, f: Antennal clubs with sutures.

25 (24): Part I

Antennal club with subcorneous basal area broadly procurved (**a**); anteromedial margin of pronotum with 4 distinct tubercles (in full dorsal view) (**c**); portraits (**e, f**)…….*Xyloterinus politus* (Say) ♎

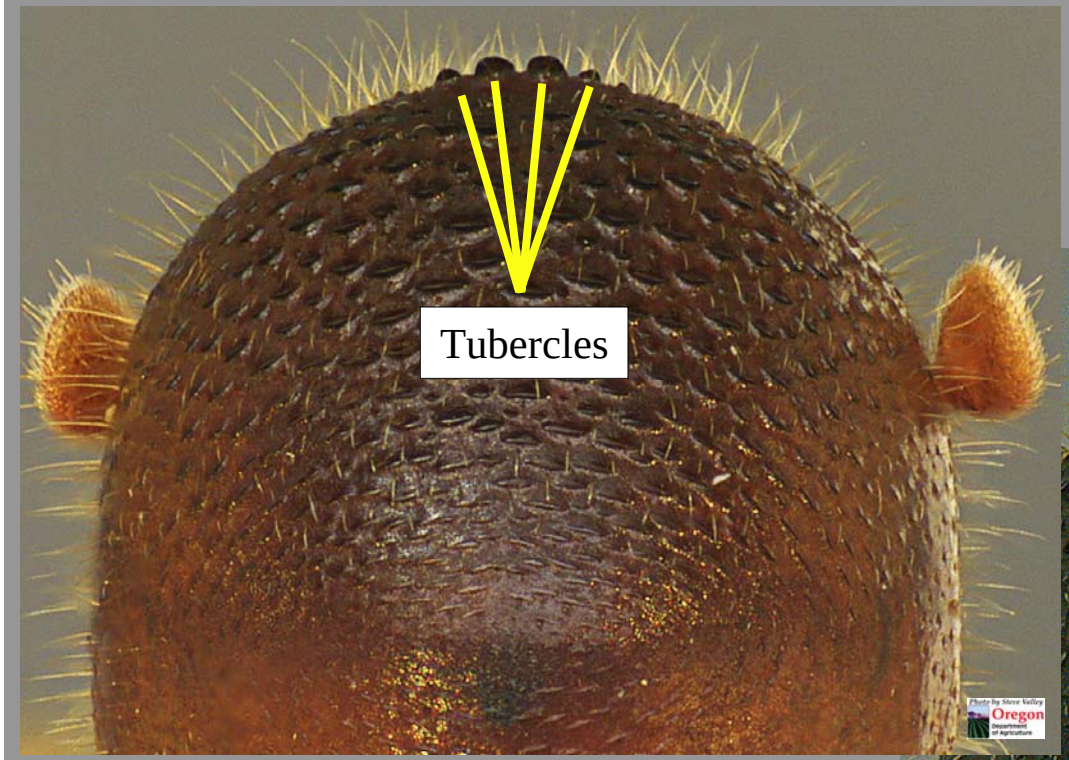
Antennal club with subcorneous basal area narrowly procurved (**b**); anterior margin of pronotum without distinct tubercles (**d**)……...26

25a: Subcorneous basal area broadly procurved.



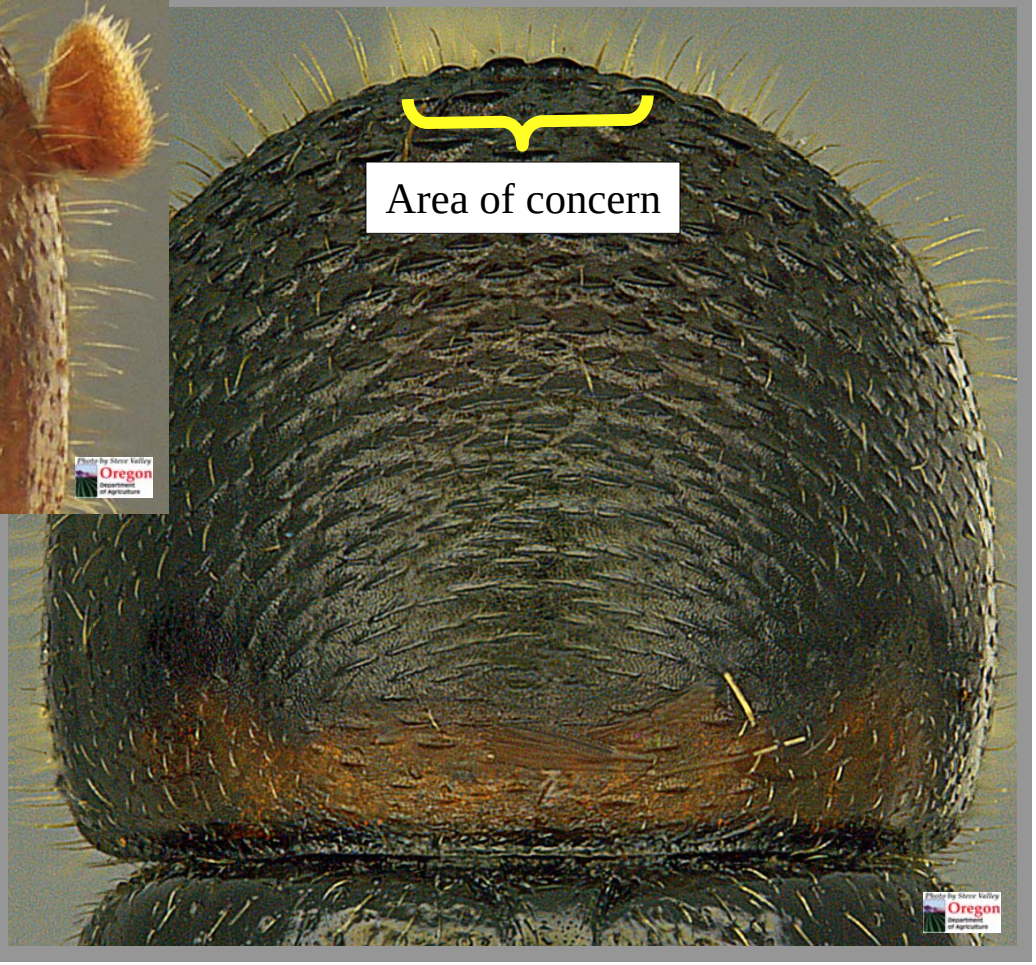
25b: Subcorneous basal area narrowly procurved.

25 (24): Part II



25c: Anterior margin of pronotum with 4 distinct tubercles.

25d: Anterior margin of pronotum without distinct tubercles.



25 (24): Part III

Xyloterinus politus (Say) ♎

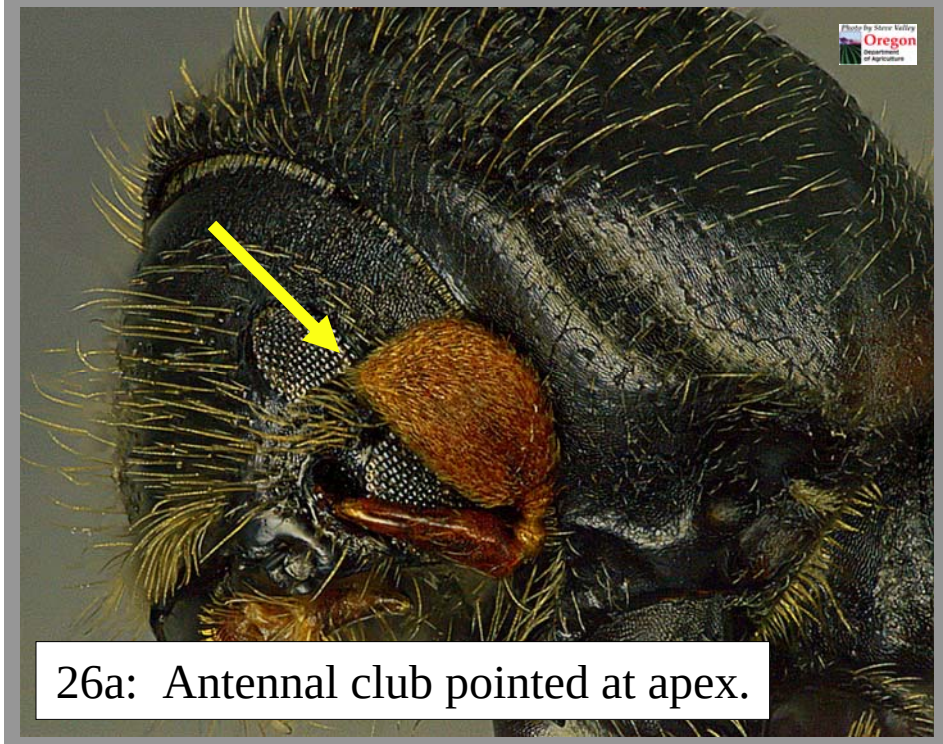
25e.

25f.

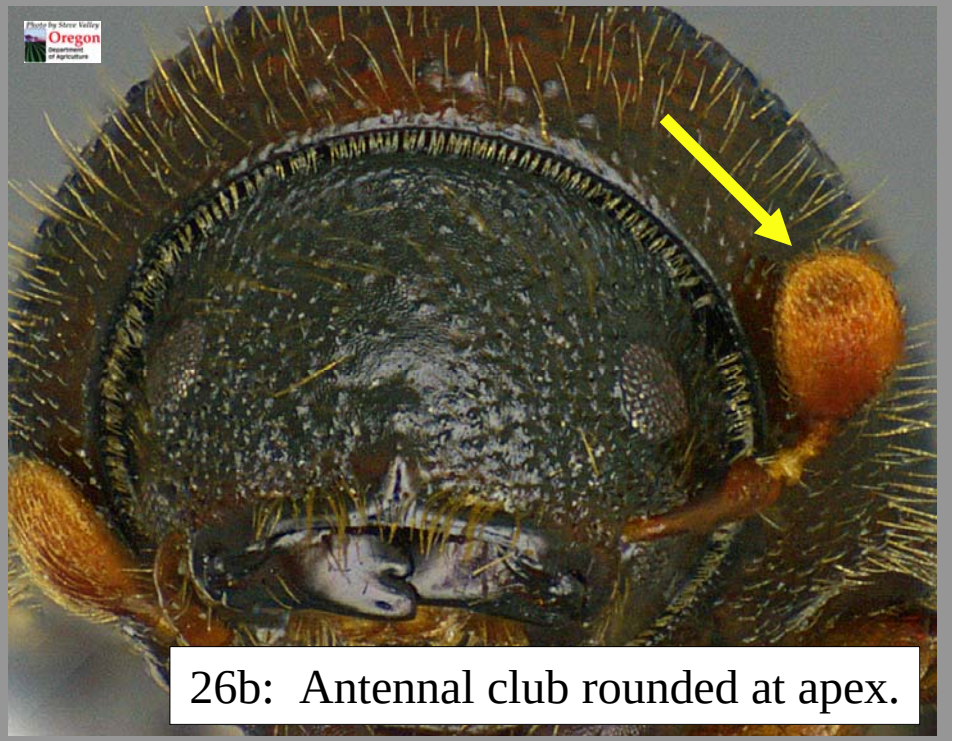
26 (25): Part I

Antennal club pointed apically (**a**); elytral apical declivity with dense, relatively long setae and with a pronounced furrow adjacent to the suture (**c**); portrait (**e**)……*Trypodendron domesticum* Linnaeus ☹

Antennal club rounded apically (**b**); elytral apical declivity with only sparse, short, setae and with at most a shallow furrow adjacent to the suture (**d**)……..……..27



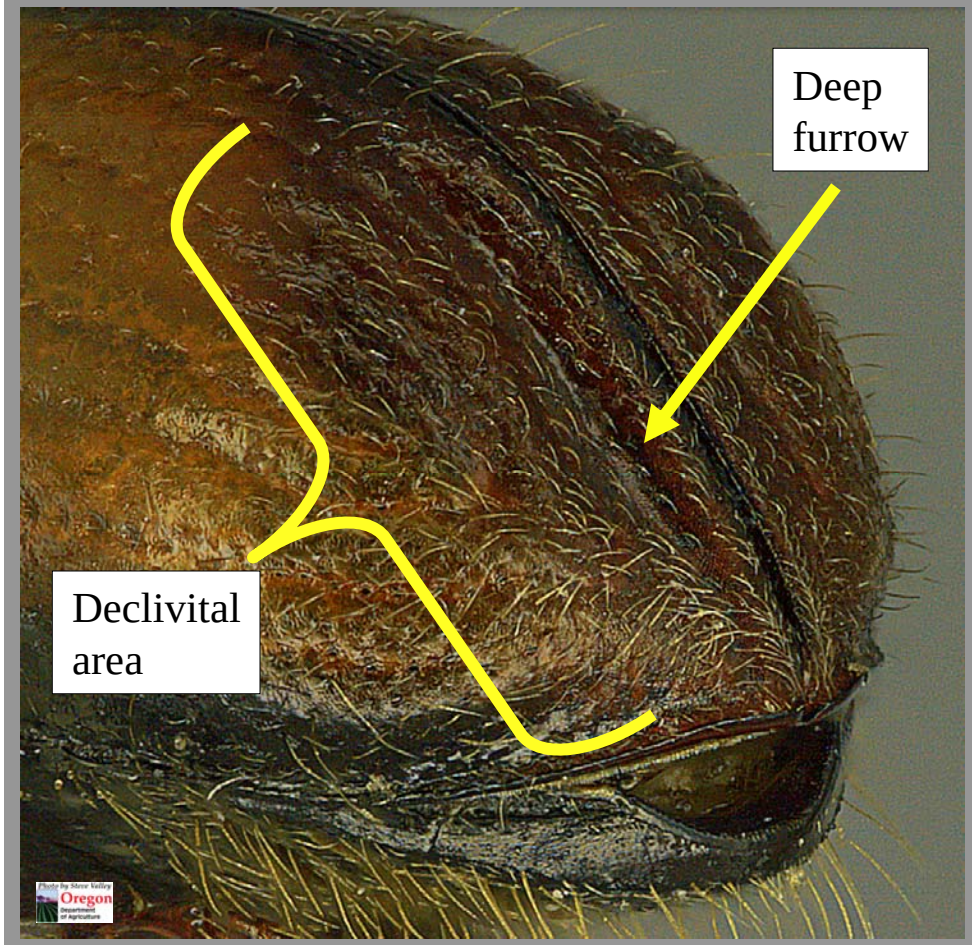
26a: Antennal club pointed at apex.



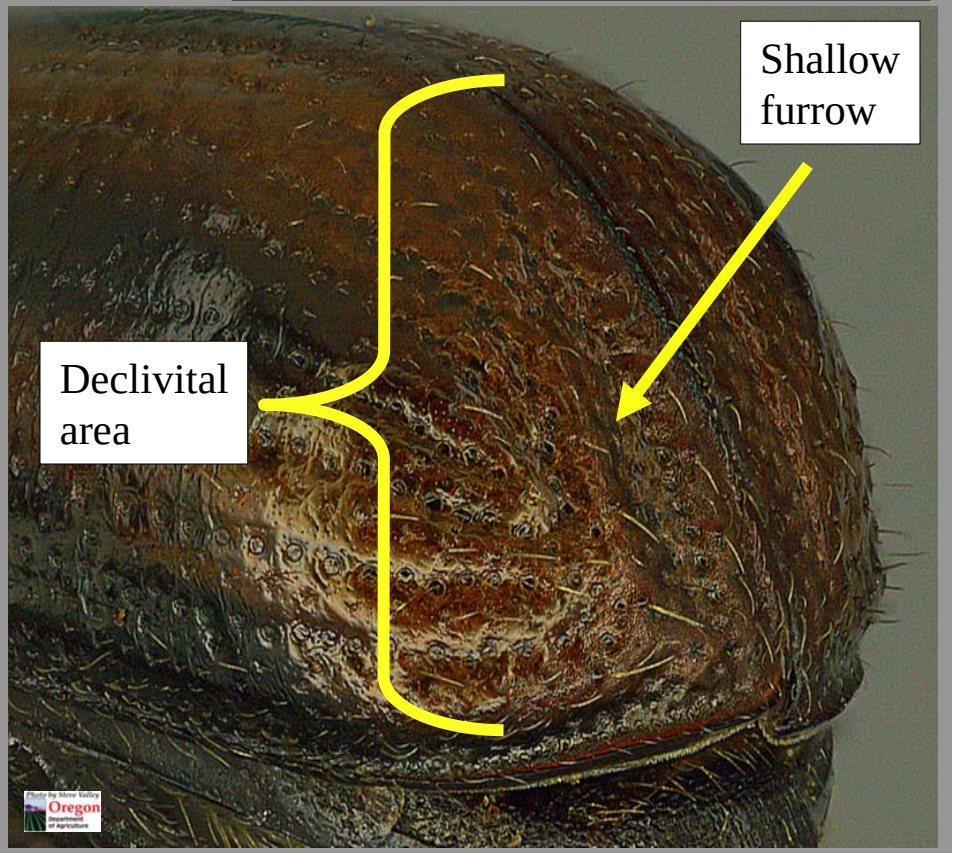
26b: Antennal club rounded at apex.

26 (25): Part II

26c: Apical declivity with dense relatively long setae and a deep furrow next to the suture.



26d: Apical declivity with sparse, short setae and a shallow furrow next to the suture.



26 (25): Part III

Trypodendron domesticum Linnaeus ☹

26e. Female.

26f. Male.

27 (26): Part I

Pronotum in dorsal view rounded, with arcuate anterior margin (**a**); frons convex (**c**) - females……..……..28

Pronotum in dorsal view rectangular, with truncate anterior margin (**b**); frons concave (**d**) - males……..……..31

27a: Pronotum rounded.

27b: Pronotum rectangular.

27 (26): Part II

27c: Frons convex.

27d: Frons concave.

28 (27)

Elytral surface between rugae and punctures smooth and shiny (**a**)……..…..29

Elytral surface between rugae and punctures roughened, more-or-less dull (**b**)…….……..STOP

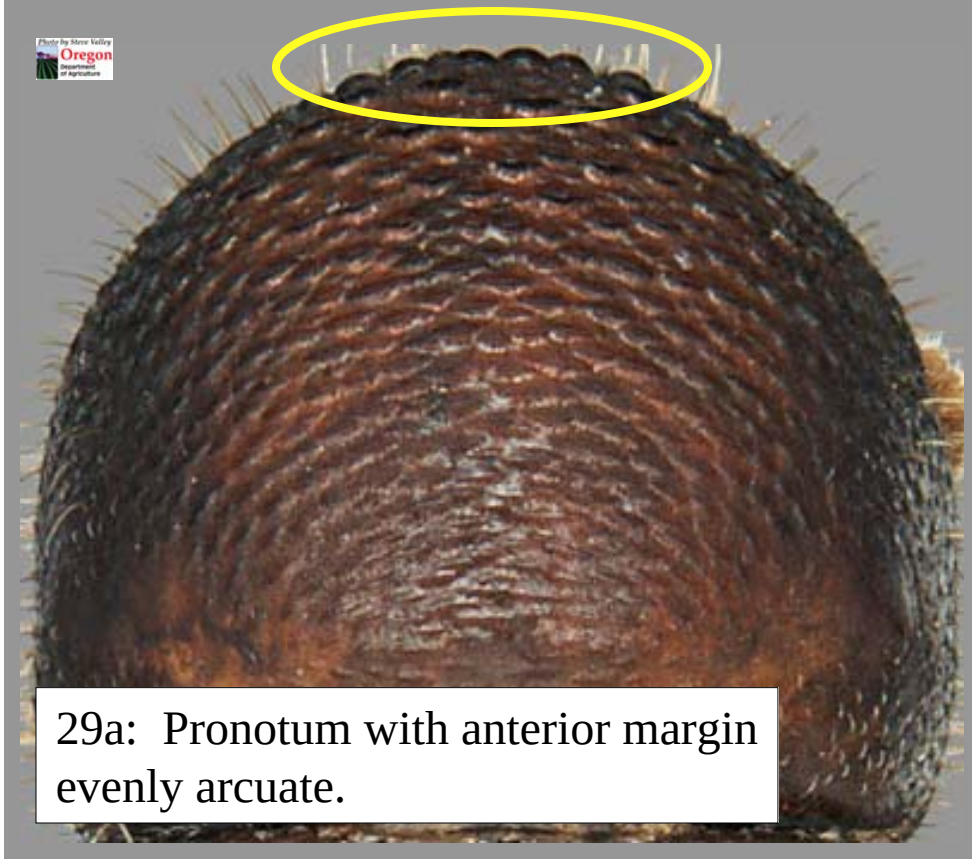
28a: Elytral surface smooth, shiny.

28b: Elytral surface roughened, dull.

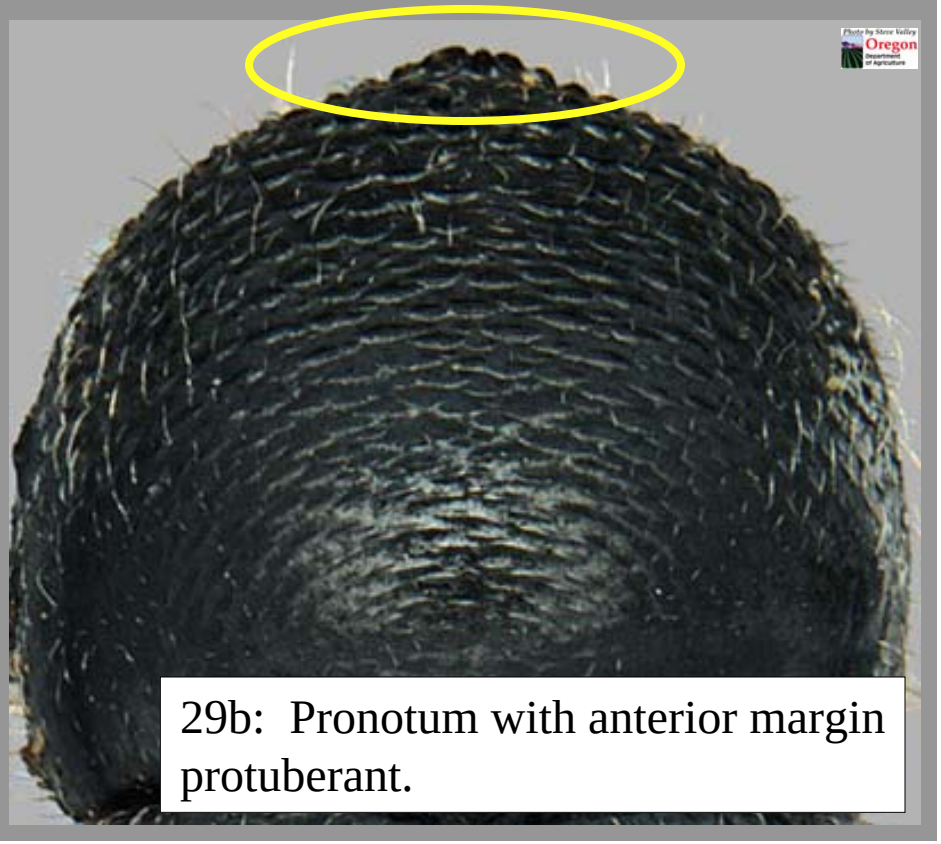
29 (28)

Anterior margin of pronotum (dorsal view) <u>without</u> prominent asperities so the median margin appears evenly arcuate (**a**)……..……...30

Anterior margin of pronotum <u>with</u> several prominent asperities causing the median margin to appear protuberant (**b**)……...STOP



29a: Pronotum with anterior margin evenly arcuate.

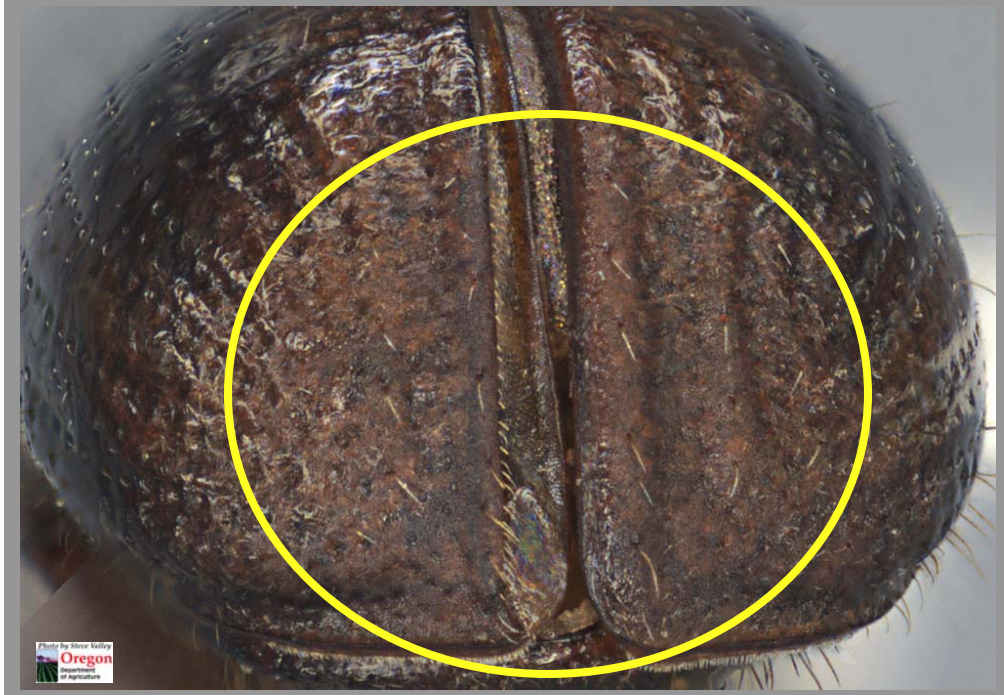


29b: Pronotum with anterior margin protuberant.

30 (29): Part I

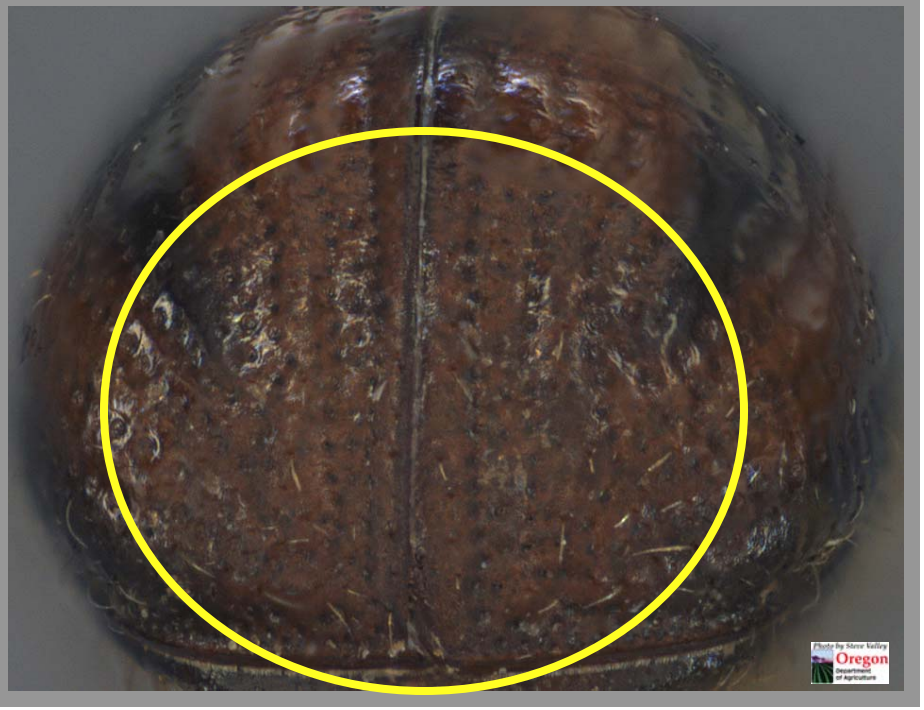
Punctures of striae on elytral declivity absent or, at most, very vague and indistinct(**a**); portraits (**c, d**)……..*Trypodendron lineatum* (Olivier) ♎ (female)

Punctures of striae on elytral declivity distinct and sharply impressed (**b**)...STOP



30a: Declivital punctures vague.

30b: Declivital punctures distinct.



30 (29): Part II

Trypodendron lineatum (Olivier) ♎

(female)

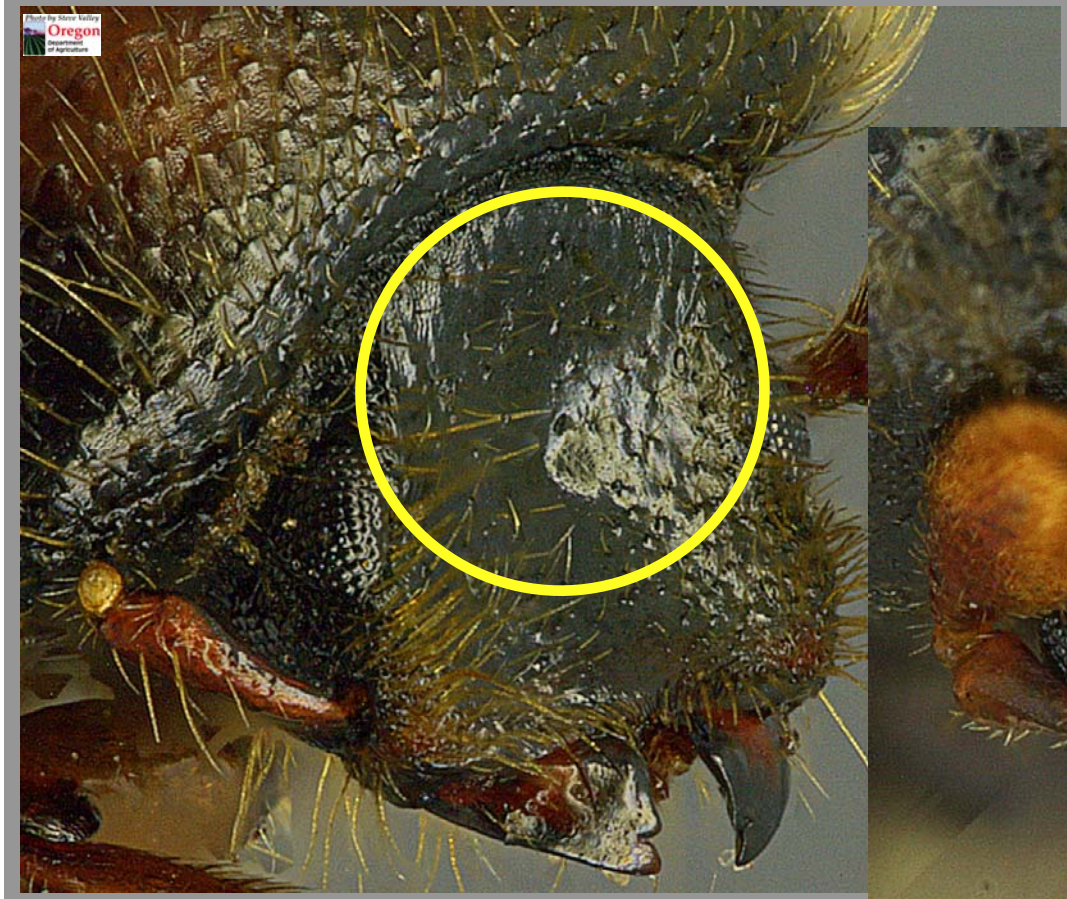
30c: Female lateral portrait.

30d: Female dorsal portrait.

31 (27)

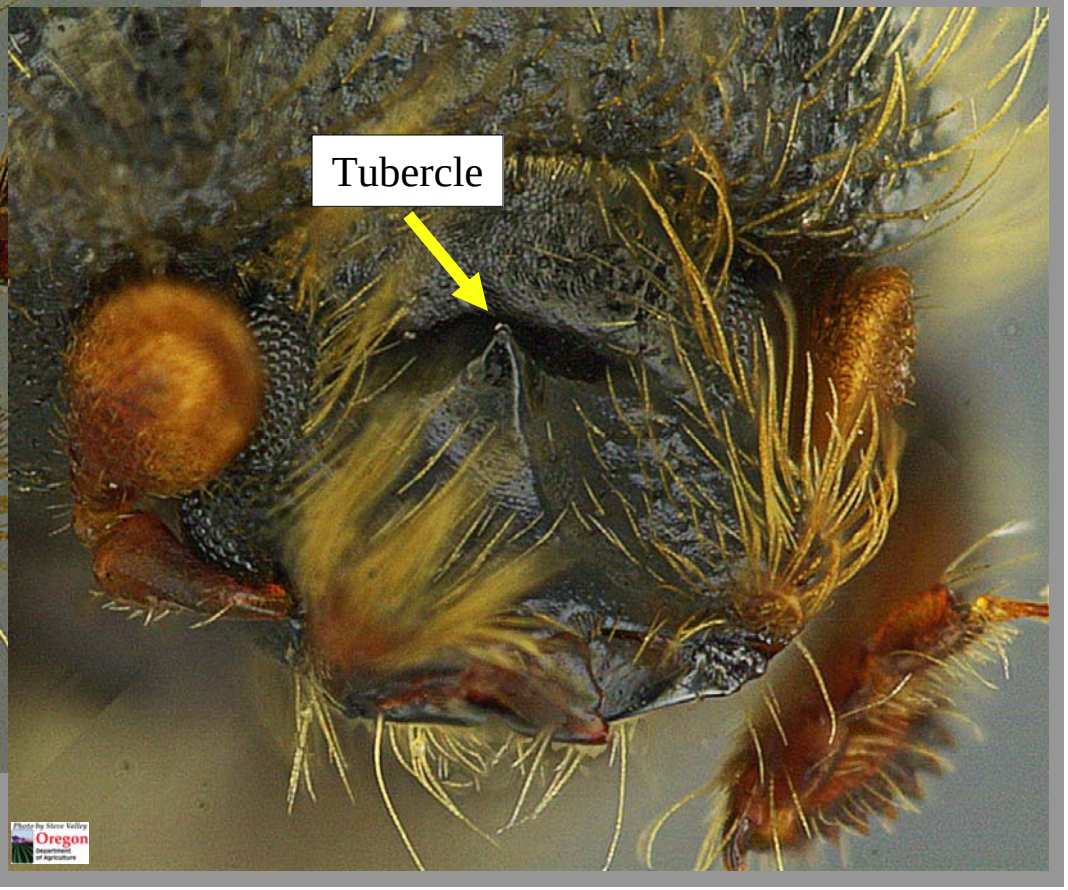
Frons of male without median tubercle (**a**)……..……..32

Frons of male with large, pointed, median tubercle between upper halves of eyes (**b**)……..…STOP



31a: Frons without tubercle.

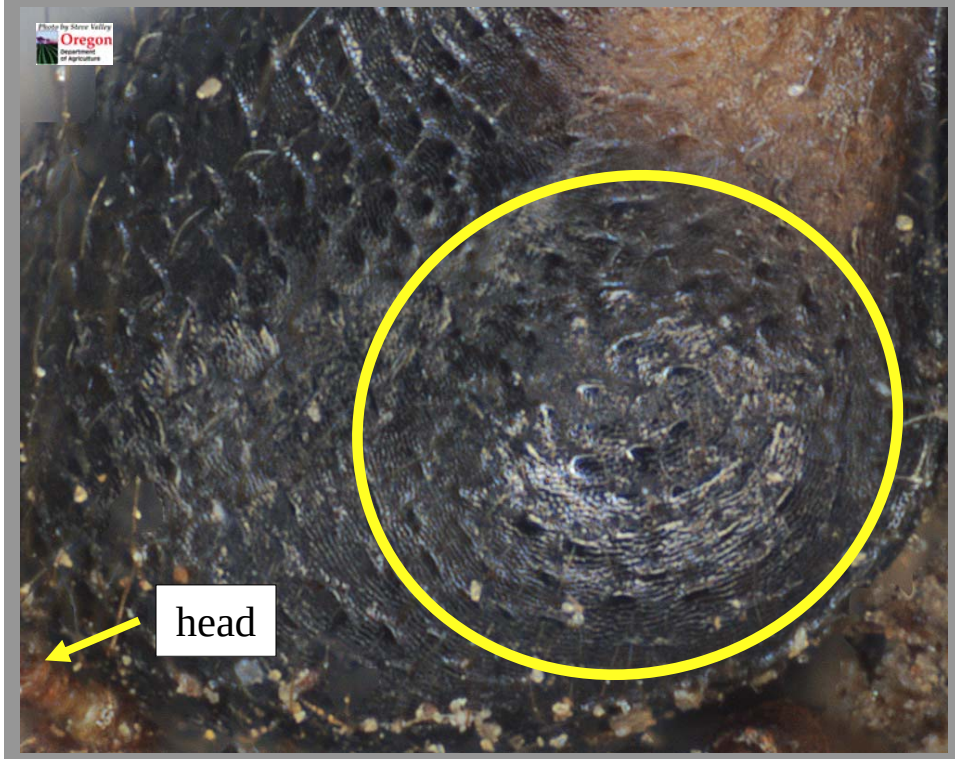
31b: Frons with tubercle.



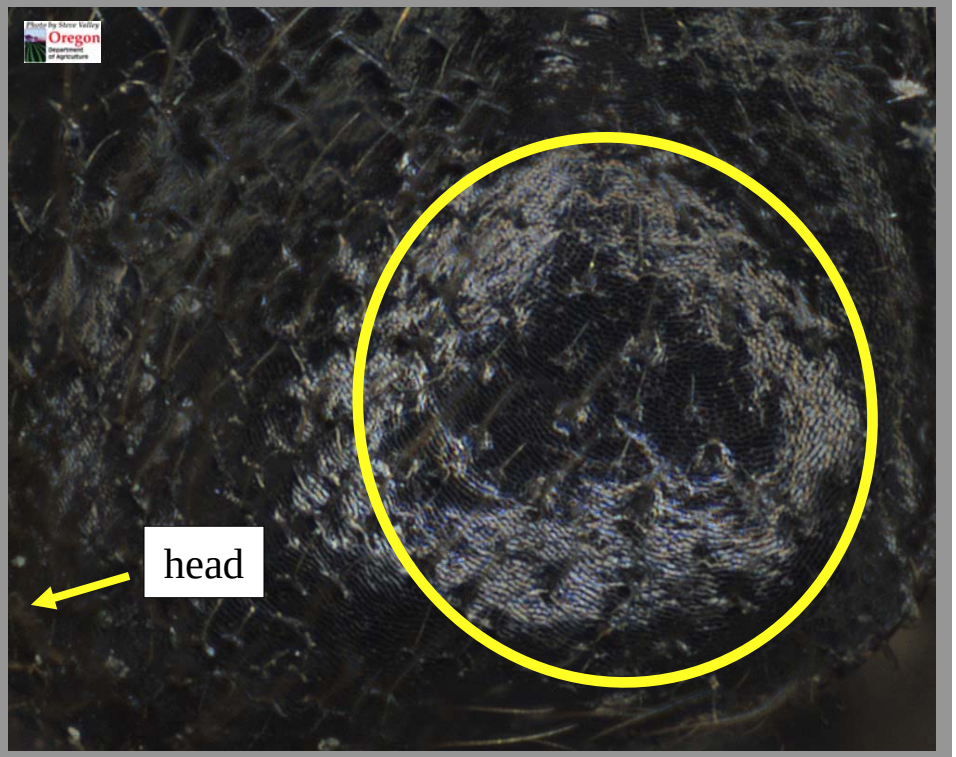
32 (31)

Posterolateral areas of pronotum with distinct asperities (**a**)……....33

Posterolateral areas of pronotum without distinct asperities (**b**).…STOP



32a: Posterolateral areas asperate.

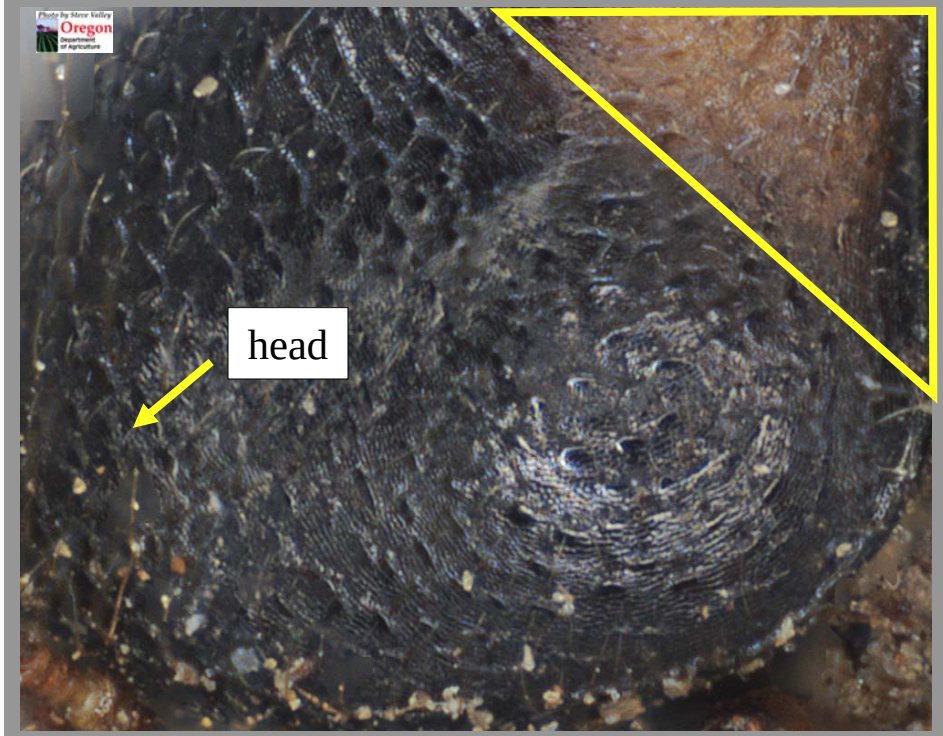


32b: Posterolateral areas not asperate.

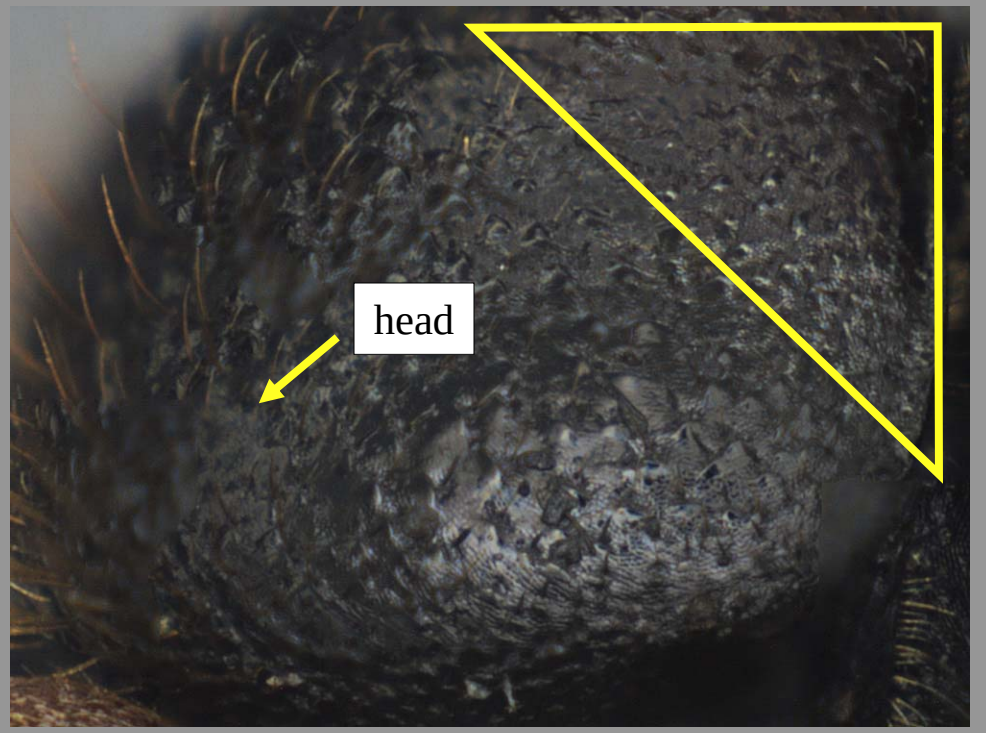
33 (32): Part I

Posterolateral areas of pronotum with sparse, shallow asperities (**a**); total length < 3.3 mm……..……....34

Posterolateral areas of pronotum with dense, coarse asperities (**b**); total length > 3.5 mm……STOP



33a: Posterolateral areas sparsely asperate.

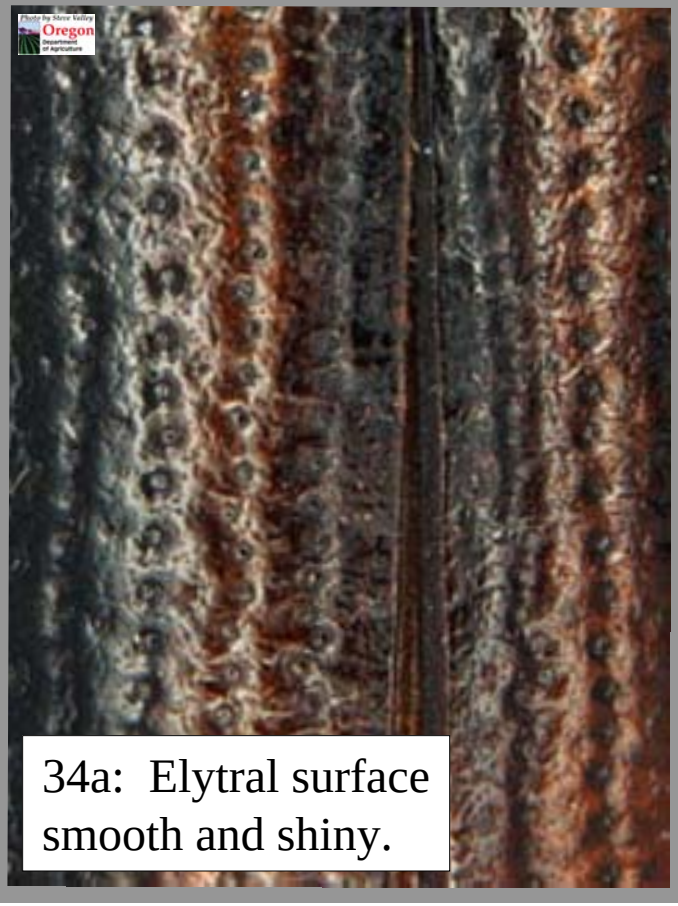


33b: Posterolateral areas densely asperate.

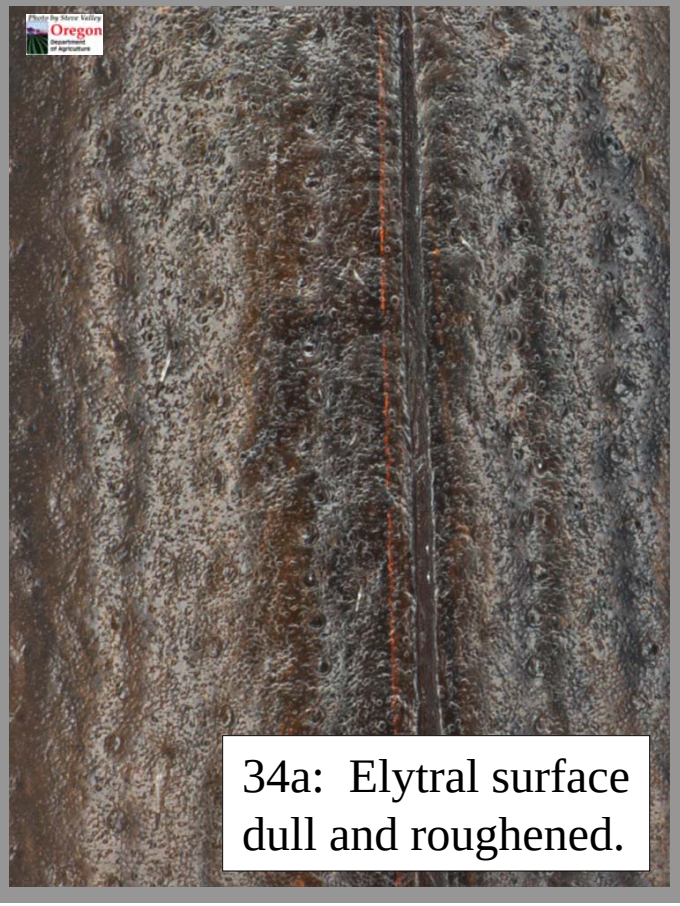
34 (33): Part I

Elytral surface smooth, shiny between rugae and punctures (**a**); elytral apex broadly rounded in dorsal view (**c**); pale markings on posterior of pronotum and elytral interstriae 2-4 and 7 with abrupt transition to dark color (**c**); portraits (**e, f**)……...*Trypodendron lineatum* (Olivier) ♎ (male)

Elytral surface rather dull and roughened between rugae and punctures (**b**); elytral apex narrowed in dorsal view (**d**); pale markings on posterior of pronotum and elytra with gradual transition to dark color (**d**)……..……....STOP



34a: Elytral surface smooth and shiny.



34a: Elytral surface dull and roughened.

34 (33): Part II

34c: Elytral apex rounded, transition from pale to dark colors abrupt.

34d: Elytral apex narrowed, transition from pale to dark colors gradual.

34 (33): Part III

Trypodendron lineatum (Olivier) ♌ (male)

34e: Male lateral portrait.

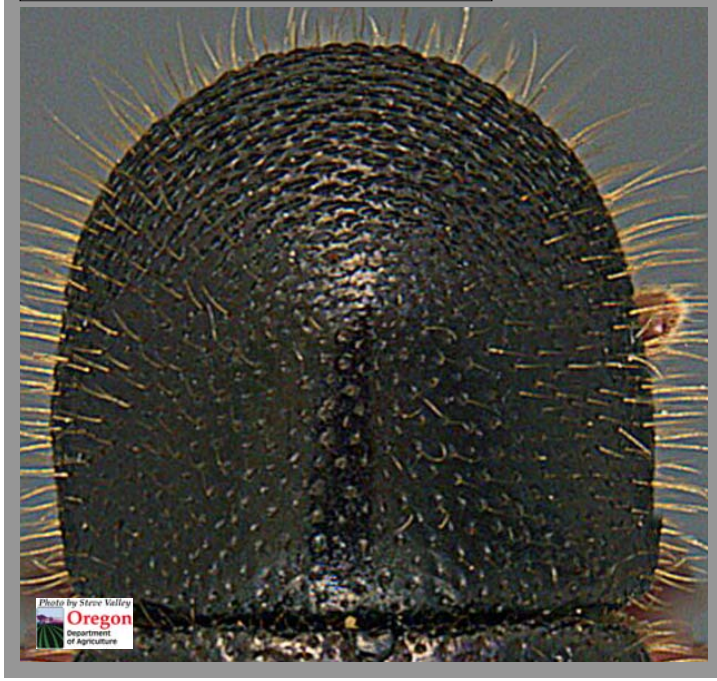
34f: Male dorsal portrait.

35 (24): Part I

Pronotum coarsely asperate and usually punctate at least on posterior third (**a**), strongly anteriorly declivous (**d**), anterior margin sometimes armed (**f**); declivity frequently armed by spines (**h-k**)..……..…….36

Pronotum either punctate (**b**) or else finely granulate (**c**) over almost entire dorsal surface, dorsal profile evenly convex, not strongly anteriorly declivous (**e**), anterior margin never armed (**g**); elytral declivity unarmed (some small granules) (**l**)……STOP

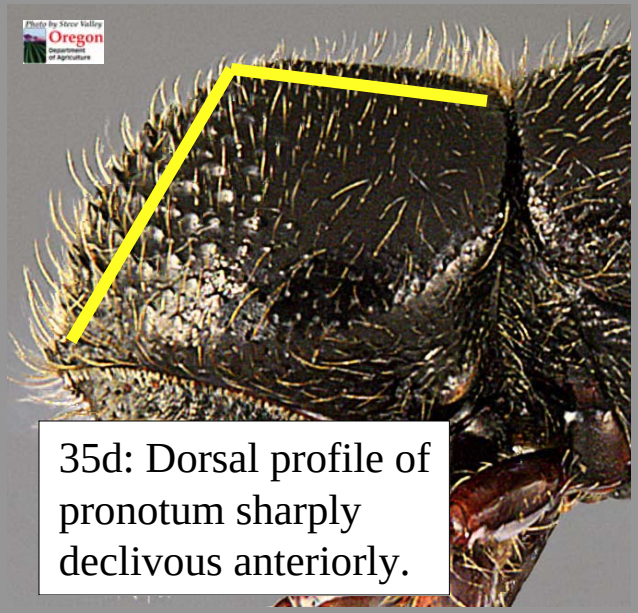
35a: Pronotum granulate AND punctate.



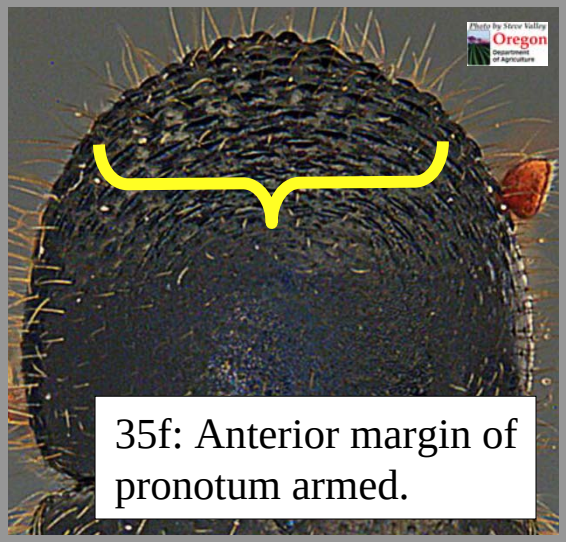
35b: Pronotum punctate.

35c: Pronotum granulate.

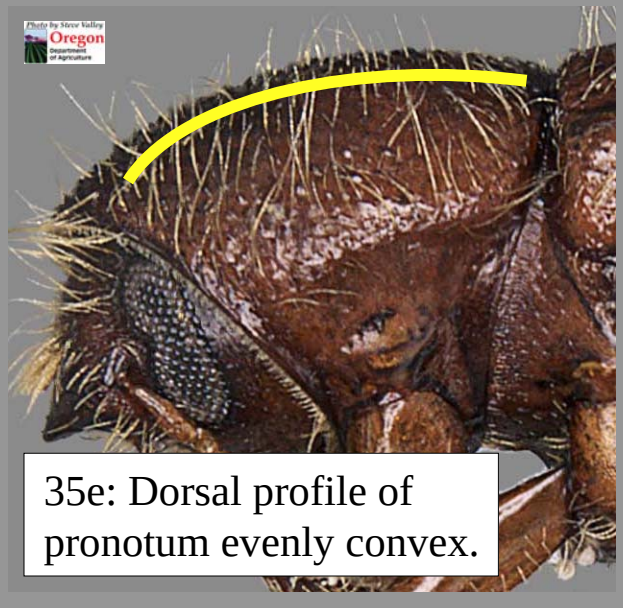
35 (24): Part II



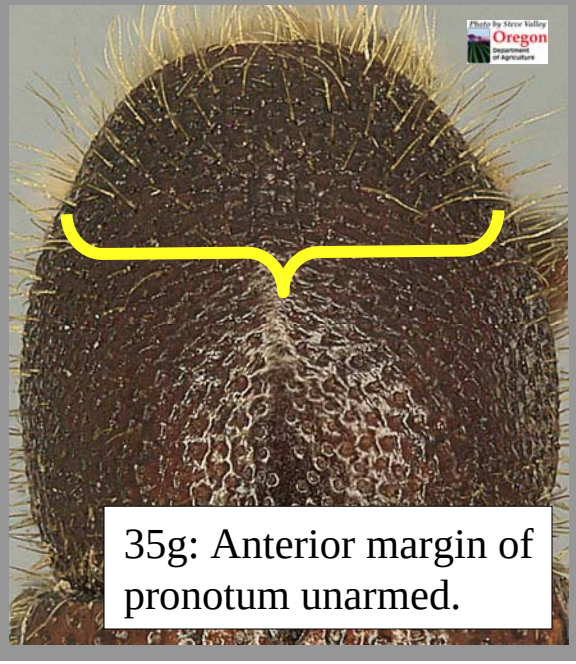
35d: Dorsal profile of pronotum sharply declivous anteriorly.



35f: Anterior margin of pronotum armed.



35e: Dorsal profile of pronotum evenly convex.



35g: Anterior margin of pronotum unarmed.

35 (24): Part III

35h-k: Elytral declivity with spines.

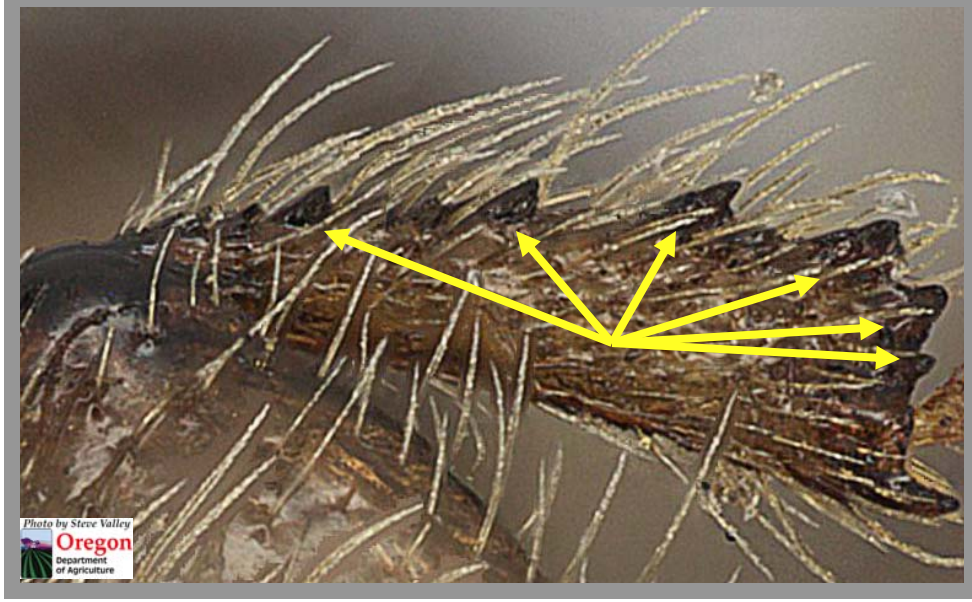
35l: Elytral declivity without spines.

36 (35): Part I

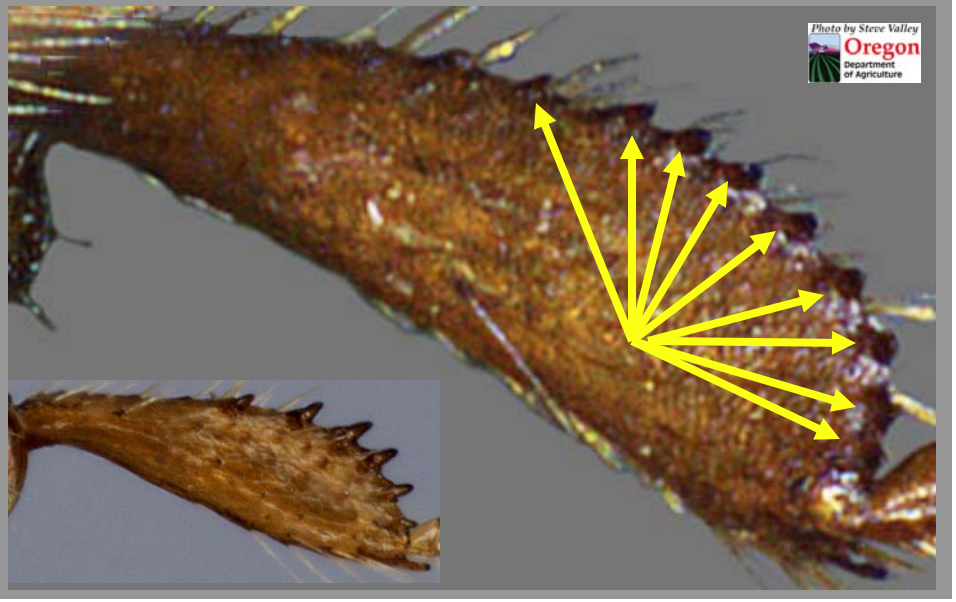
Mid- and hind tibiae rather slender, abruptly truncate apically, armed by a few rather widely spaced coarse teeth (**a**); males and females similar in size and appearance (**c, d**)……..…….37

Mid- and hind tibiae rather broadly dilated to a point slightly beyond middle then gradually narrowed to apex, armed by numerous small closely set teeth (**b**) - one species in this group has only a few large teeth - see inset in (**b**); males rarely encountered, usually smaller and radically different in appearance from females (**e, f**)…..……..…….……..57

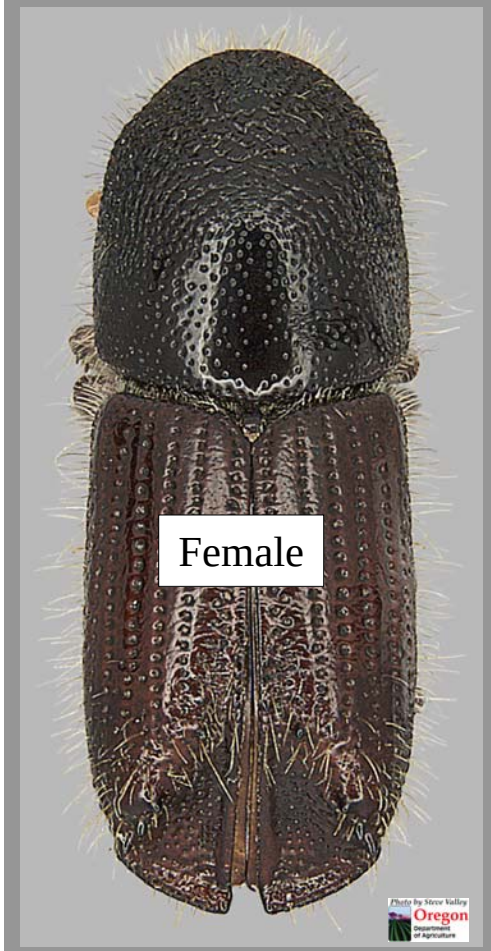
36a: Narrow tibia with few, coarse teeth.

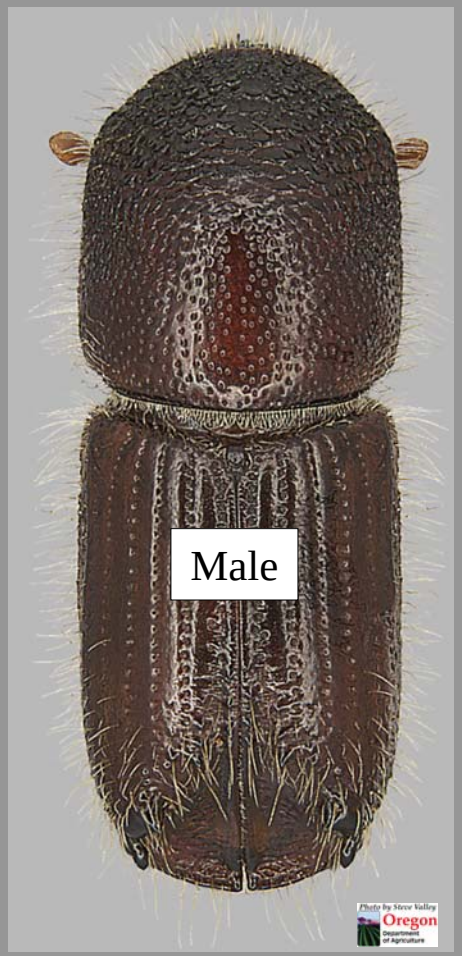


36b: Broad tibia with many, fine marginal teeth.

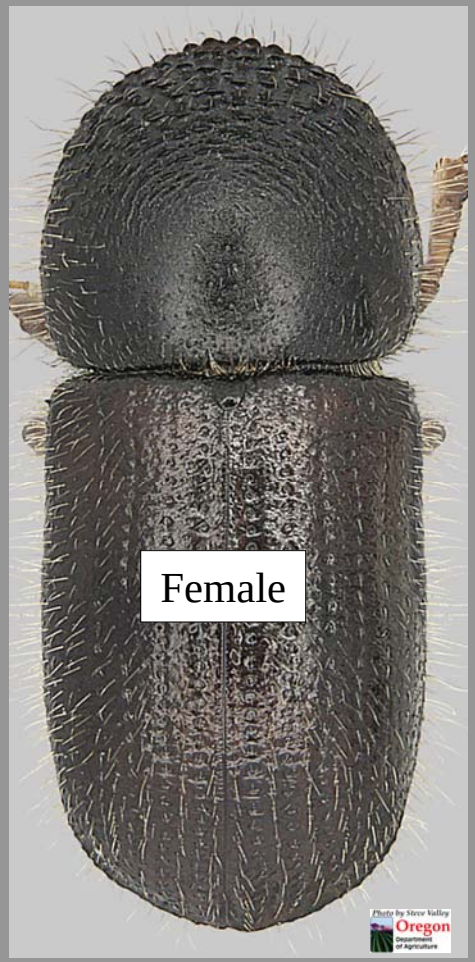


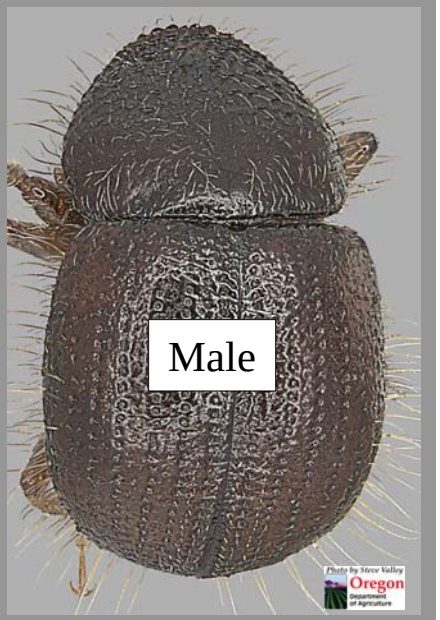
36 (35): Part II





36c,d: Females and males similar in appearance and size.



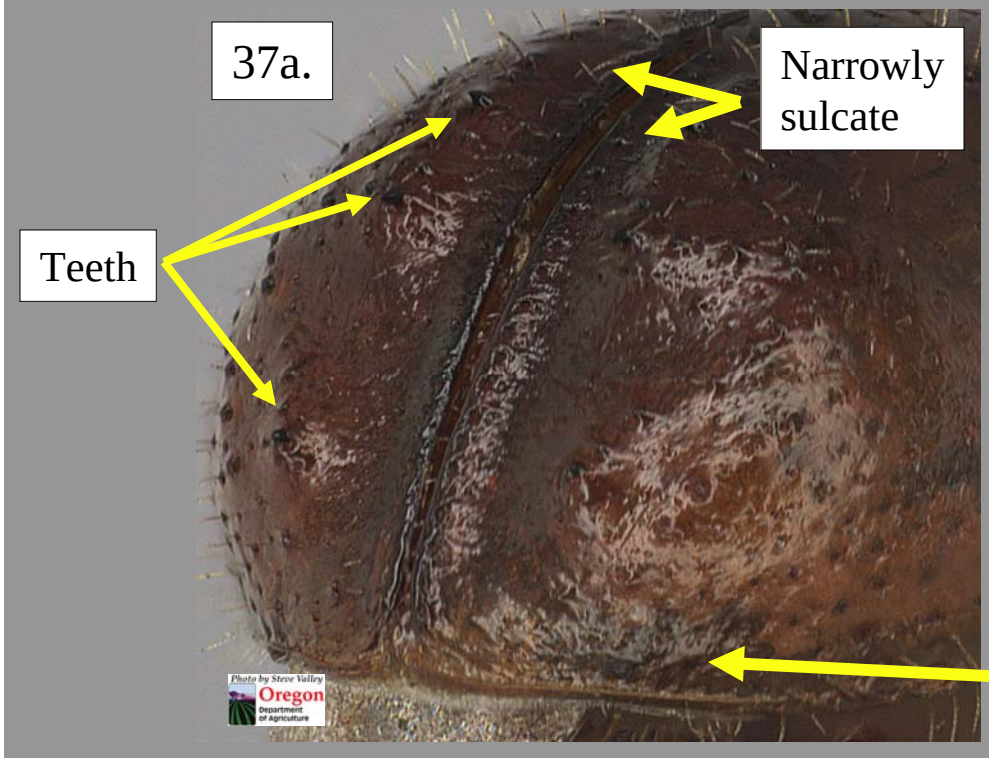


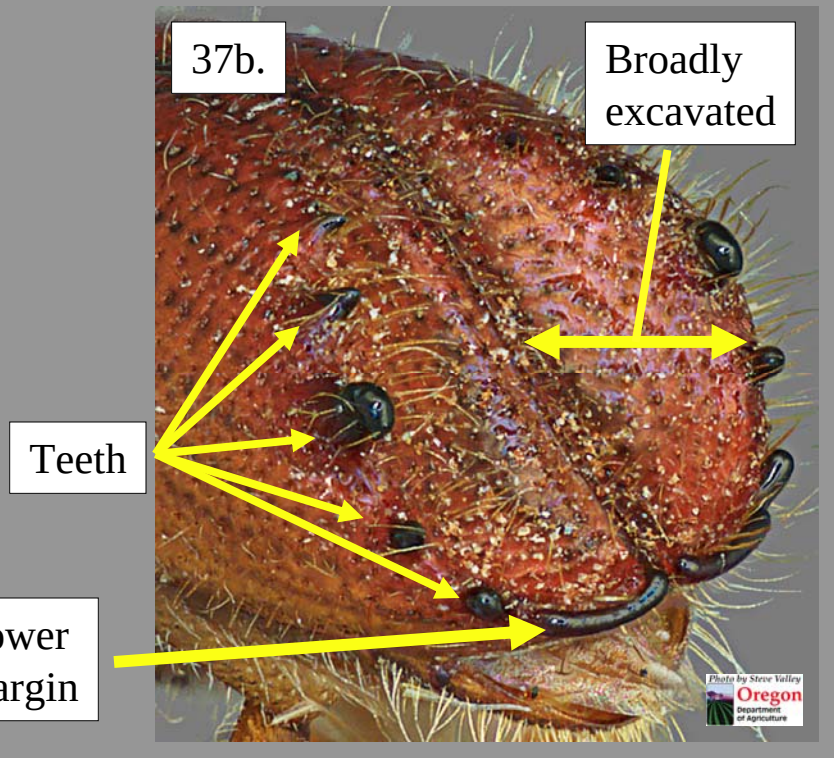
36e,f: Females and males different in appearance and size.

37 (36)

Elytral declivity rather narrowly bisulcate, margins moderately elevated, rounded, and armed by no more than 3 teeth, lower margin of declivity rounded (**a**); body usually shorter than 3.0 mm……38

Elytral declivity broadly, rather deeply excavated, margins acutely elevated and armed by 3 or more teeth, lower margin of declivity with an acutely elevated transverse ridge separating declivital excavation from apical margin (**b**); body usually longer than 3.0 mm……47

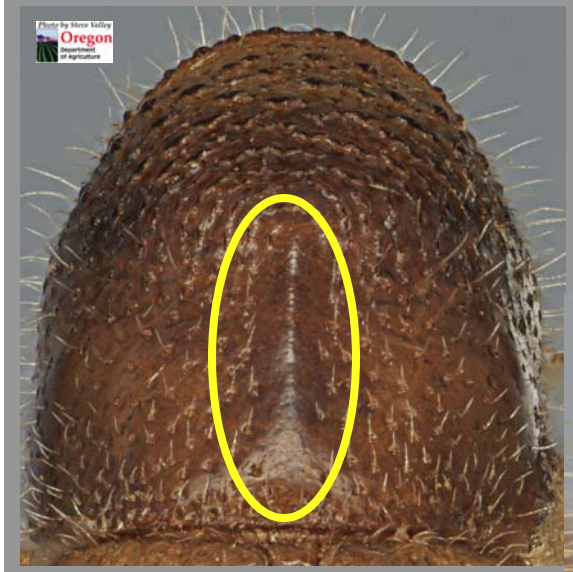




38 (37): Part I

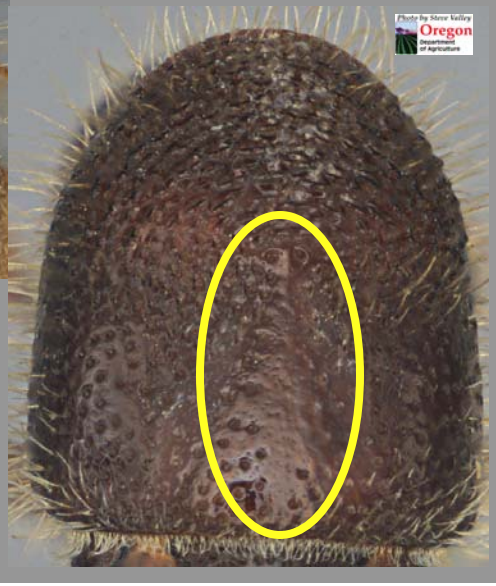
Posterior half of pronotum normally with smooth, raised, medial carina (**a**); posterior face of antennal club with 2 sutures visible (**c**); elytral surface smoother between strial punctures, strial punctures small, striae not impressed (**e**)……39

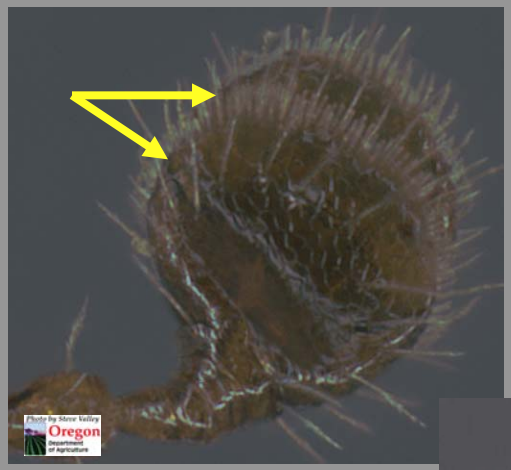
Smooth area on posterior half of pronotum normally flat, not raised and carinate (**b**); posterior face of club without sutures (**d**); elytral surface between strial punctures roughened (especially near declivity), strial punctures large, striae impressed (**f**).….STOP



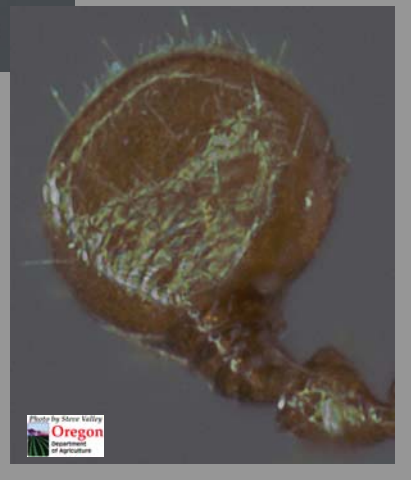
38a: Posterior half pronotum with raised carina.

38b: Posterior half pronotum without raised carina.





38c: Posterior club face with 2 sutures.



38d: Posterior club face with-out sutures.

38 (37): Part II

38e: Elytral surface between punctures smooth, punctures small, striae not impressed.

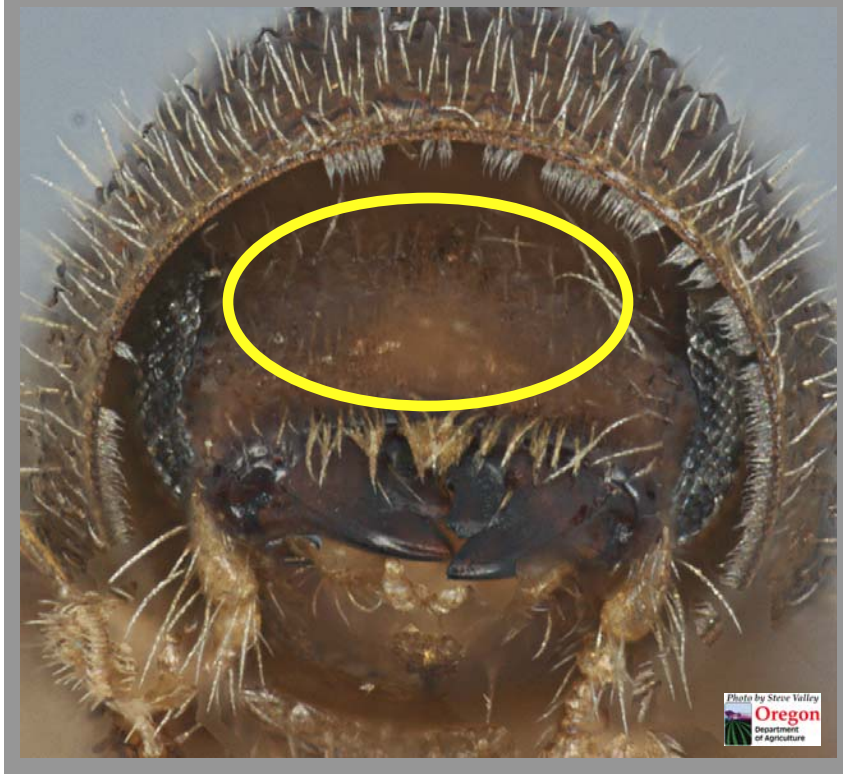
38f: Elytral surface between punctures rough, punctures large, striae impressed.

39 (38)

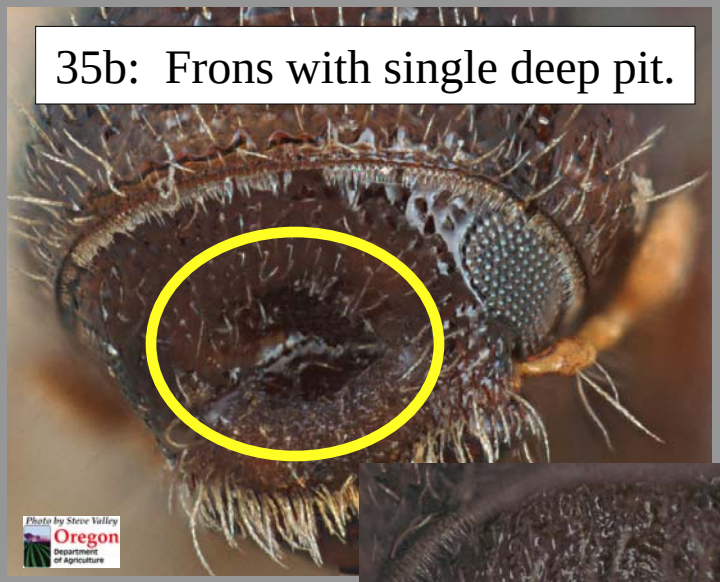
Frons without deep pits (**a**)……..…40

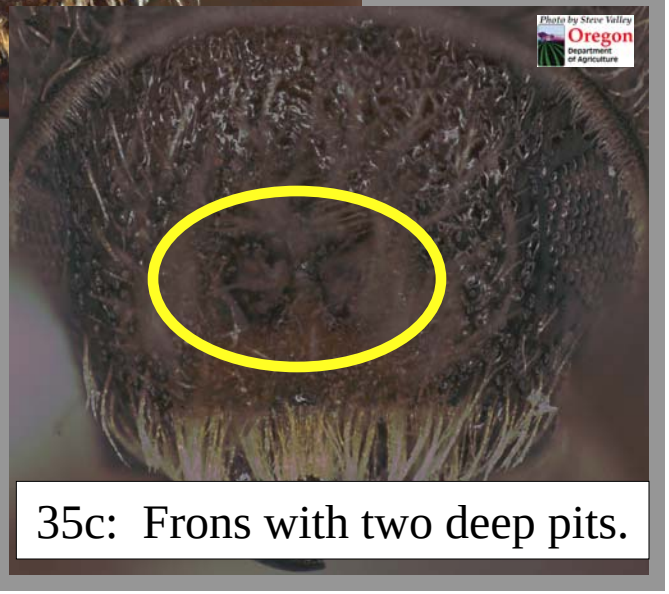
Frons with one or two deep pits (**b, c**)……..……45

35a: Frons without deep pits.



35b: Frons with single deep pit.





35c: Frons with two deep pits.

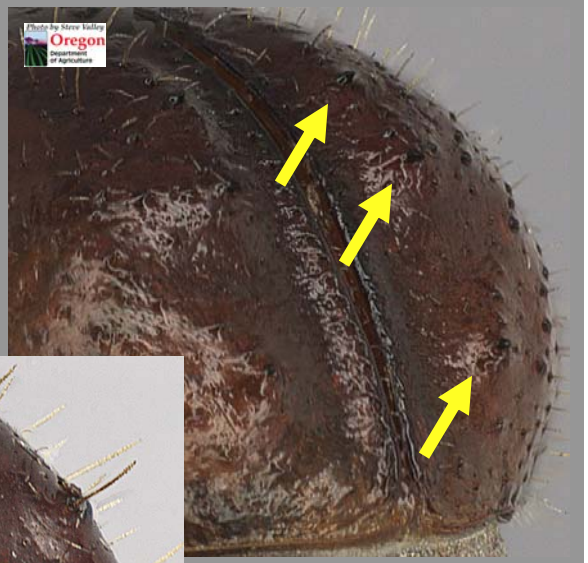
40 (39): Part I

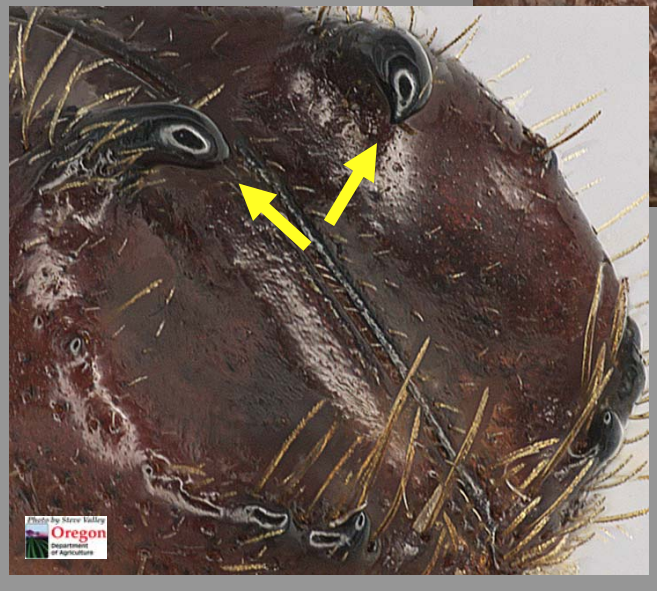
Elytral declivity without easily seen spines (**a**); portrait (**d**) ……..……*Pityogenes bidentatus* (Herbst) ☹ ♎ (female)

At least short, conical declivital spines evident (**b**), sometimes elongate and hooked (**c**)..……..41

40a: Declivital spines not evident.

40b: Short, conical spines.





40c: Long, hooked spines.

40 (39): Part II

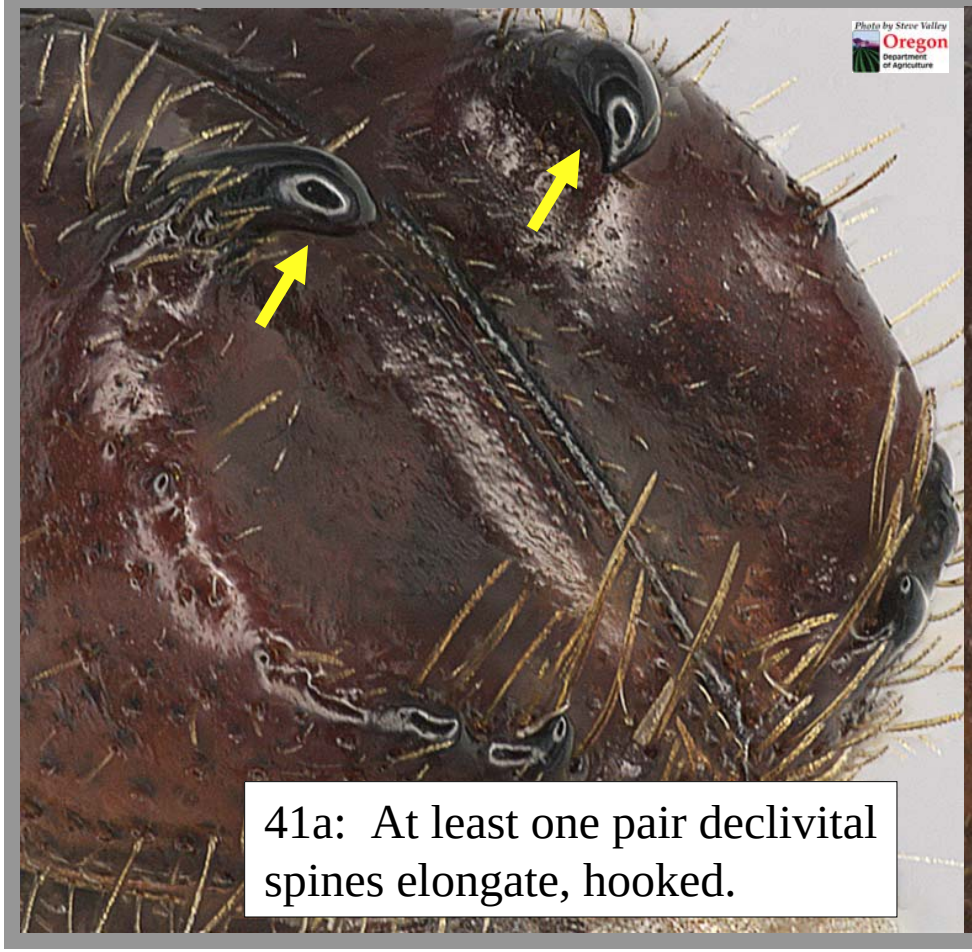
Pityogenes bidentatus (Herbst) ☹ ♎ (female)

40d.

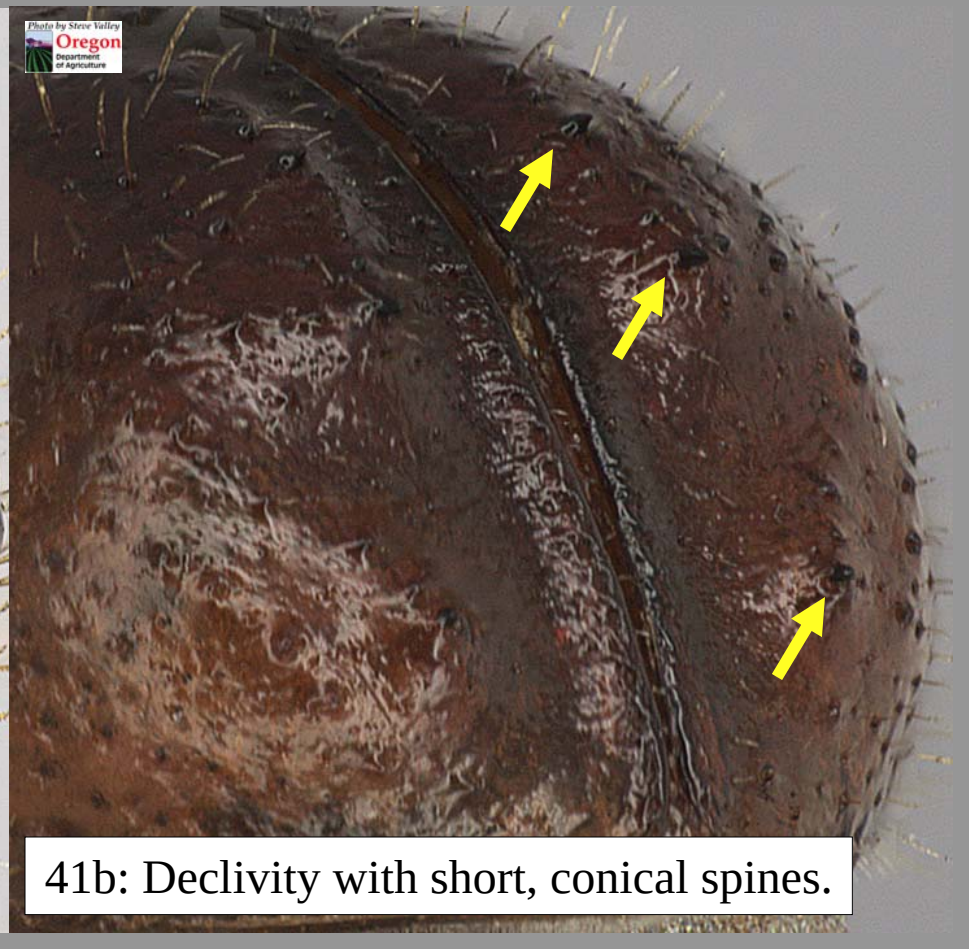
41 (40)

At least one pair of declivital spines elongate and hooked (**a**).....42

Elytral declivity with, at most, short, conical spines (**b**).....43



41a: At least one pair declivital spines elongate, hooked.



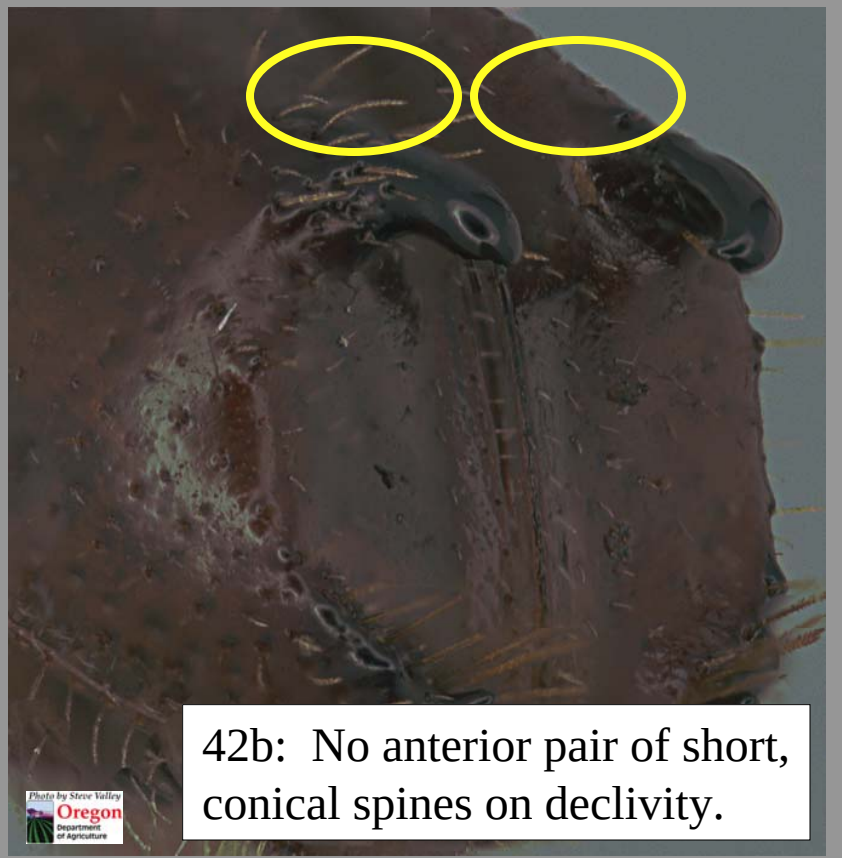
41b: Declivity with short, conical spines.

42 (41): Part I

Short, sharply conical pair of spines anterior to the pair of large, elongate, hooked spines on elytral declivity (**a**); portrait (**c**)…..
……..…*Pityogenes bidentatus* (Herbst) ☹ ♎ (male)

No conical pair of spines anterior to the pair of large, elongate, hooked spines on elytral declivity (**b**)……..…STOP

42a: Anterior pair of short, conical spines on declivity.



42b: No anterior pair of short, conical spines on declivity.

42 (41): Part II

Pityogenes bidentatus (Herbst) ☹ ♎

(male)

42c.

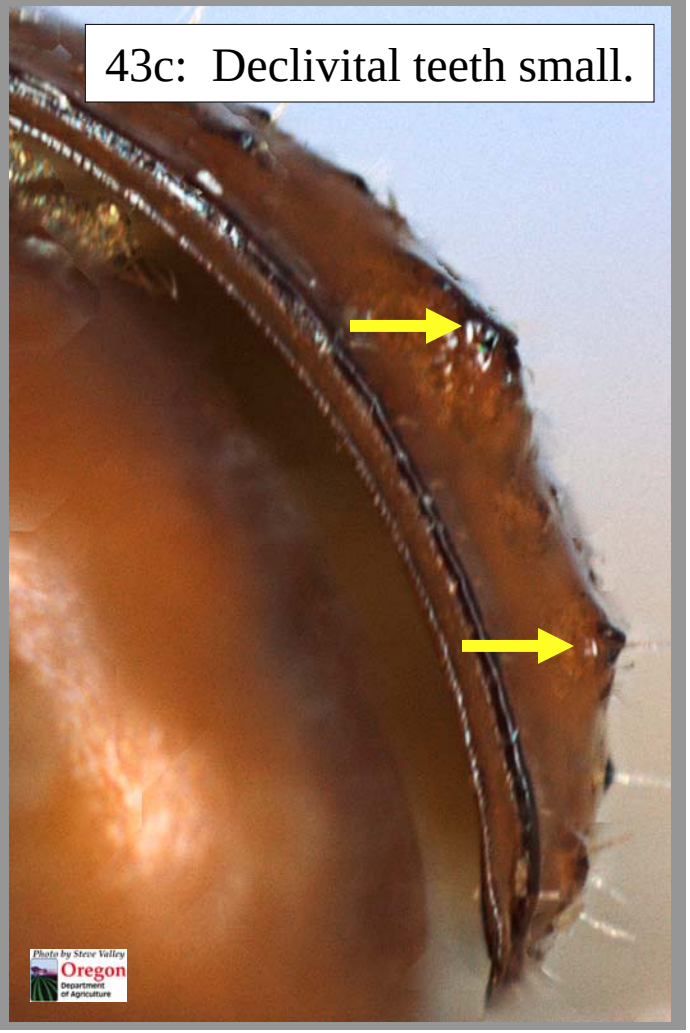
43 (41)

Teeth on elytral declivity large, conspicuous (**a, b**)……..44

Teeth on elytral declivity very small, inconspicuous (**c**)……STOP

43a, b: Declivital teeth large.

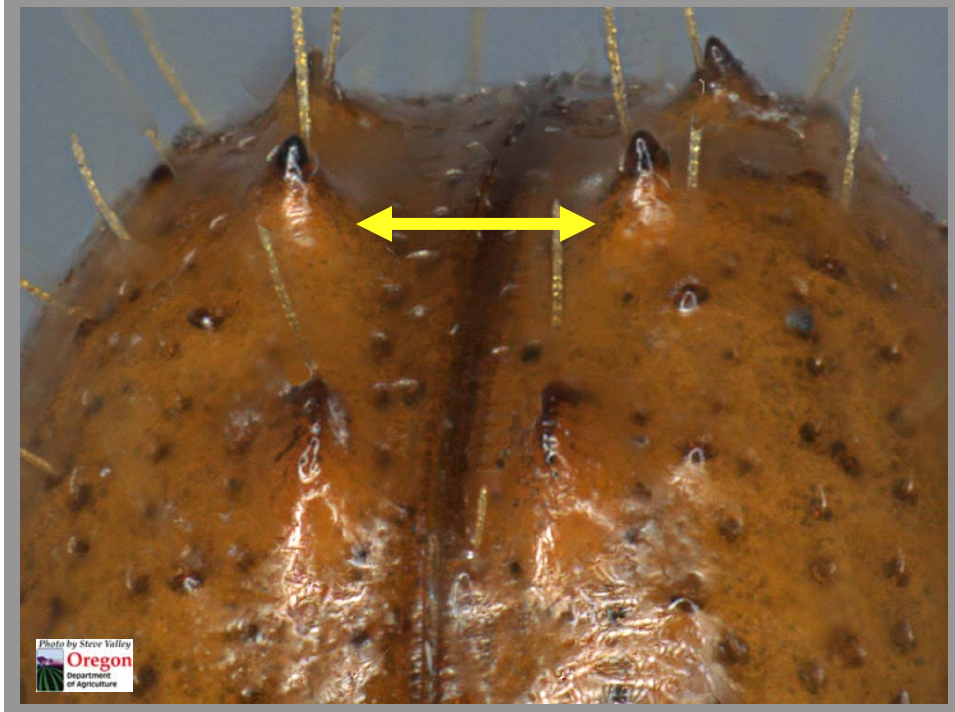
43c: Declivital teeth small.



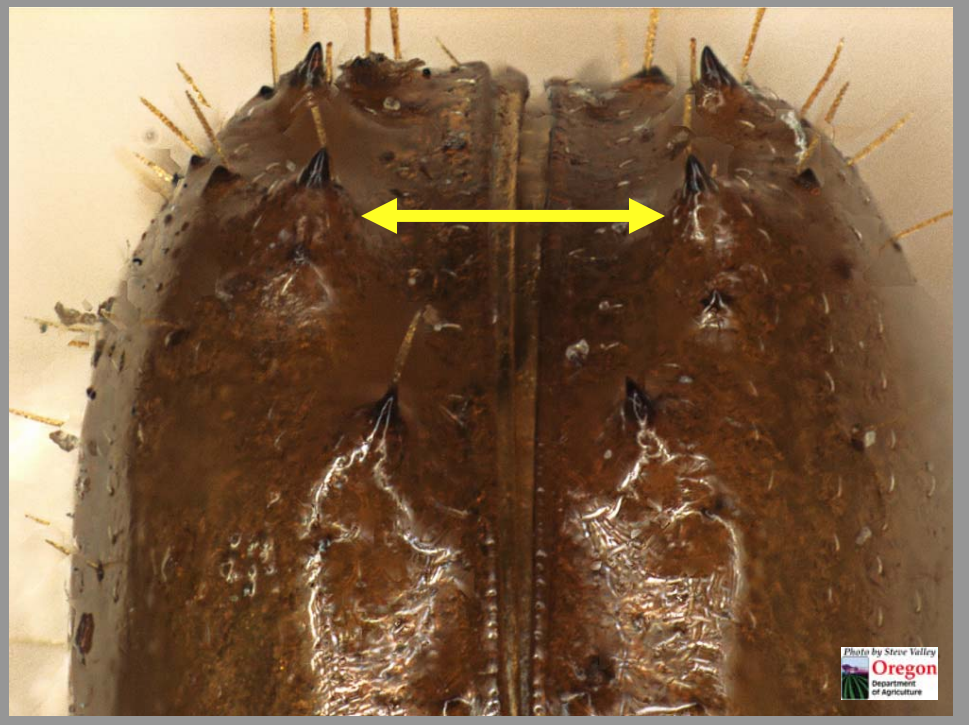
44 (43): Part I

Elytral declivity narrowly excavated (**a**); portrait (**c**)……
……*Pityogenes hopkinsi* Swaine ♎ (male)

Elytral declivity broadly excavated (**b**); portrait (**d**)…….
…….……..…..*Pityogenes chalcographus* (Linnaeus) ☹ (male)



44a: Elytral declivity narrowly excavated.



44b: Elytral declivity broadly excavated.

44 (43): Part II

Pityogenes hopkinsi Swaine ♎

(male)

44c.

44 (43): Part III

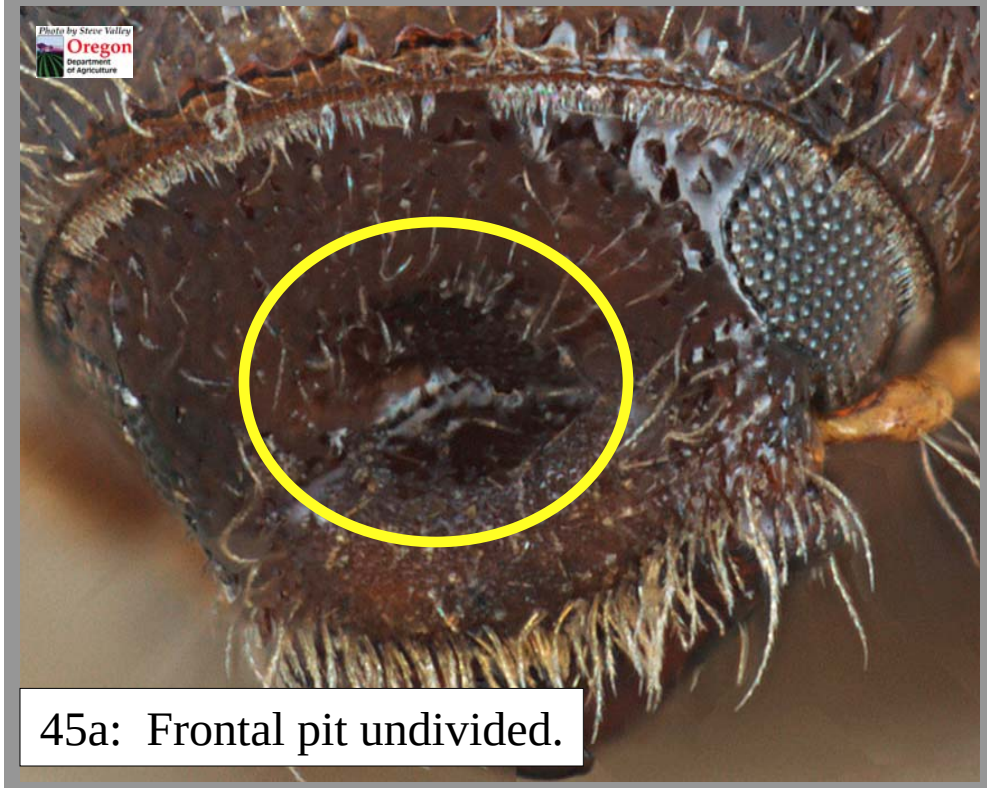
Pityogenes chalcographus (Linnaeus) ☹ (male)

44d.

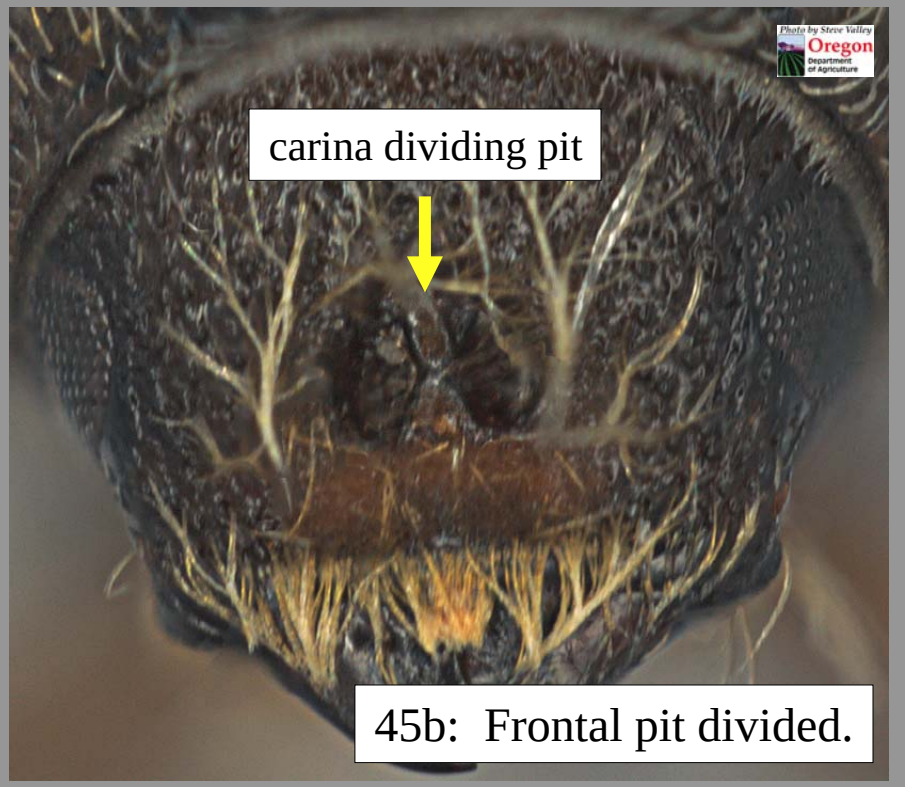
45 (39): Part I

Pit on frons undivided (**a**); distance between elytral declivital spines 1 and 2 about equal that of distance between spines 2 and 3 (**d**)……..46

Pit on frons divided by carina (**b**); distance between elytral declivital spines 1 and 2 about half that of distance between spines 2 and 3 (**d**)……..STOP

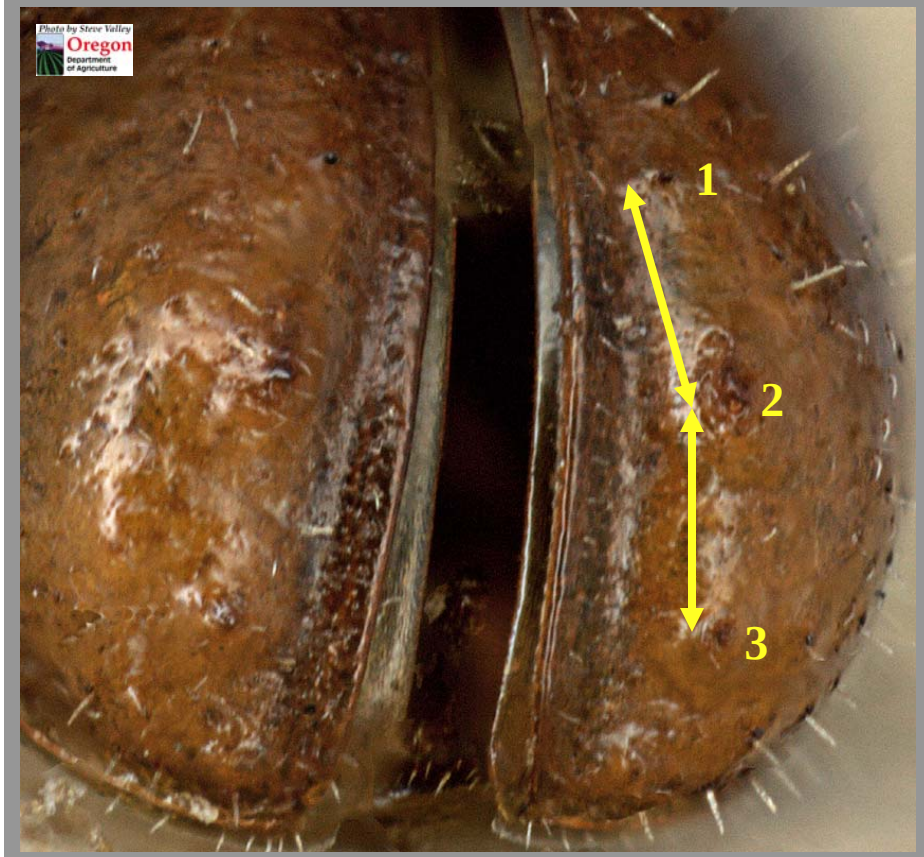


45a: Frontal pit undivided.



45b: Frontal pit divided.

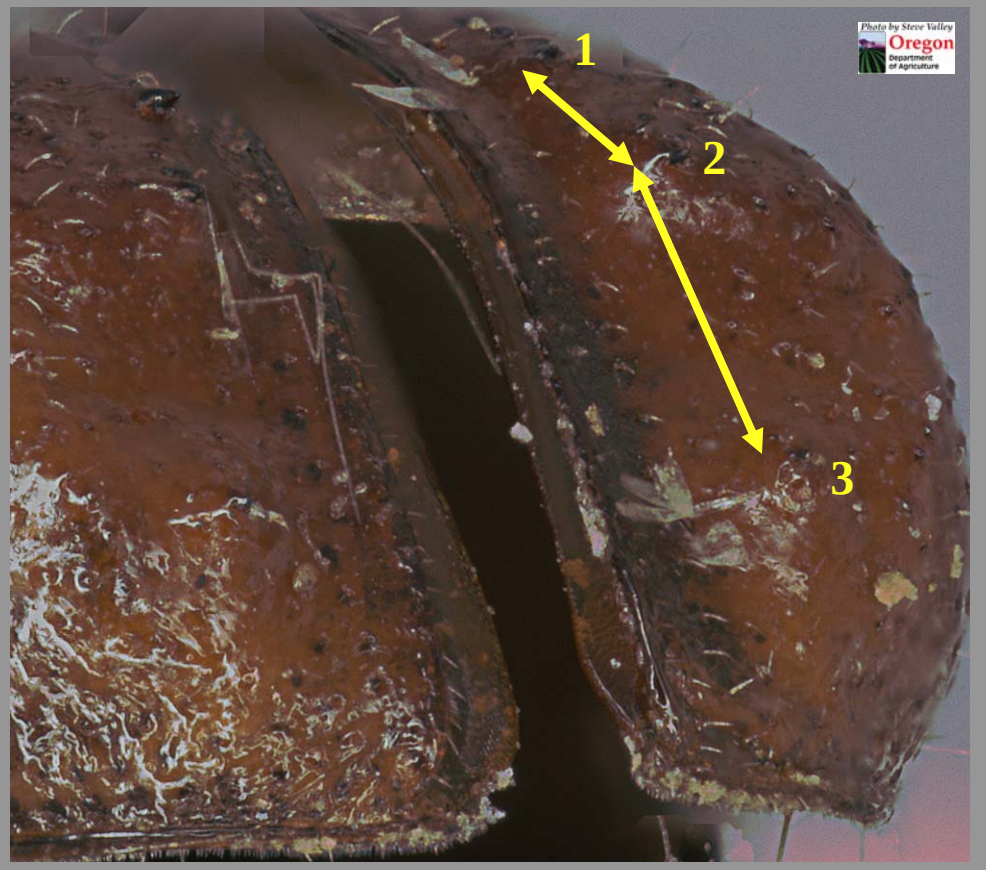
45 (39): Part II



45c: Distance between declivital spines 1 and 2 about equal to distance between spines 2 and 3.

***Numbers denote spine pairs.**

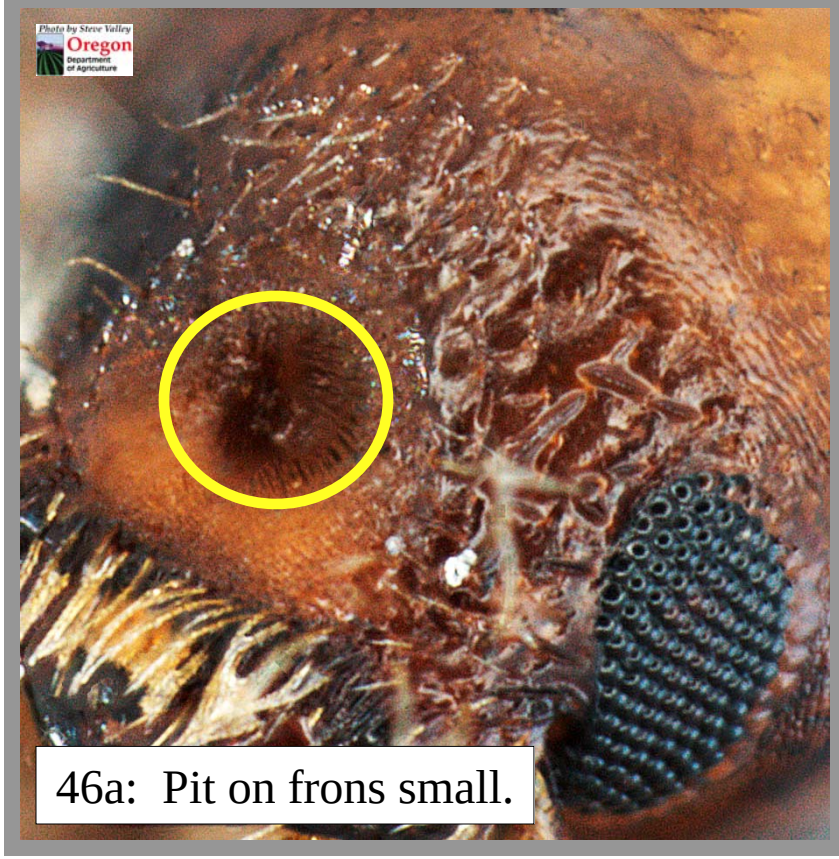
45d: Distance between declivital spines 1 and 2 about half of distance between spines 2 and 3 .



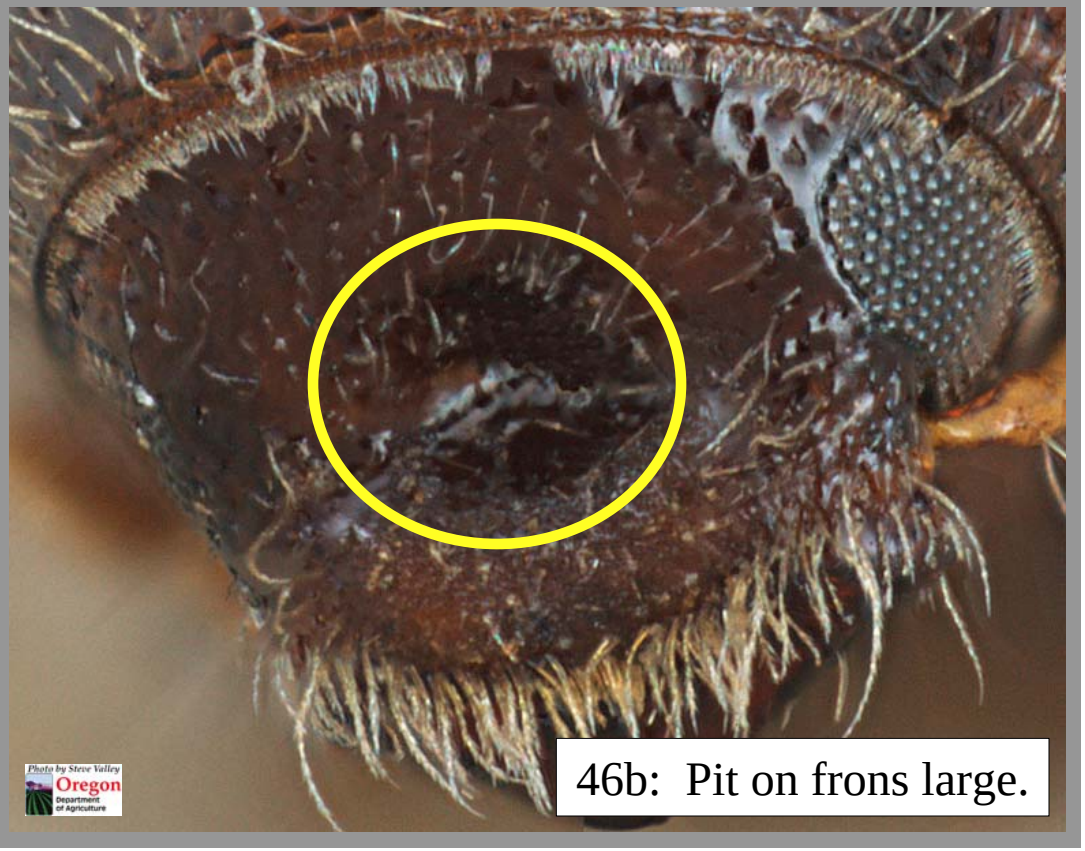
46 (45): Part I

Pit on frons smaller, occupying about 1/3 total area of frons (**a**); portrait (**c**)……..... *Pityogenes hopkinsi* Swaine ♎ (female)

Pit on frons large, occupying most of frons and extending up to upper margin of eyes (**b**); portrait (**d**)…….
…….*Pityogenes chalcographus* (Linnaeus) ☹ (female)



46a: Pit on frons small.



46b: Pit on frons large.

46 (45): Part II

Pityogenes hopkinsi Swaine ♎

(female)

46c.

46 (45): Part III

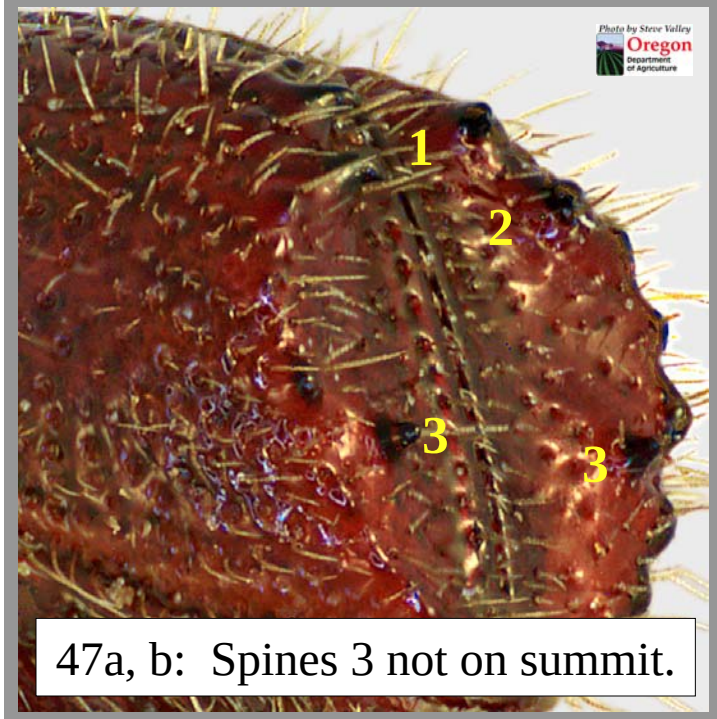
Pityogenes chalcographus (Linnaeus) ☹ (female)

46d.

47 (37)

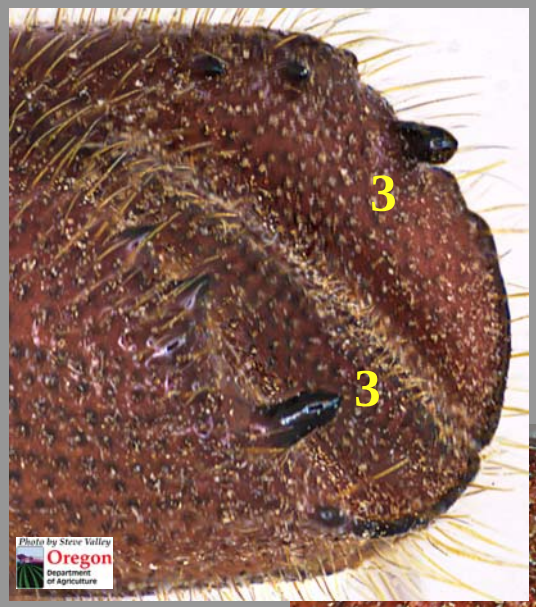
Elytral declivity with 3 (**a**) or 4 pairs spines (**b**), 3rd pair of spines displaced mesally, not on summit of declivital margin (**a, b**)……..….48

Elytral declivity with 3-6 major spines, all spines on summit of lateral margin (**c, d**)……..……....49

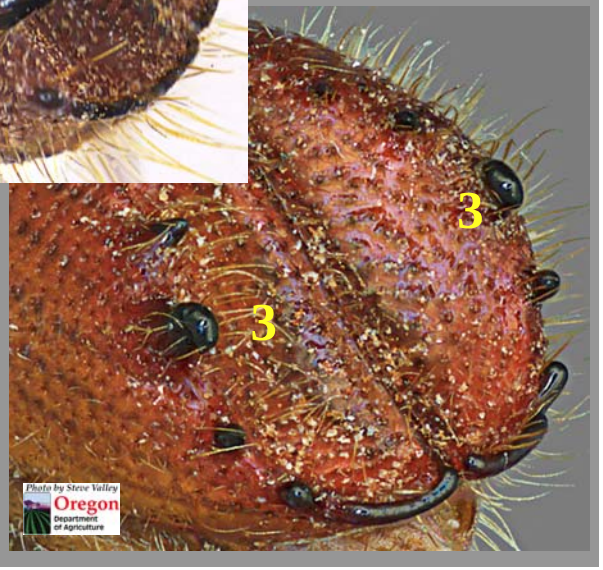


47a, b: Spines 3 not on summit.

***Numbers denote spine pairs**



47c, d: Spines 3 on summit.



48 (47): Part I

Antennal club sutures recurved (**a**); elytral declivity narrowly excavate (**c, e**); male elytral declivity with 3 pairs of spines, spine 2 not lobate (**c**); female with lower declivital carinate margin not reaching bottom pair of spines, spines 1 and 2 almost touching (2 & 3 at least twice distance between 1 and 2) (**e, f**); portraits (**i, j**)……..…..…*Orthotomicus caelatus* (Eichoff) ♎ ☼

Antennal club sutures procurved (**b**); elytral declivity broadly excavate (**d, f**); male elytral declivity with 4 pairs of spines, spine 2 lobate (**d**); female with lower declivital carinate margin about at level of spines 3, spines 1 and 2 distant (about as distant as 2 & 3) (**g, h**); portraits (**k, l**)…….
……..…*Orthotomicus erosus* (Wollaston) ☹

48a: Antennal club sutures recurved.

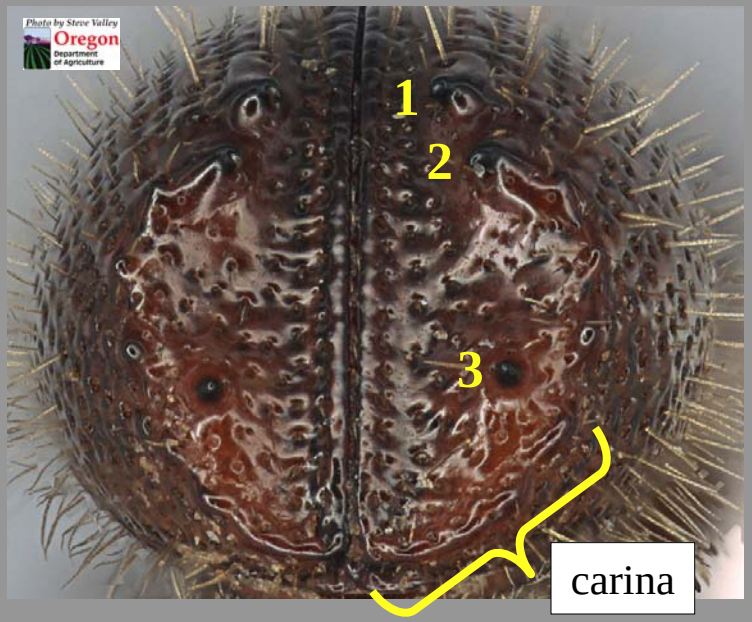
48b: Antennal club sutures procurved.

48 (47): Part II

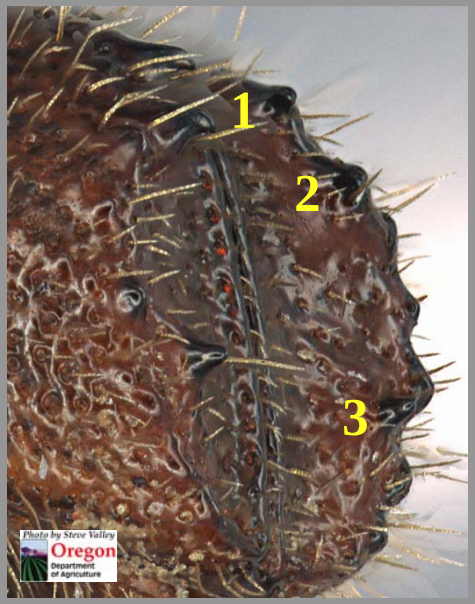
48c: Male declivity with 3 pair spines, spine 2 not lobate.

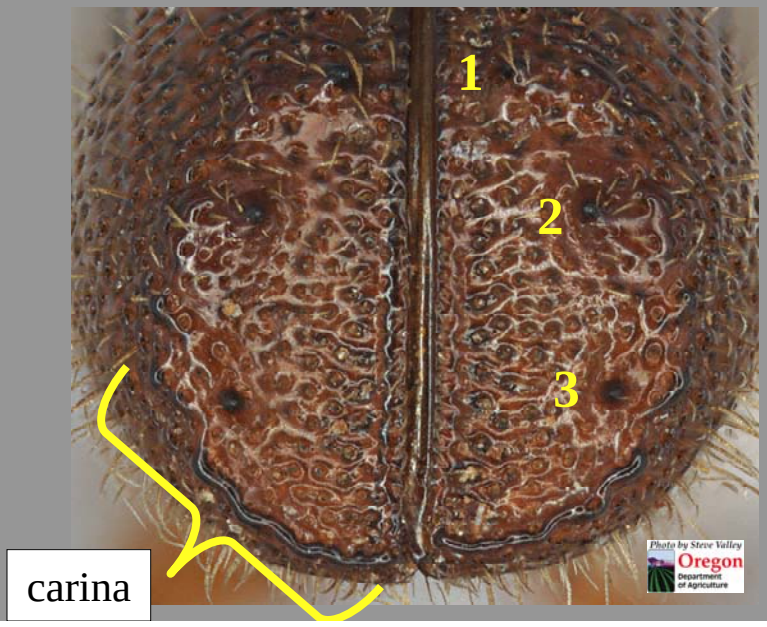
48d: Male declivity with 4 pair spines, spine 2 lobate.

48 (47): Part III

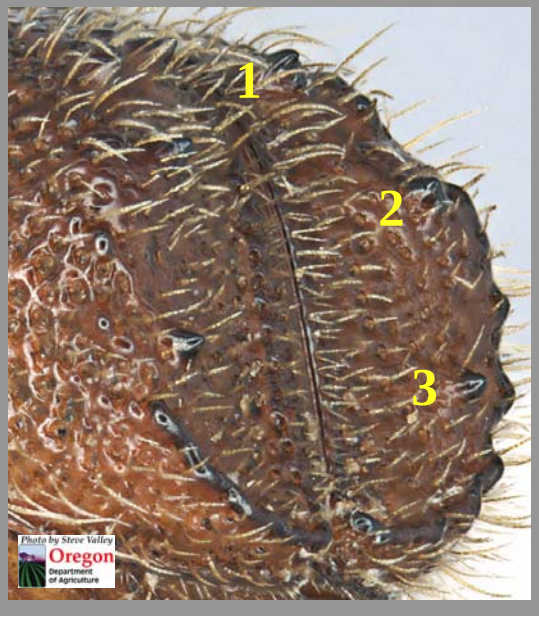


48e, f: Female carina not reaching bottom pair of spines, spines 1 & 2 closer together.





48g, h: Female carina extending beyond bottom pair of spines, spines 1 & 2 distant from each other.



48 (47): Part IV

Orthotomicus caelatus (Eichoff) ♎ ☼

43i. Female.

43j. Male.

48 (47): Part IV

Orthotomicus erosus (Wollaston) ☹

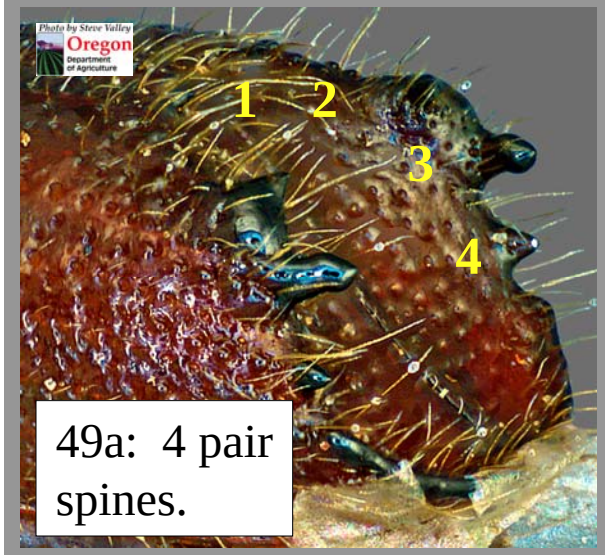
43k: Female.

43l: Male.

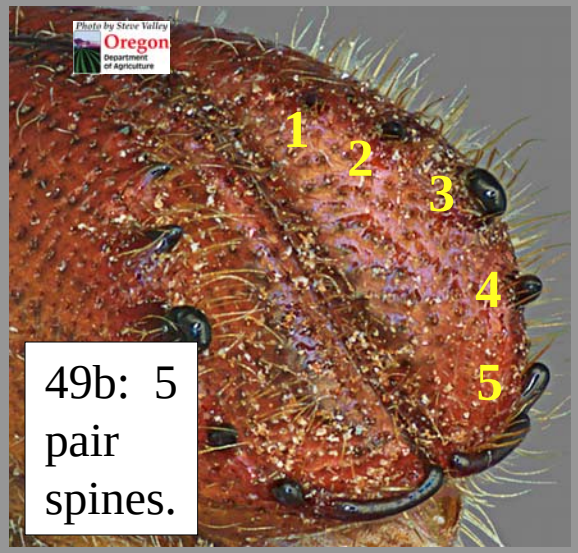
49 (47)

Lateral margins of elytral declivity with 4-6 pairs of spines (**a-c**)……50

Lateral margins of elytral declivity with 3 pairs of spines (**d**)……STOP

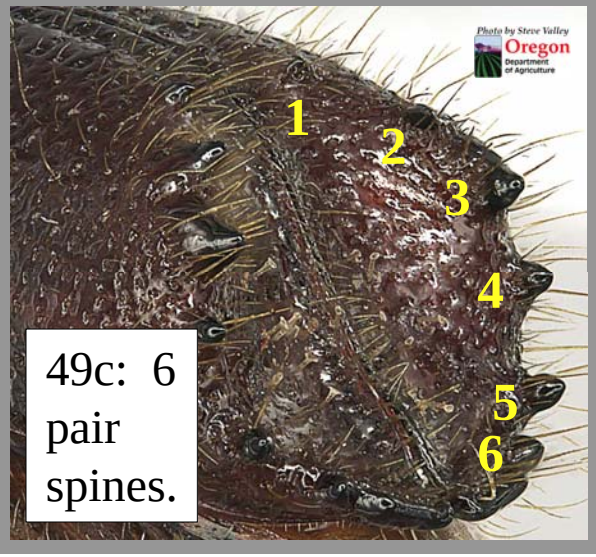


49a: 4 pair spines.

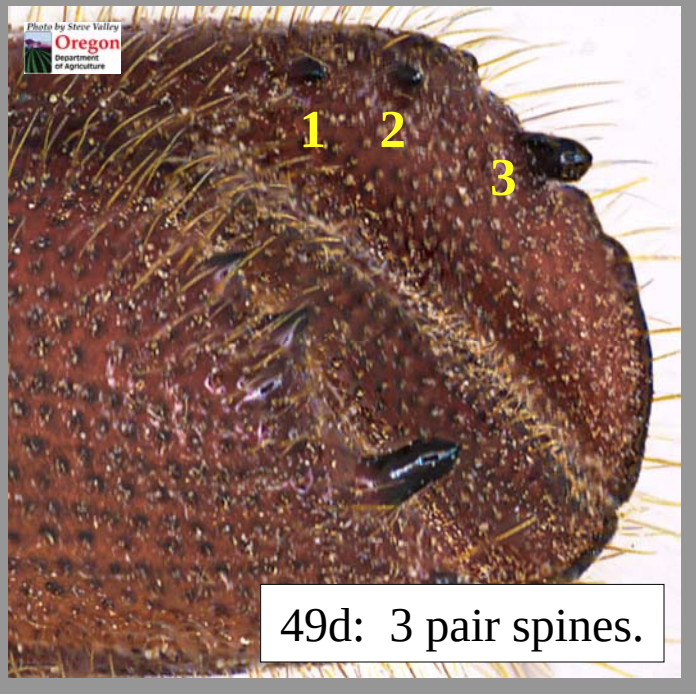


49b: 5 pair spines.

***Numbers denote spine pairs**



49c: 6 pair spines.

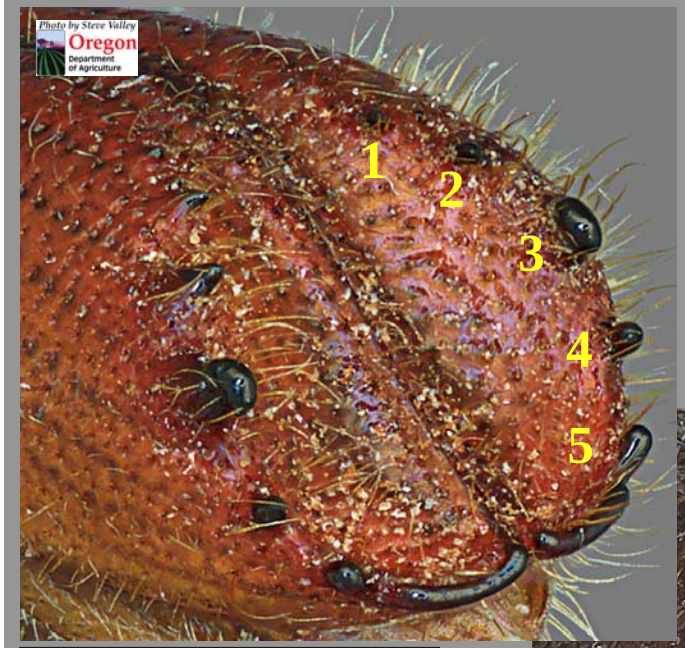


49d: 3 pair spines.

50 (49)

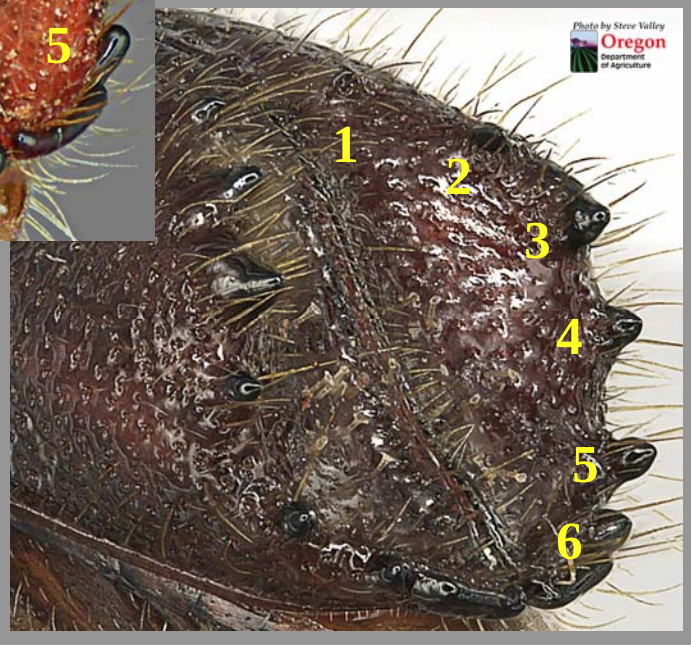
Lateral margins of elytral declivity with 5 (**a**) or 6 (**b**) pairs of spines……51

Lateral margins of elytral declivity with 4 pairs of spines (**c**)……53

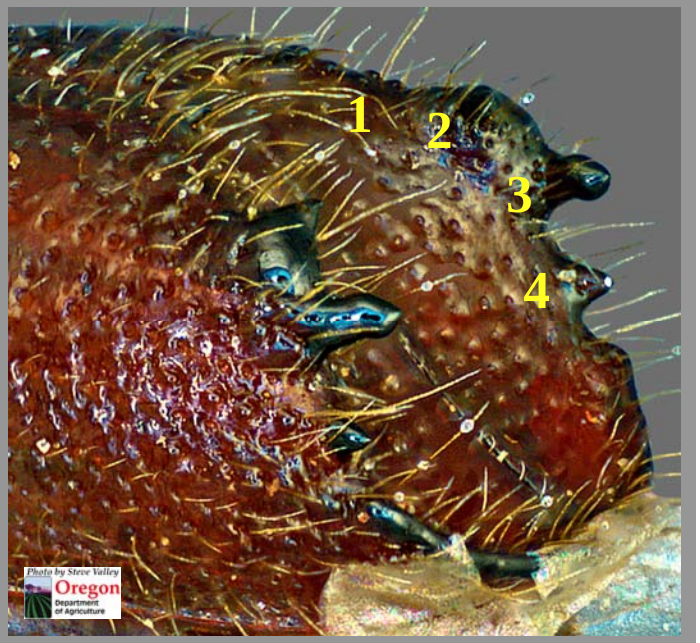


50a: 5 pairs spines.

***Numbers denote spine pairs**



50b: 6 pairs spines.



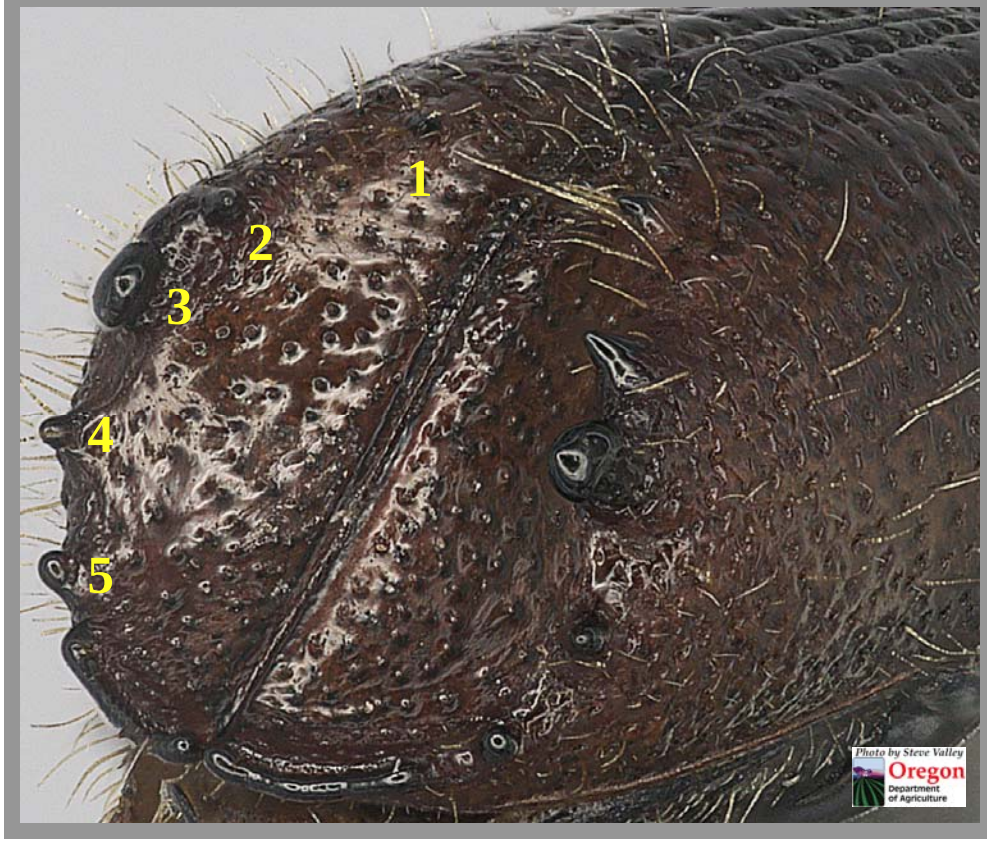
50c: 4 pairs spines.

51 (50): Part I

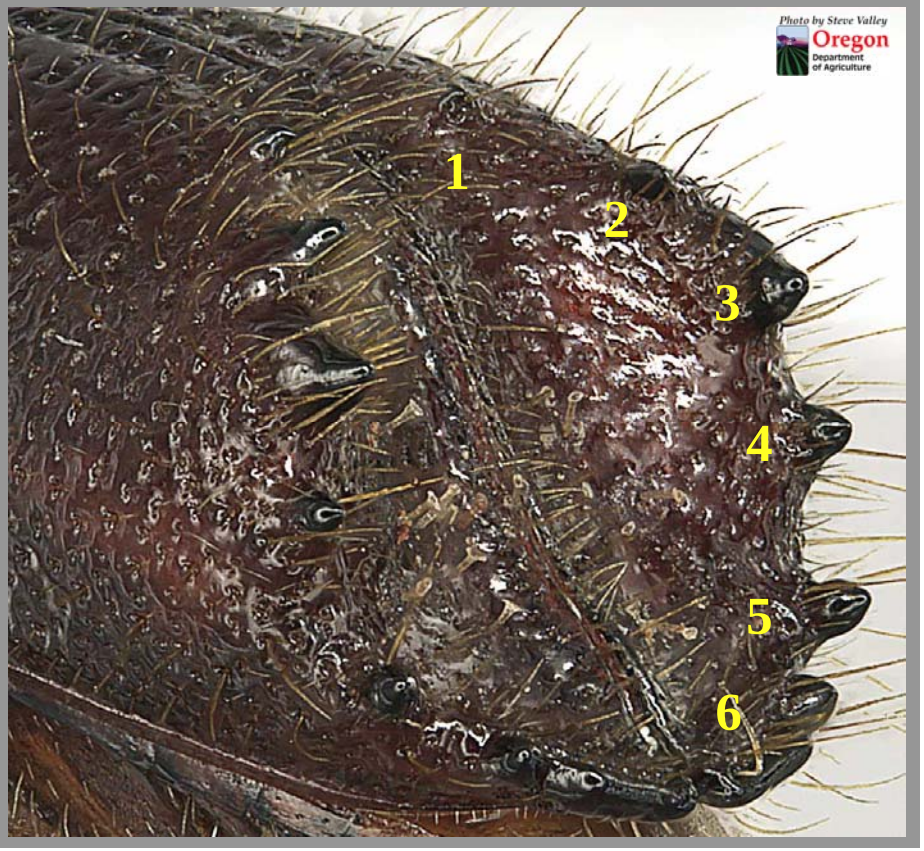
Lateral margins of elytral declivity with 5 pairs of spines (**a**); portrait (**c**)…….....*Ips grandicollis* (Eichoff) ☼ ♎

Lateral margins of elytral declivity with 6 pairs of spines…..52

51a: 5 pairs of spines on declivity.



51b: 6 pairs of spines on declivity.



51 (50): Part II

Ips grandicollis (Eichoff) ☼ ♎

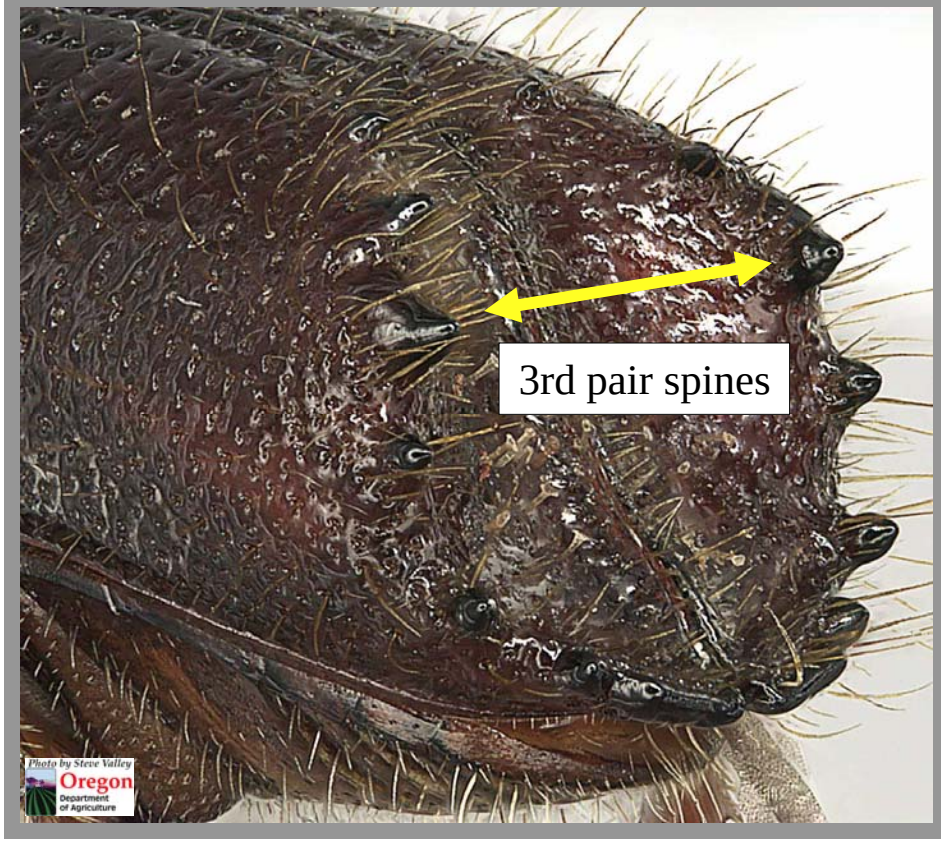
51c.

52 (51): Part I

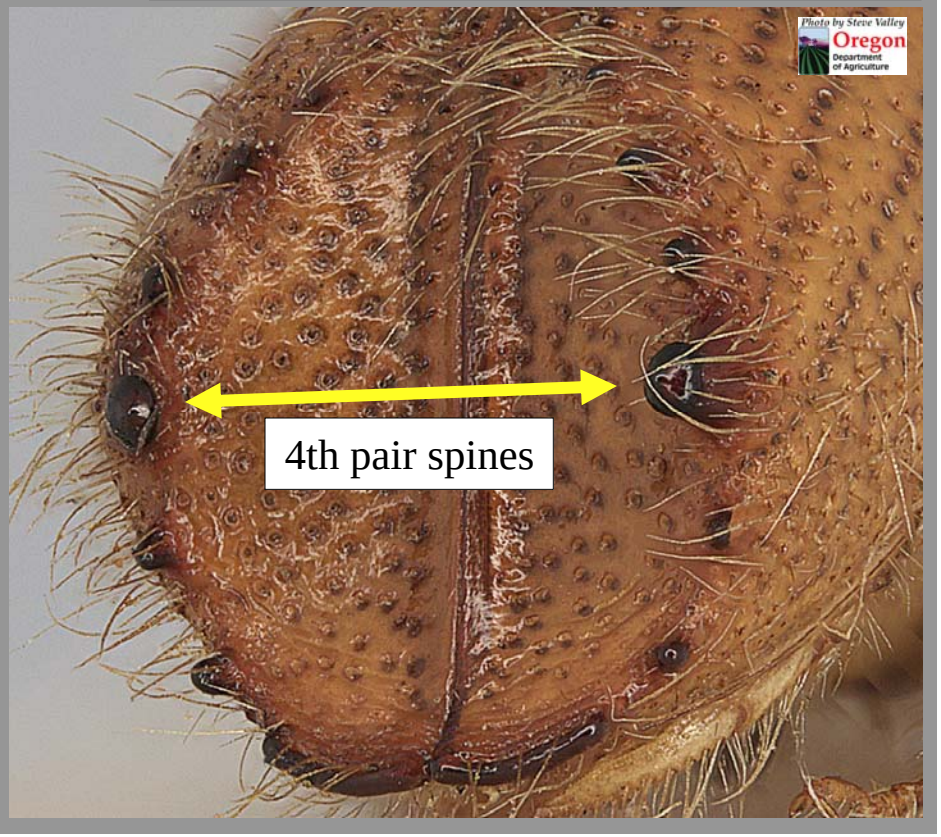
3rd pair of declivital spines largest (**a**); frons without a raised line above the median tubercle (**c**); larger, 5.5-8.2 mm in length; portrait (**e**).....*Ips calligraphus* (Germar) ☼ ♎

4th pair of declivital spines largest (**b**); frons with a short, transverse raised line above median tubercle (**d**); smaller, 3.5-5.9 mm in length; portrait (**f**)…….
…….....*Ips sexdentatus* (Boerner) ☹

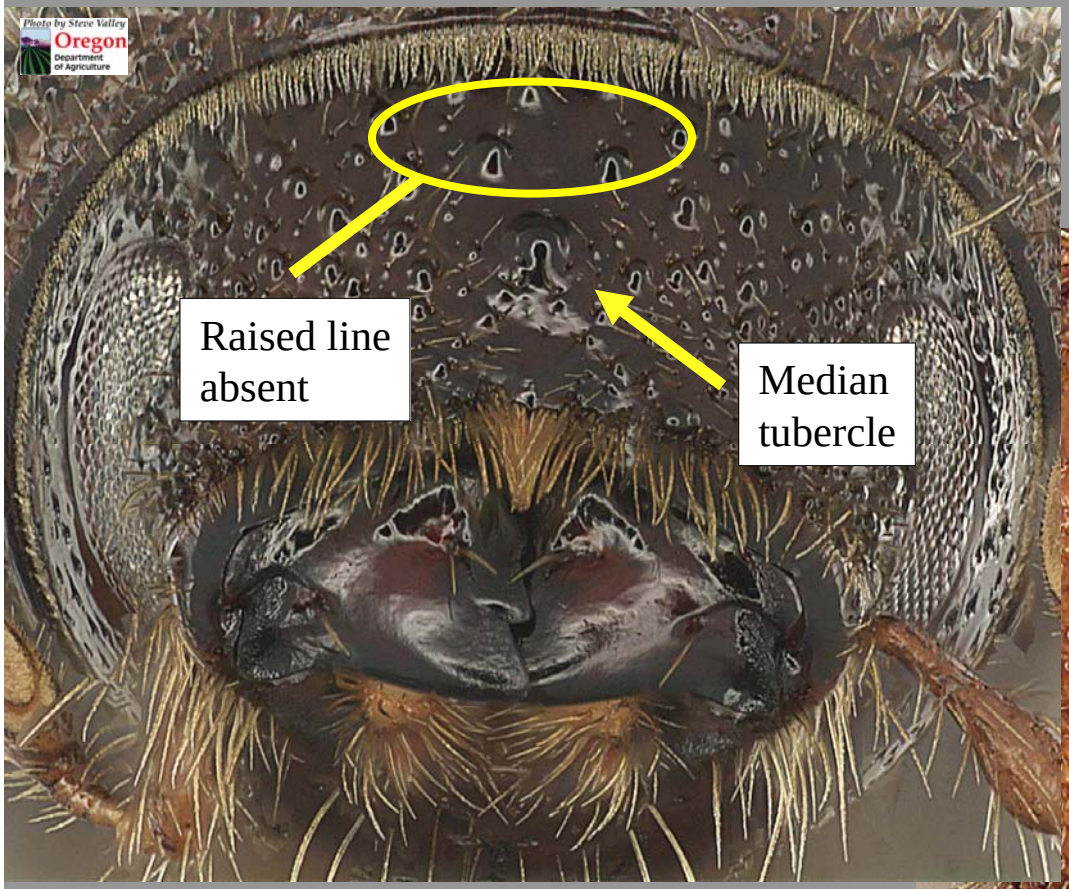
52a: 3rd pair declivital spines largest.



52b: 4th pair declivital spines largest.

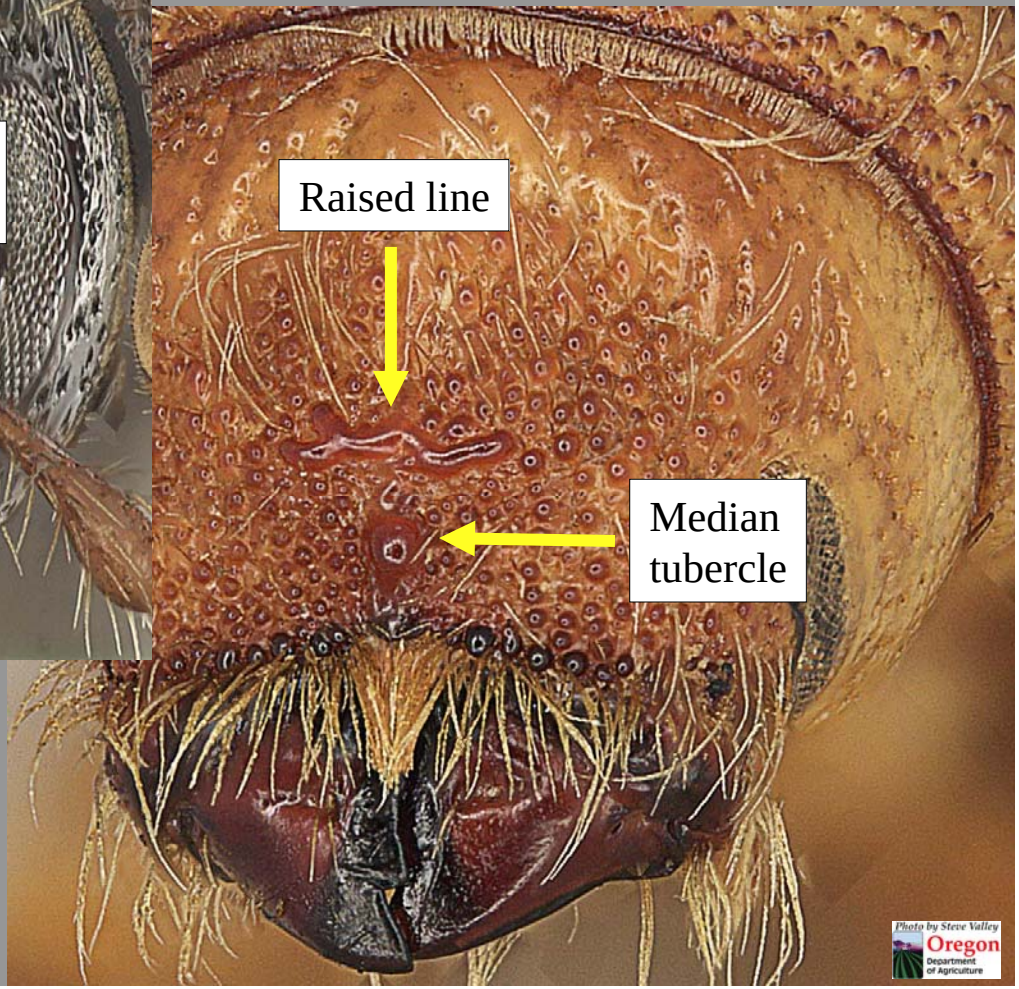


52 (51): Part II



52c: Frons without transverse raised line above median tubercle.

52d: Frons with transverse raised line above median tubercle.



52 (51): Part III

Ips calligraphus (Germar) ☼ ♎

52e.

Photo by Steve Valley
Oregon
Department of Agriculture

52 (51): Part IV

Ips sexdentatus (Boerner) ☹

52f.

53 (50)

Discal interstriae impunctate (except near declivity in some species) (**a**).....54

Discal interstriae with irregular median row of setose punctures (**b**) (*some specimens may have this character restricted to the apical half of the elytra).....STOP

53a: Discal interstriae impunctate.

53b: Discal interstriae punctate, setose throughout.

54 (53): Part I

Surface of elytral declivity dull, roughened between punctures (**a**); portrait (**c**)……..*Ips typographus* (Linnaeus) ☹

Surface of elytral declivity shiny, smooth between punctures (**b**).……55

54a: Declivital surface dull, rough.

54b: Declivital surface shiny, smooth.

54 (53): Part II

Ips typographus (Linnaeus) ☹

54c.

55 (54)

Sutures of antennal club broadly bisinuate (first suture is normally the most distinct and diagnostic (**a**)……..….56

Sutures of antennal club narrowly, strongly bisinuate (the first suture is normally the most distinct and diagnostic) (**b**)……....STOP

55a: Sutures broadly bisinuate.

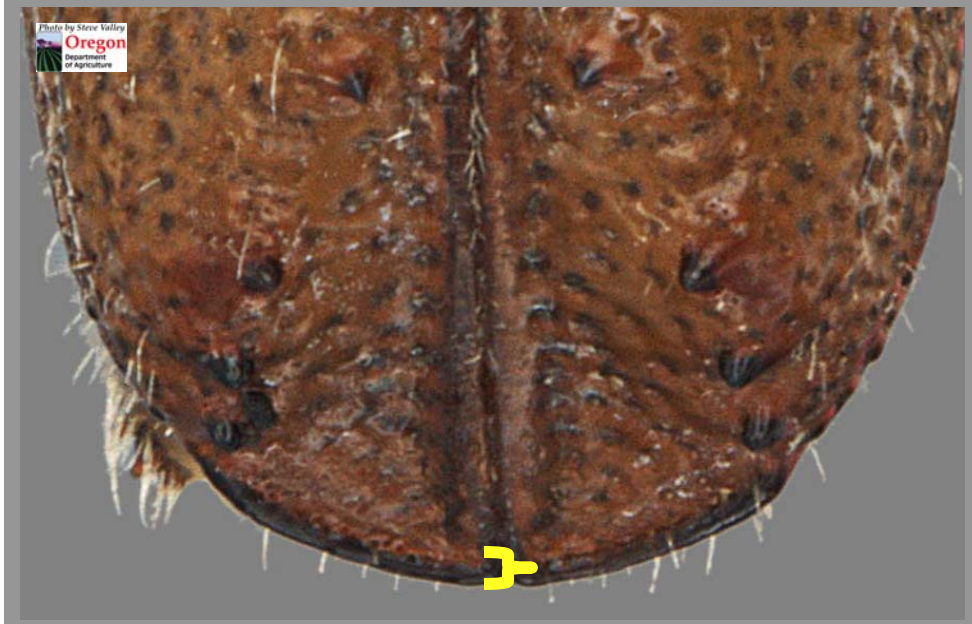
55b: Sutures narrowly bisinuate.

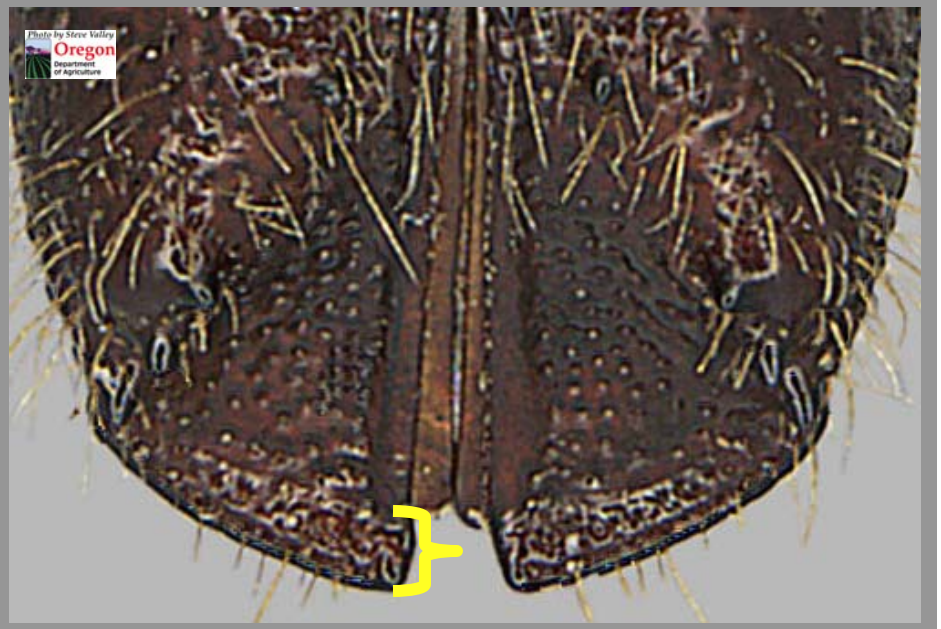
56 (55): Part I

In dorsal view, the apex of elytron is a narrow ridge perpendicular to the posterior slope of the declivity (**a**); declivital spines are short cones in both sexes (**c, d**); portraits (**g, h**)……..*Ips avulsus* (Eichoff) ☼

In dorsal view, the apex of elytron projects as a broad shelf perpendicular to the posterior slope of the declivity (**b**); spine 3 is capitate in male (**e, f**); portraits (**i, j**)…..……..……..*Ips pini* (Say) ♎

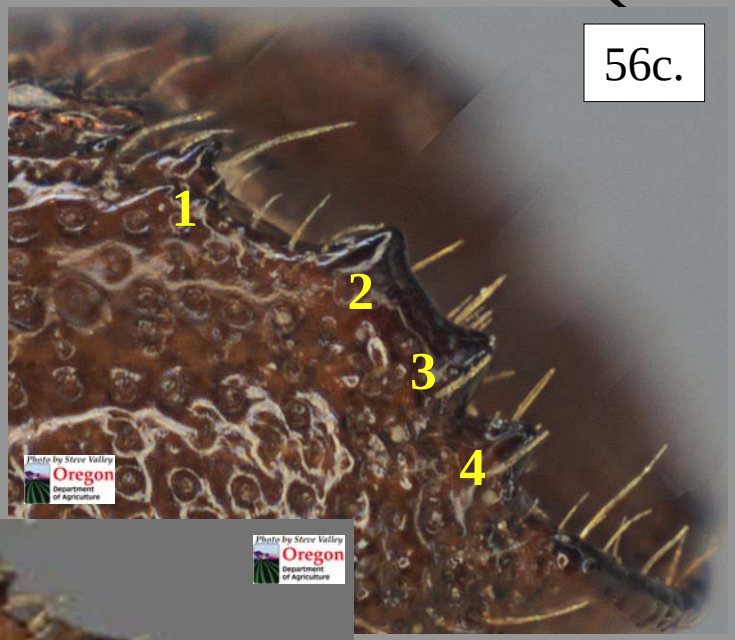
56a: Apex of elytron a narrow ridge.



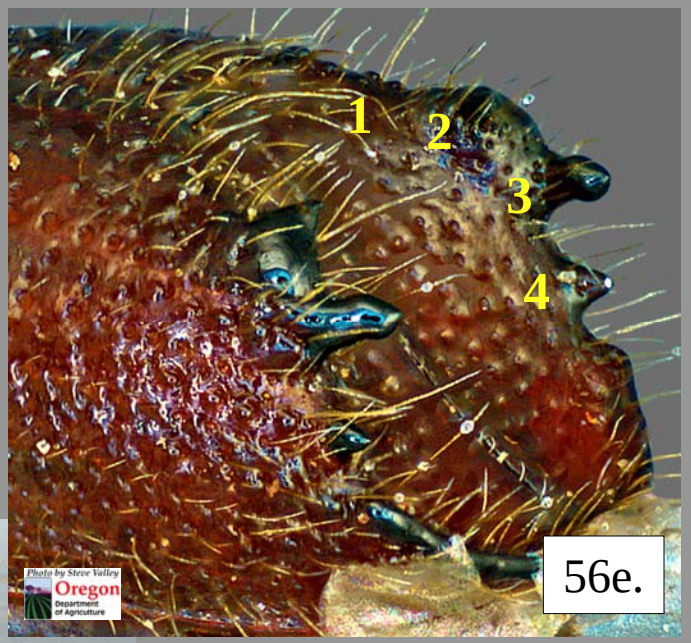


56b: Apex of elytron a strongly projecting shelf.

56 (55): Part II



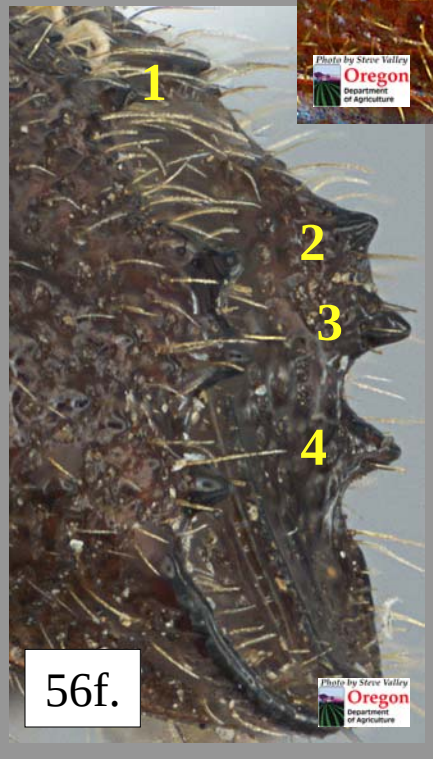
56c.



56e.

56d.

Declivital spine 3 not capitate in either male (c) or female (d).



56f.

Declivital spine 3 capitate in male (e), not capitate in female (f).

56 (55): Part III

Ips avulsus (Eichoff) ✡

56g: Female.

56h: Male.
Not available at this time.

56 (55): Part IV

Ips pini (Say) ♎

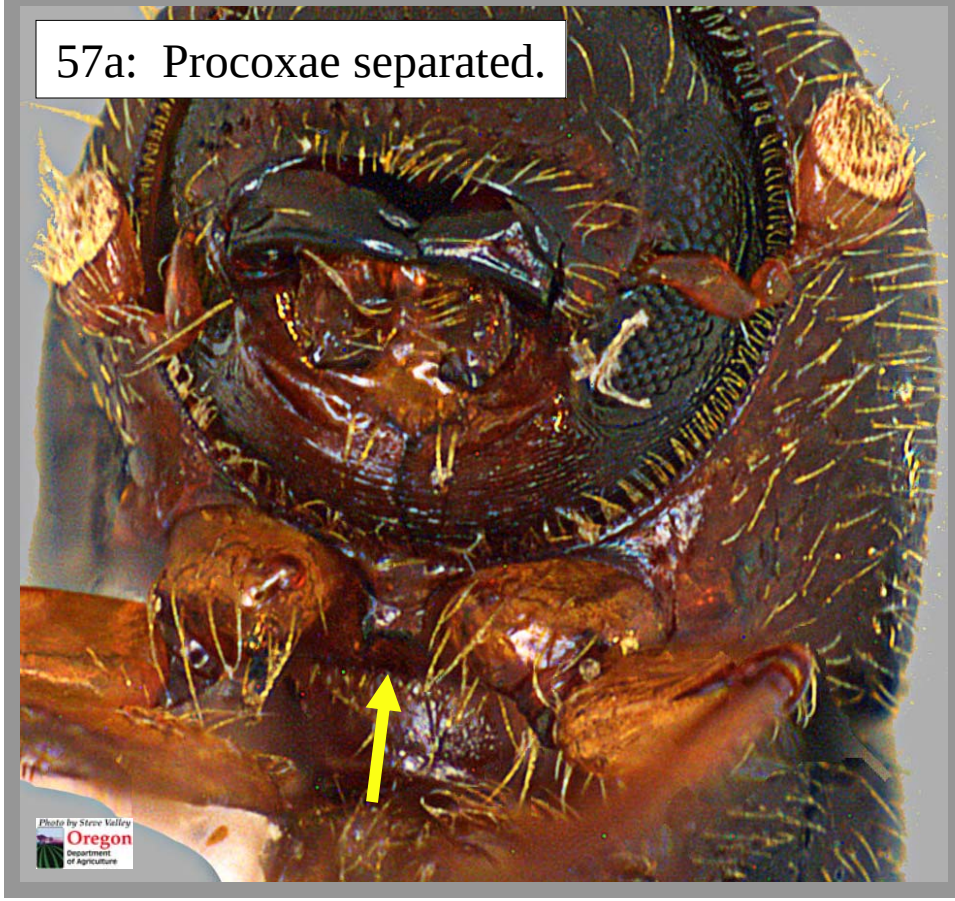
56i: Female.

56j: Male.

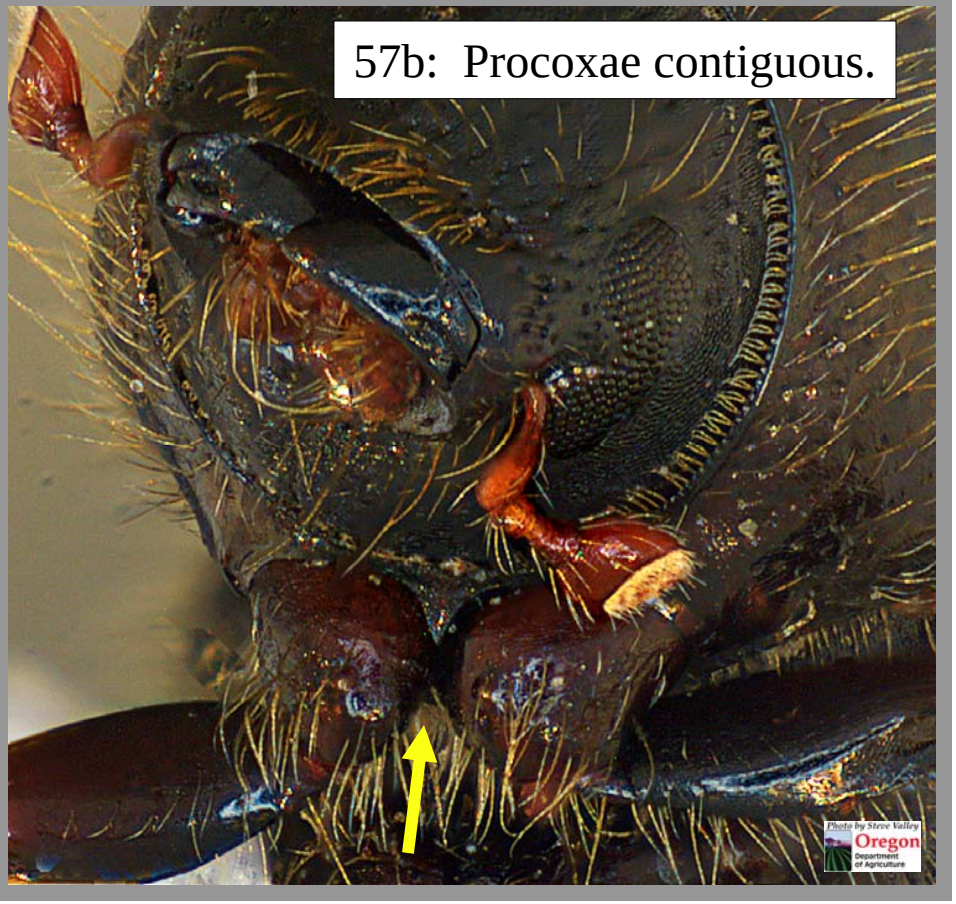
57 (36): Part I

Procoxae widely separated (**a**); posterolateral margins of elytral apex sharply and distinctly carinate (**c**); body stout (**e**)……..……58

Procoxae contiguous (**b**); posterolateral margins of elytral apex not or feebly raised (**d**); body <u>often</u> elongate (some stout) and slender (**f**)…...61

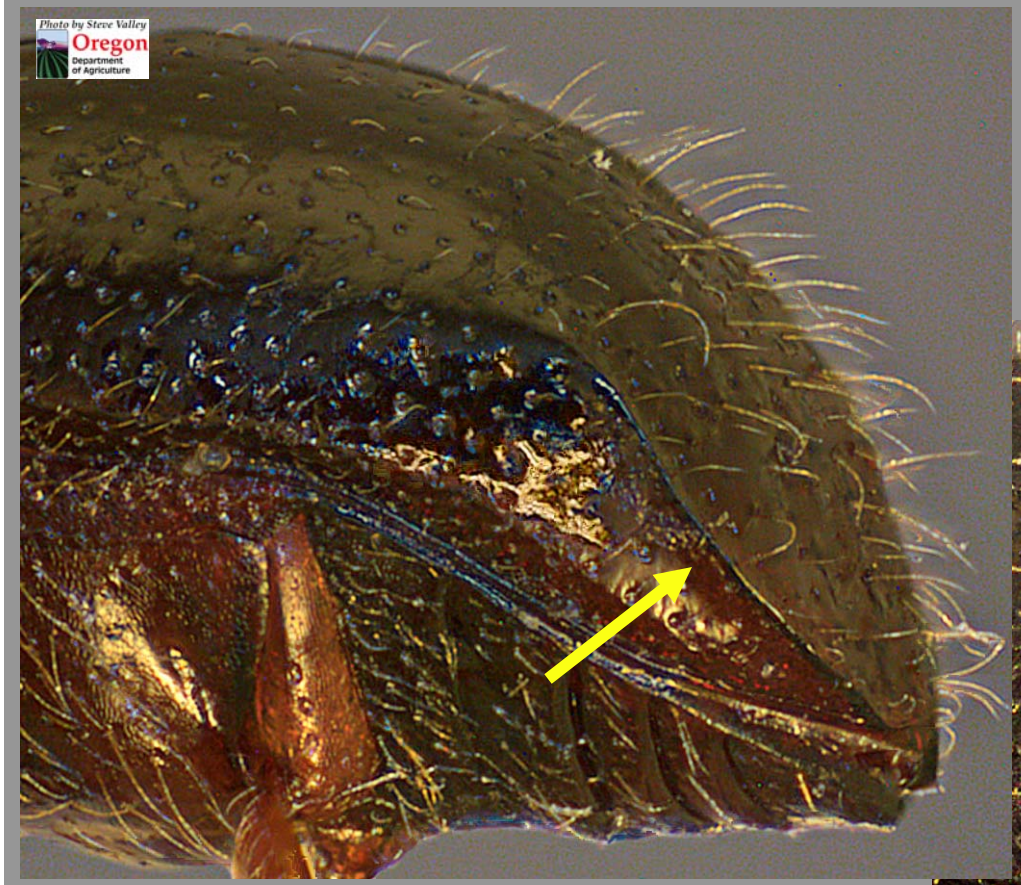


57a: Procoxae separated.



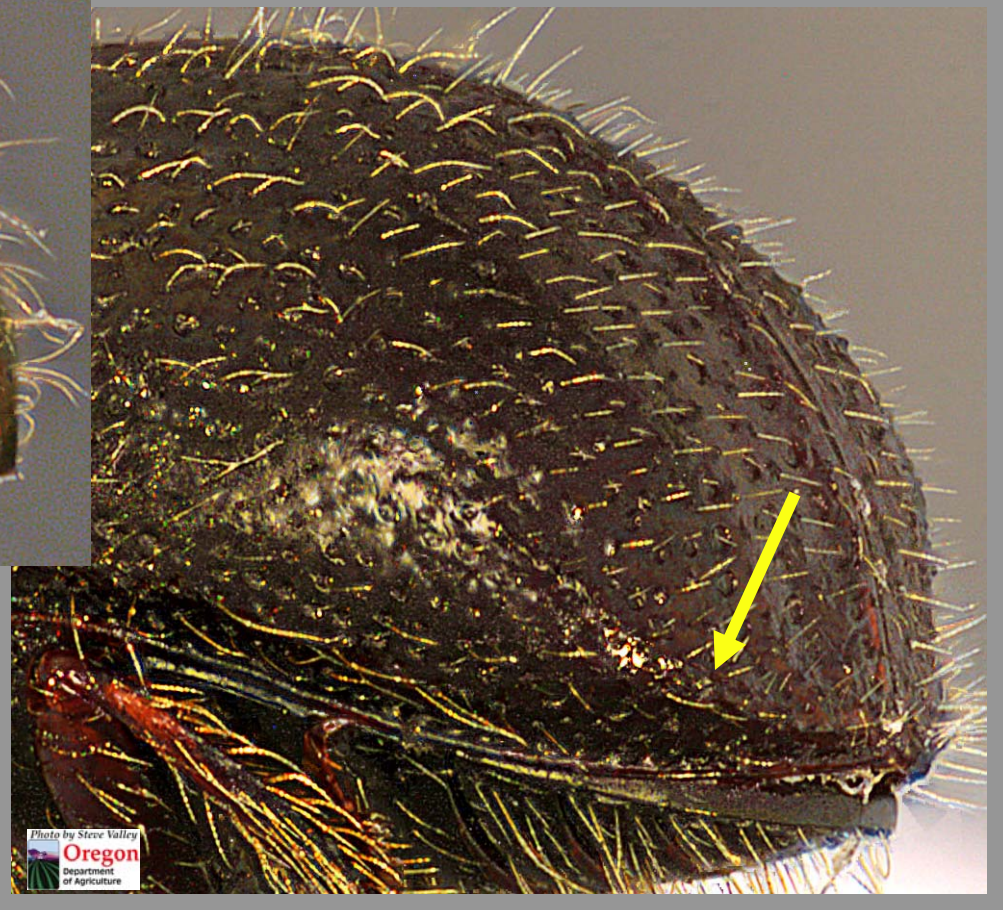
57b: Procoxae contiguous.

57 (36): Part II



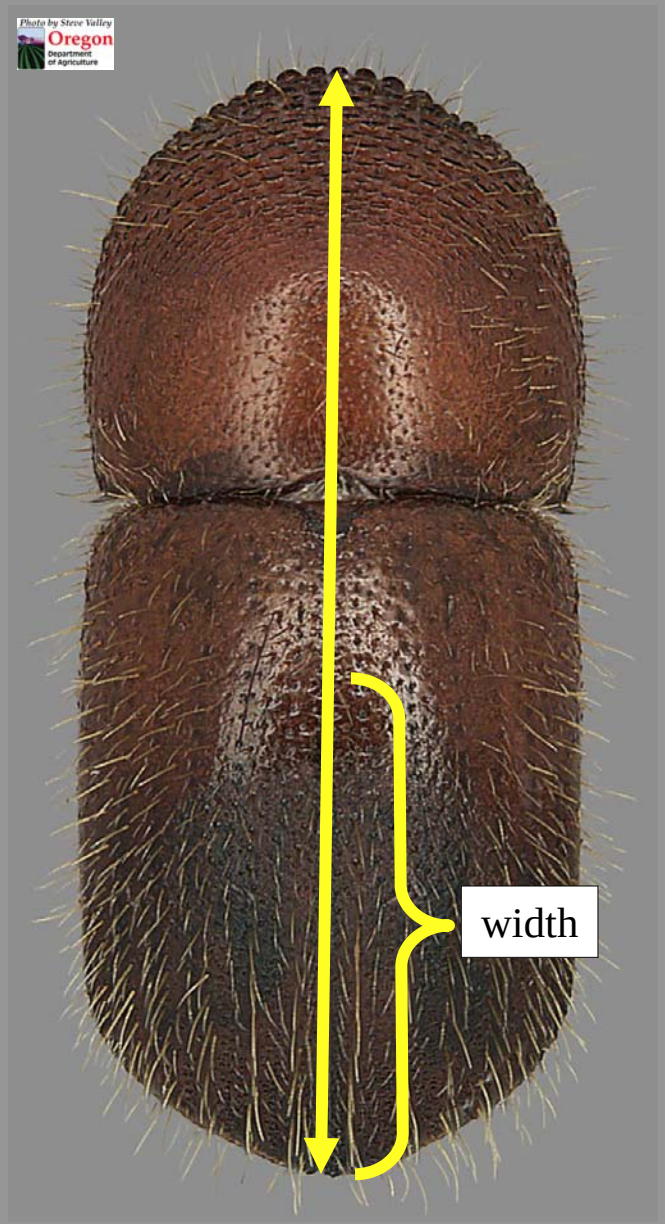
57c: Elytral apex with sharp carina.

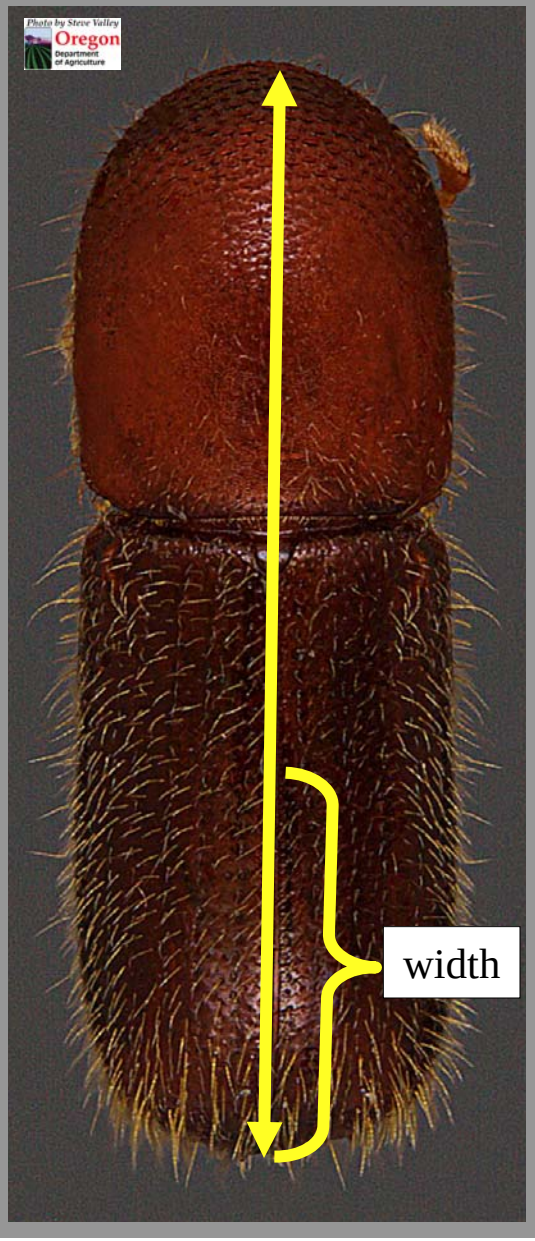
57d: Elytral apex without sharp carina.



57 (36): Part III

57e: Body stout.



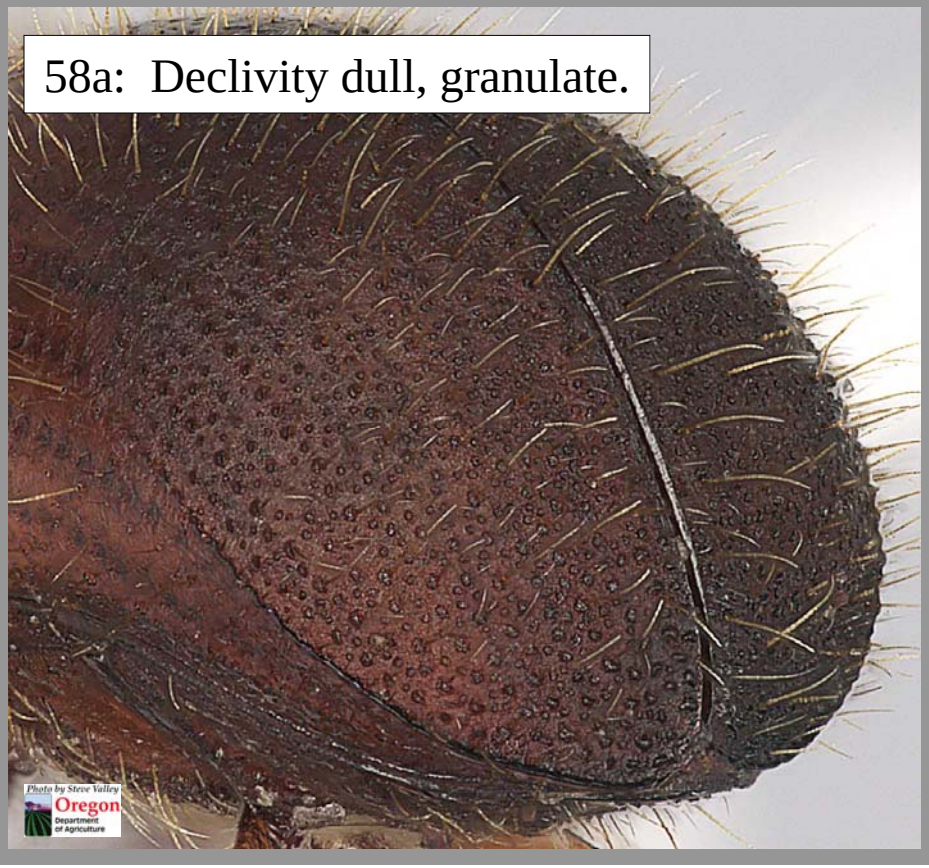


57f: Body slender.

58 (57)

Declivity without punctures, surface granulate, dull **(a);** total body length longer than 2.3 mm…….59

Declivital striae with distinct, clearly impressed rows of punctures (**b**); declivital surface shining, granules (if present) in sparse rows (**b**); total body length less than 2.3 mm……..……60



58a: Declivity dull, granulate.

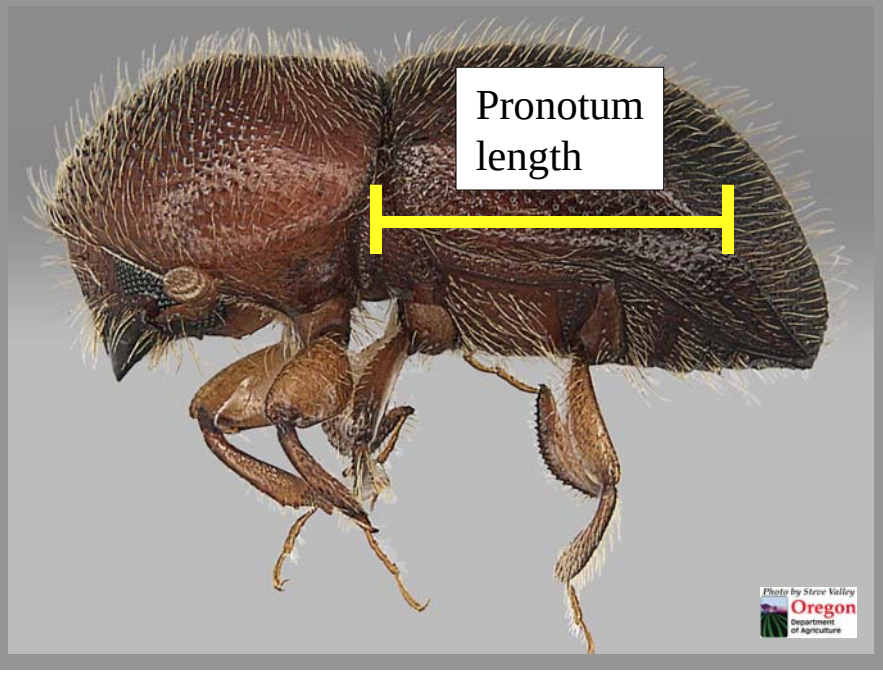
58b: Declivity shiny, striate.

59 (58): Part I

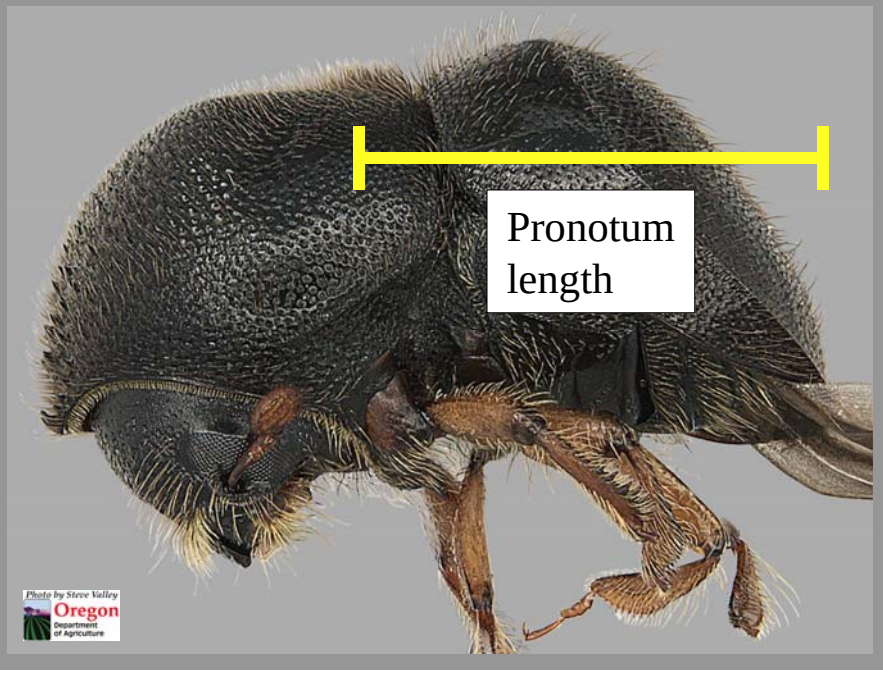
Body less stout, elytra longer than pronotum (**a**); declivity shorter, with carina around lower 1/2 (**c**); total body length less than 3 mm; portrait (**e**)……..……
……..….*Xylosandrus crassiusculus* (Motschulsky) ☼ ♎ ☹

Body very stout, elytra shorter than pronotum (**b**); declivity longer, with raised carina around lower 3/4 (**d**); total body length greater than 3 mm; portrait (f)..
……..……*Xylosandrus mutilatus* (Blandford) ☼ ☹

59a: Elytra longer than pronotum.

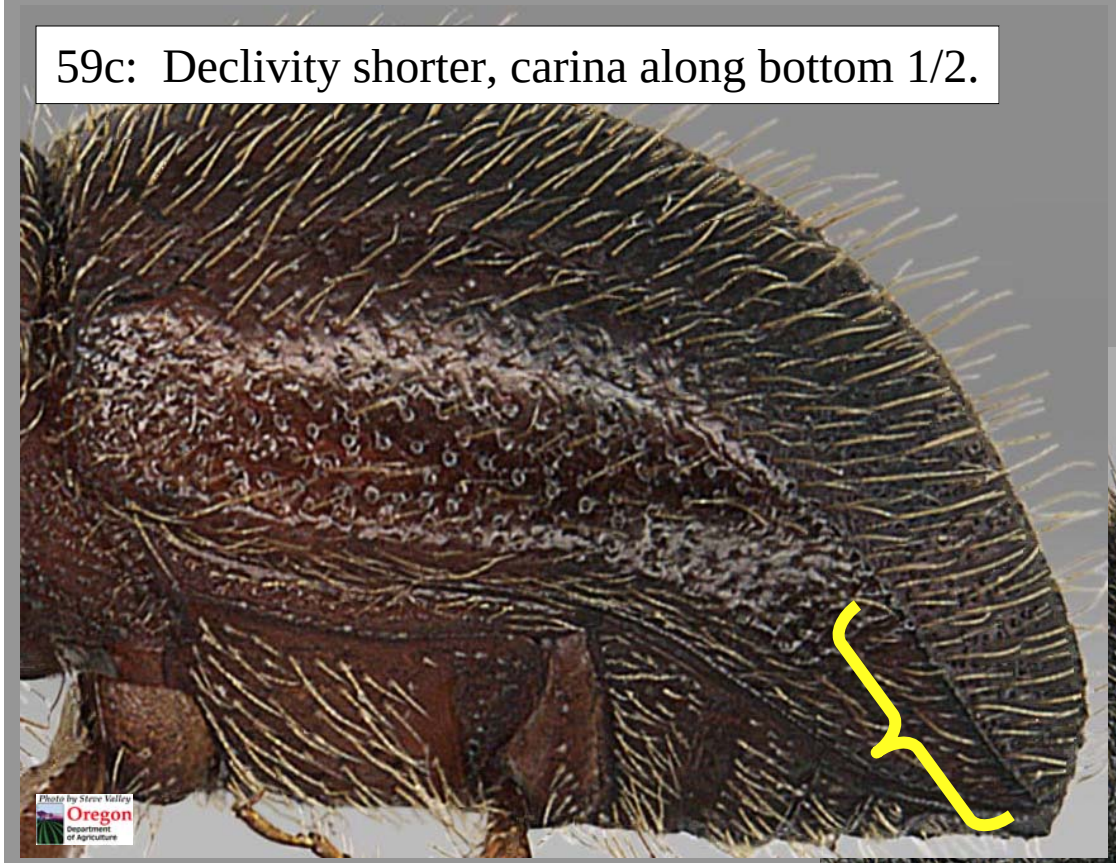


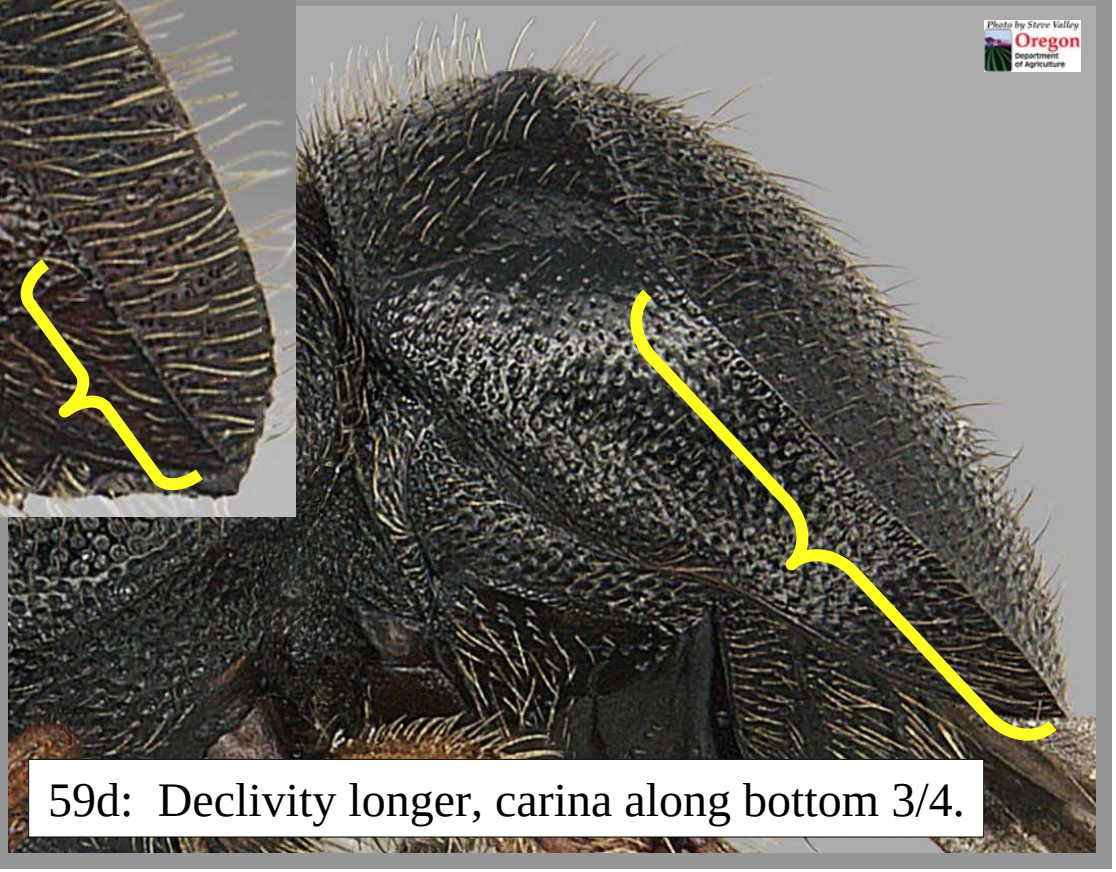
59b: Elytra shorter than pronotum.



59 (58): Part II

59c: Declivity shorter, carina along bottom 1/2.





59d: Declivity longer, carina along bottom 3/4.

59 (58): Part III

Xylosandrus crassiusculus (Motschulsky) ☼ ♎ ☹

59e.

59 (58): Part III

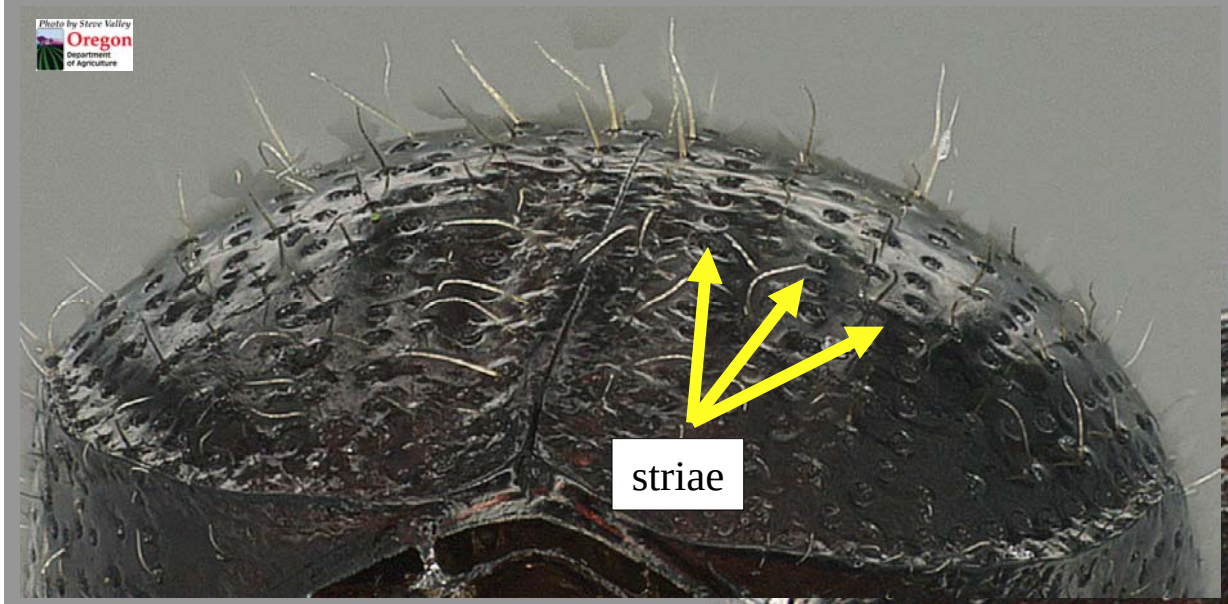
Xylosandrus mutilatus (Blandford) ☼ ☹

59f.

60 (58): Part I

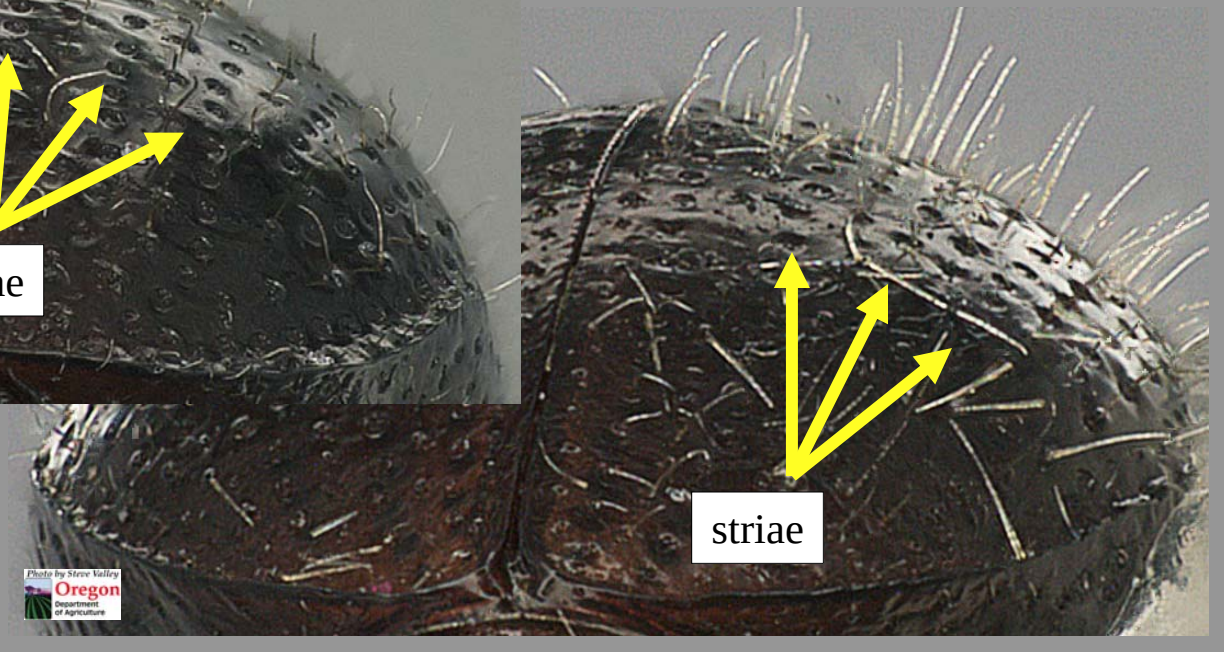
Larger, 2.0-2.3 mm total length; strial setae on elytral declivity absent) (**a**), striae at least feebly impressed, interstriae very slightly convex (**c**); portrait (**e**)……*Xylosandrus germanus* (Blandford) ♎ ☼ ☹

Smaller, 1.7 mm or less in length; strial setae on elytral declivity present (at least 1/3 as long as those on interstriae) (**b**), striae not impressed, interstriae flat (**d**); portrait (**f**)……*Xylosandrus compactus* (Eichoff) ☼ ☹



60a: Declivital strial setae absent.

60b: Declivtal strial setae present.



60 (58): Part II

60c: Striae impressed, interstriae convex.

60d: Striae not impressed, interstriae flat.

60 (58): Part III

Xylosandrus germanus (Blandford) ♎ ☼ ☹

60e.

60 (58): Part IV

Xylosandrus compactus (Eichoff) ☼ ☹

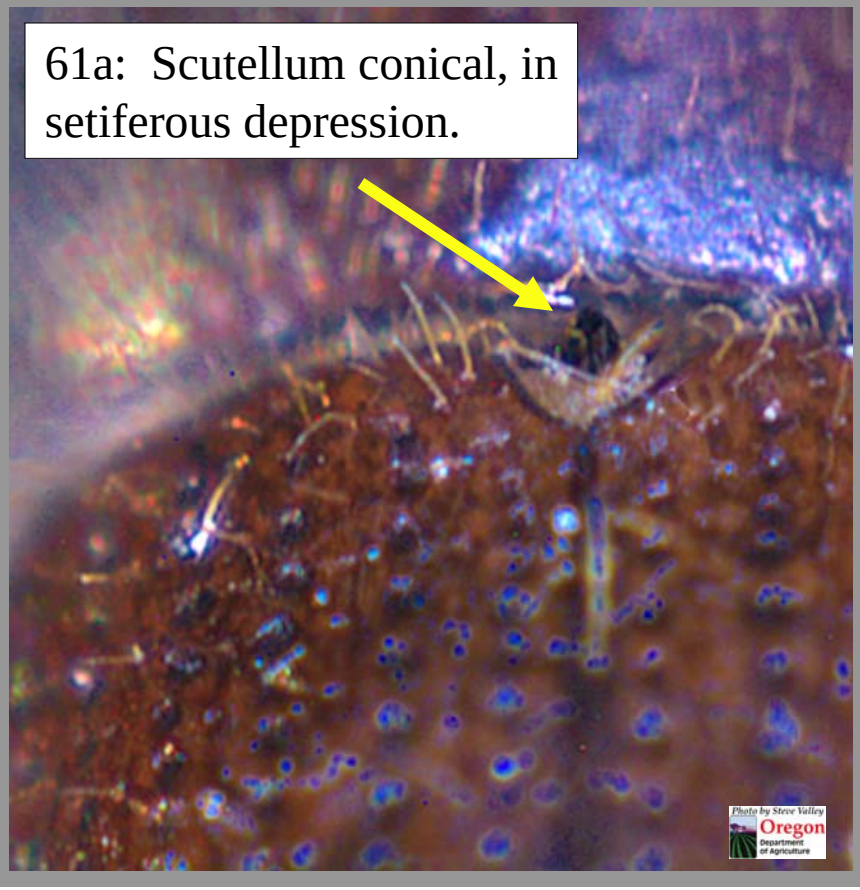
60f.

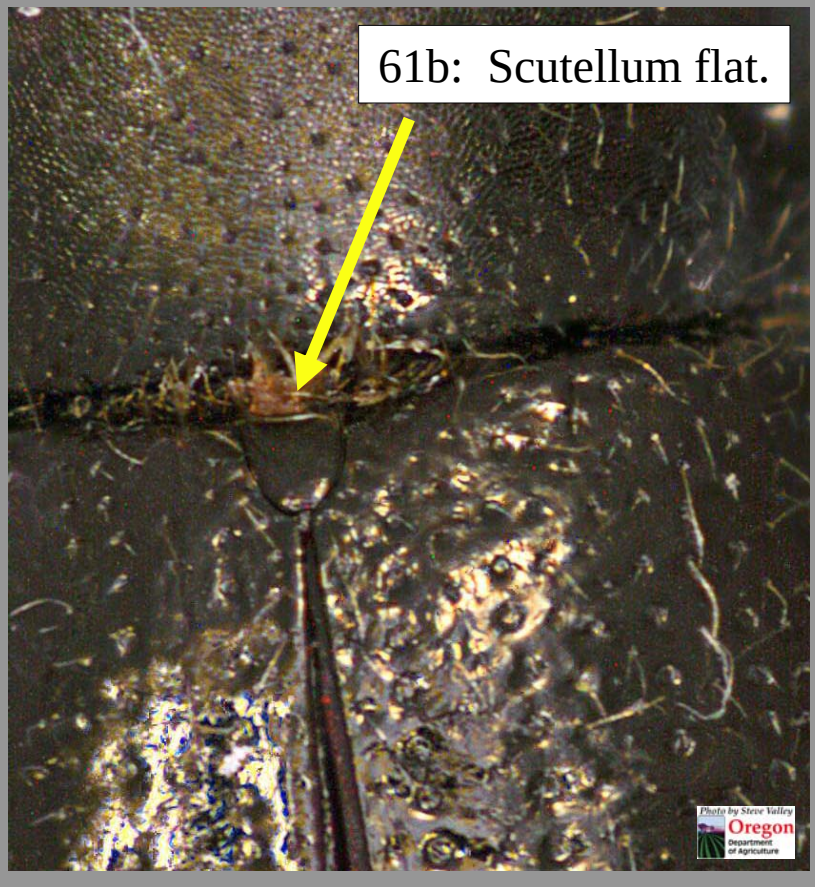
Photo by Steve Valley
Oregon
Department of Agriculture

61 (57): Part I

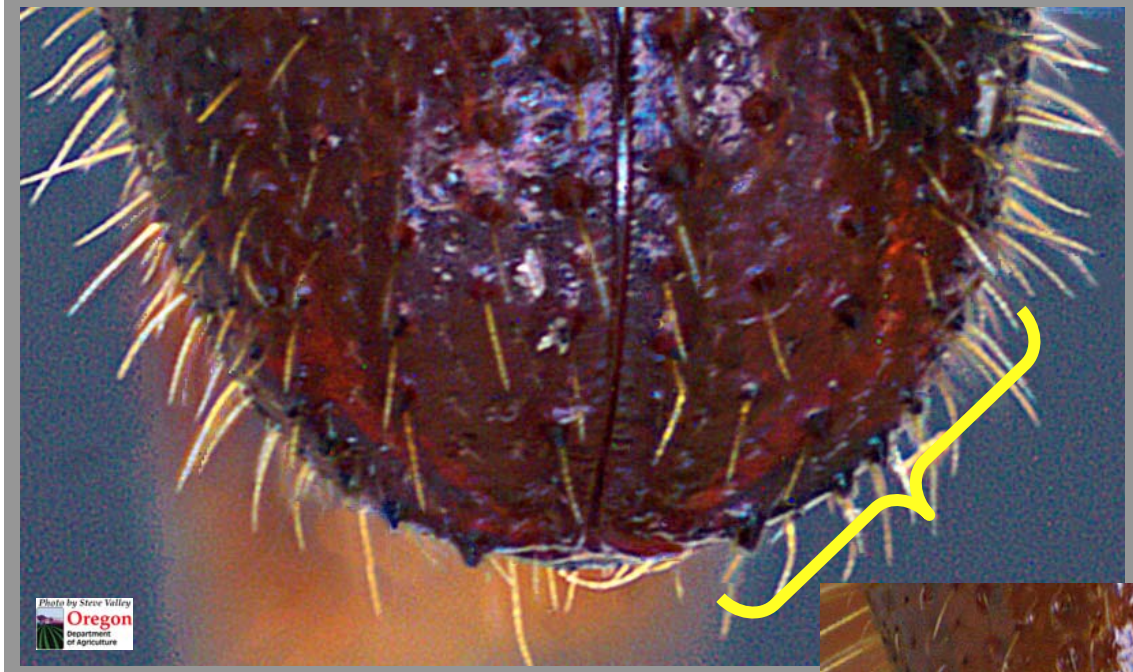
Scutellum conical, within setiferous depression between elytral bases (**a**); lower margin of elytral declivity (beginning about interstria 7) with small spines, the largest (at interstria 2) nearest the suture (**c**) ……..……62

Scutellum flat, in same plane as elytral bases (**b**); lower margin of elytral declivity without spines (**d**)……..……..…..64



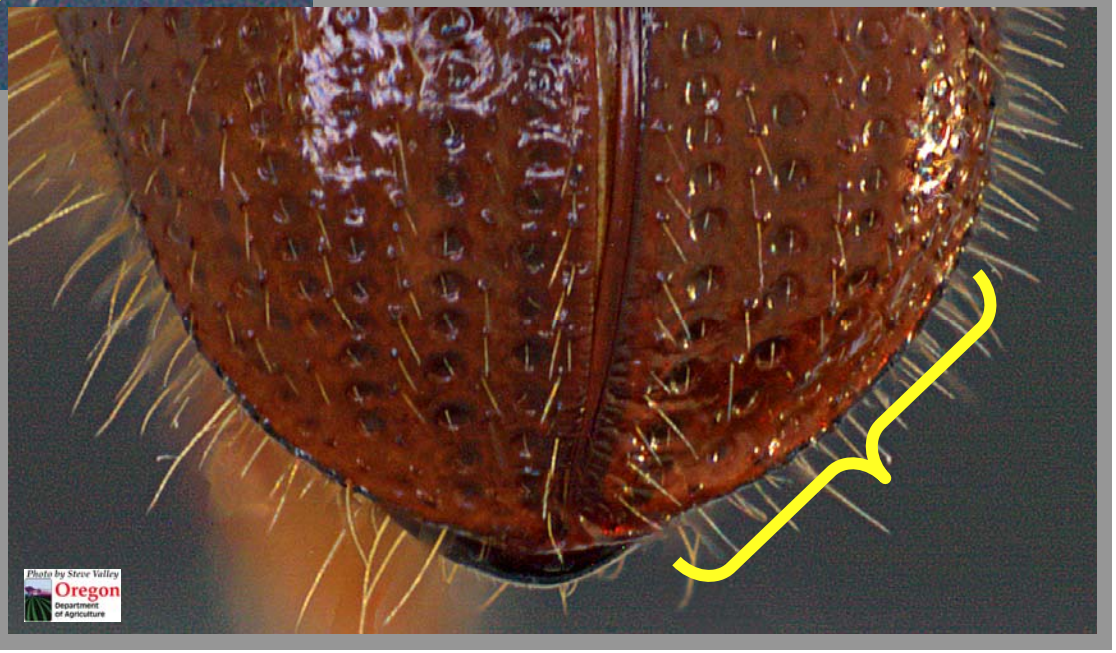


61 (57): Part II



61c: Declivital margin with spines.

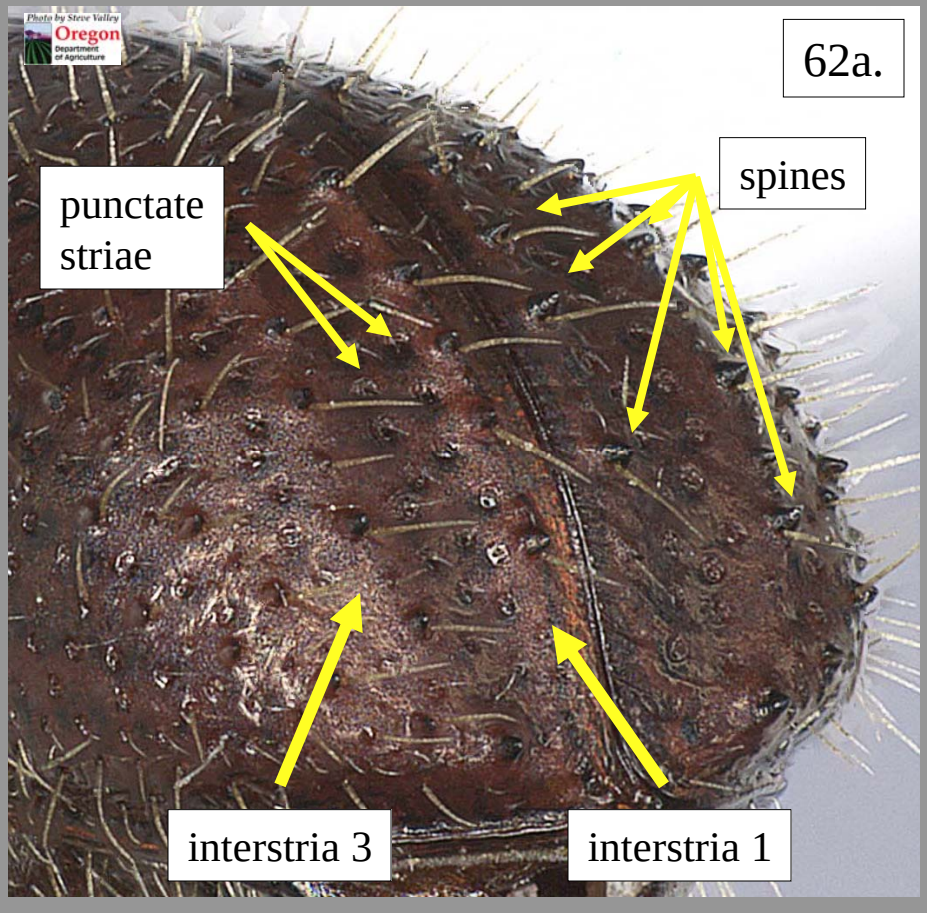
61d: Declivital margin without spines.

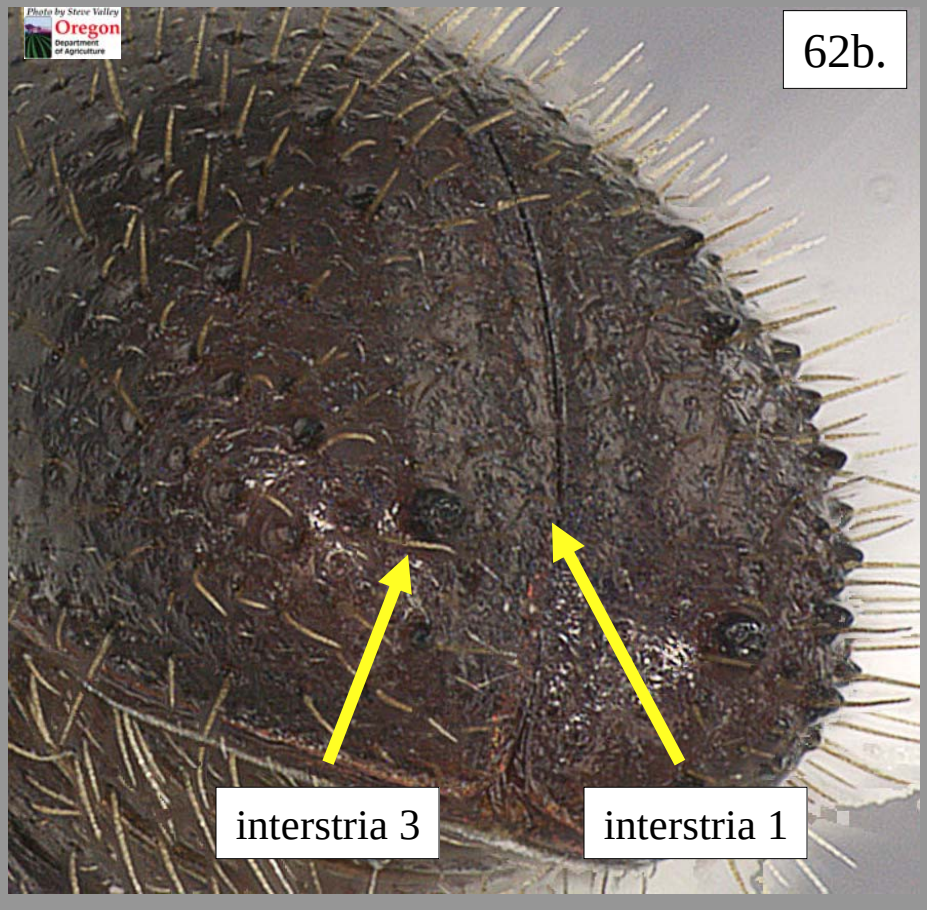


62 (61)

Declivital interstriae 1 and 3 with small spines, 1 and 3 weakly elevated; declivital striae punctate (**a**); slightly larger, 2.0-2.8 mm.....63

Declivital interstriae 1 without spines, 3 with spine near apex, 1 and 3 not elevated (**b**); declivital striae not punctate (**b**); smaller, 1.6-1.9 mm.....STOP



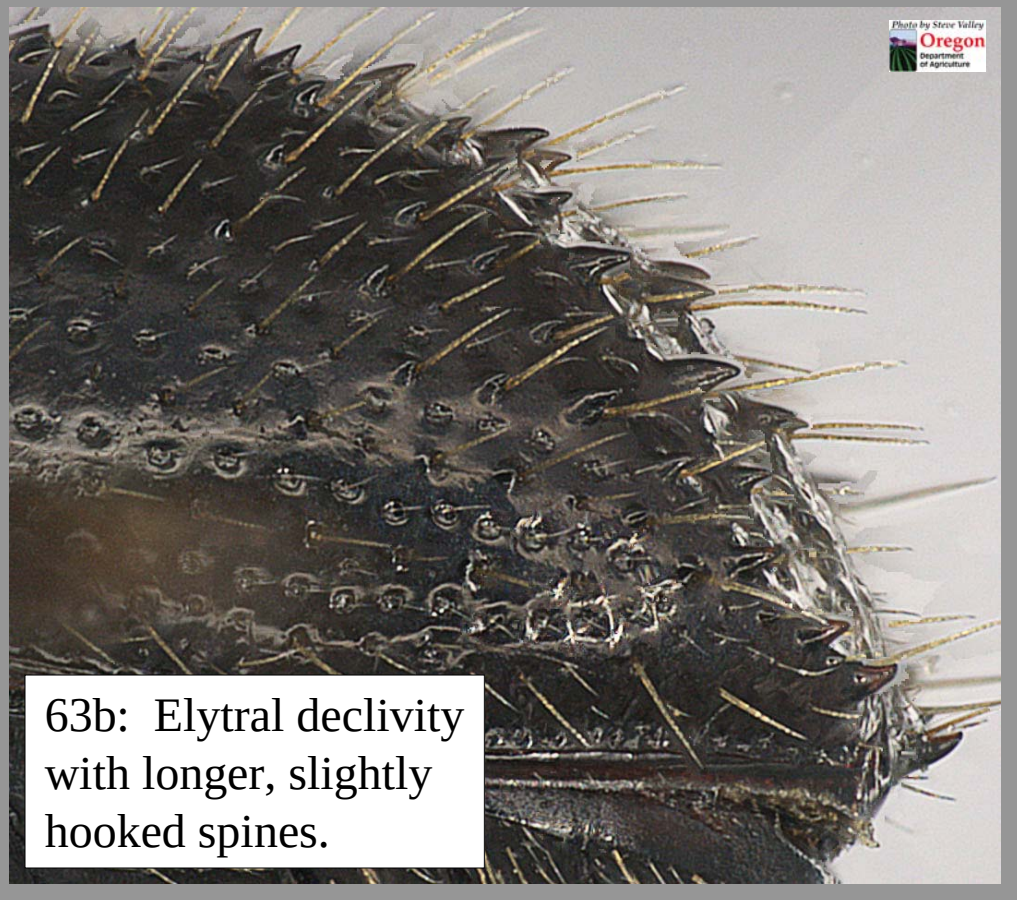


63 (62): Part I

Spines on declivital interstriae 1 and 3 and ventrolateral margin conical, not hooked at apex (**a**); smaller, 2.0-2.4 mm; portrait (**c**)...*Xyleborinus saxesenii* (Ratzeburg) ♎ ☼ ☹

Spines on declivital interstriae 1 and 3 and ventrolateral margin larger, slightly hooked at apex (especially the largest) (**b**); larger, 2.5-2.8 mm; portrait (**d**)……
……*Xyleborinus alni* (Niisima) ♎ ☹

63a: Elytral declivity with small, conical spines.



63b: Elytral declivity with longer, slightly hooked spines.

63 (62): Part II

Xyleborinus saxesenii (Ratzeburg) ♎ ☼ ☹

63c.

63 (62): Part III

Xyleborinus alni (Niisima) ♎ ☹

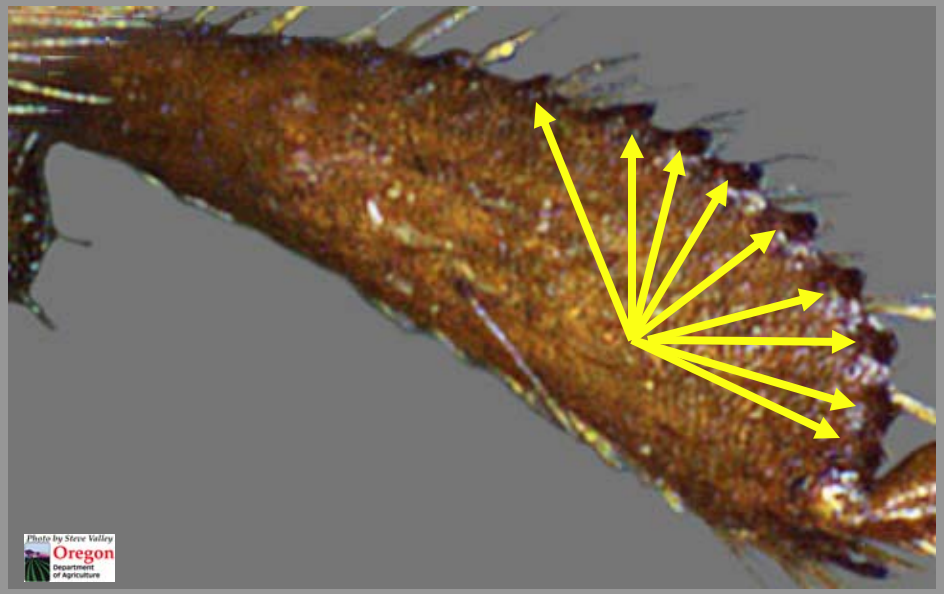
63d.

Photo by Steve Valley
Oregon
Department of Agriculture

64 (61)

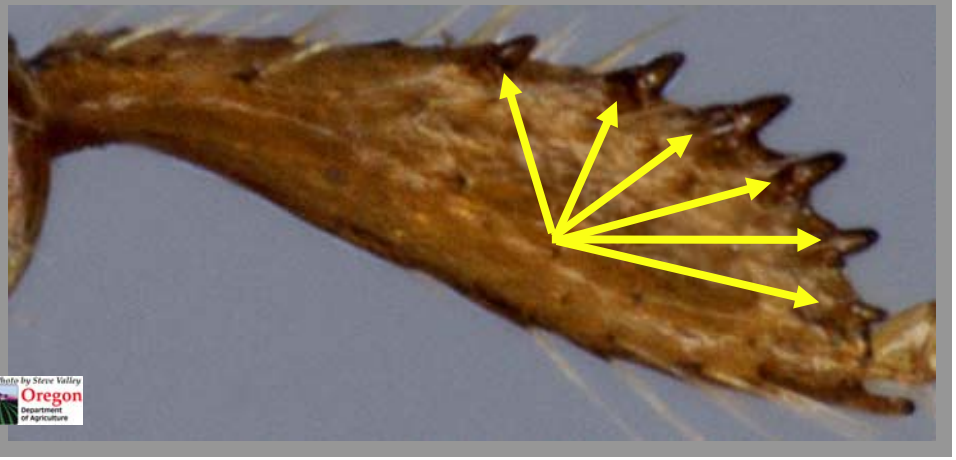
Tibial teeth many, small, and closely spaced (**a**)……....65

Tibial teeth few, large, and widely separated (**b**)……....STOP



64a: Tibial teeth many, small, close together.

64b: Tibial teeth few, large and far apart.

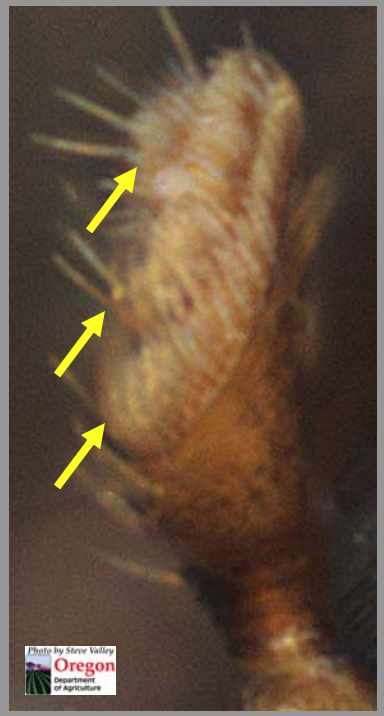


65 (64): Part I

Several segments of antennal club visible beyond corneous basal segment in lateral view (**a**) and at apex of posterior face (**c**); segment one not forming a complete circle enclosing subsequent segments (**e**)…….....66

No segments of antennal club visible beyond corneous basal segment in lateral view (**b**); segments not visible at apex of posterior face (**d**); segment one forming a complete circle enclosing subsequent segments (**f**)…….... 70

65a: In lateral view, antennal club segments visible beyond basal segment.



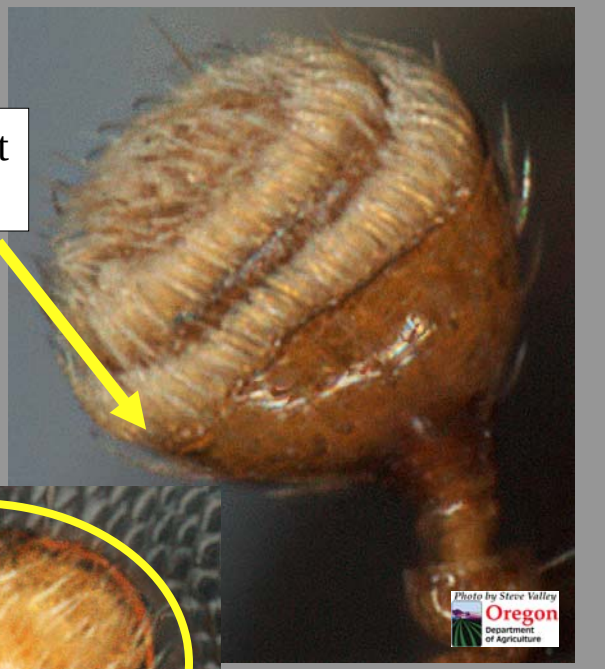
65b: In lateral view, no antennal club segments visible beyond basal segment.

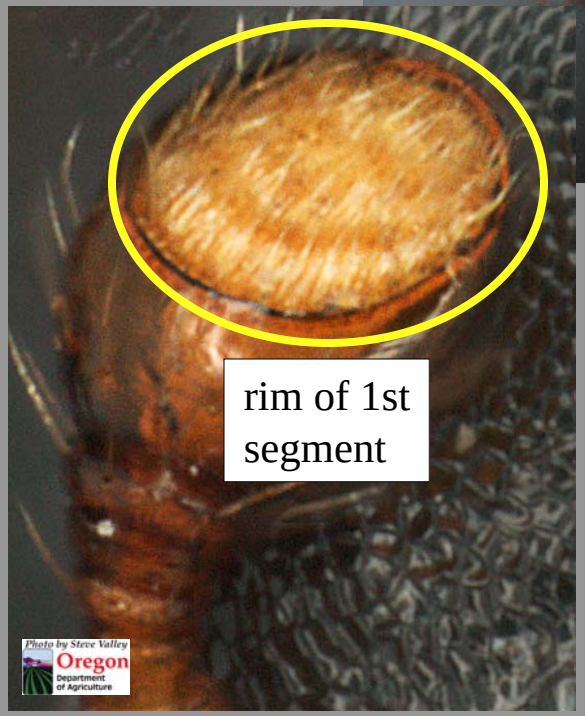
65 (64): Part II

65e: 1st segment not enclosing those following.

65c: Segments visible at apex posterior face.

edge of 1st segment





rim of 1st segment

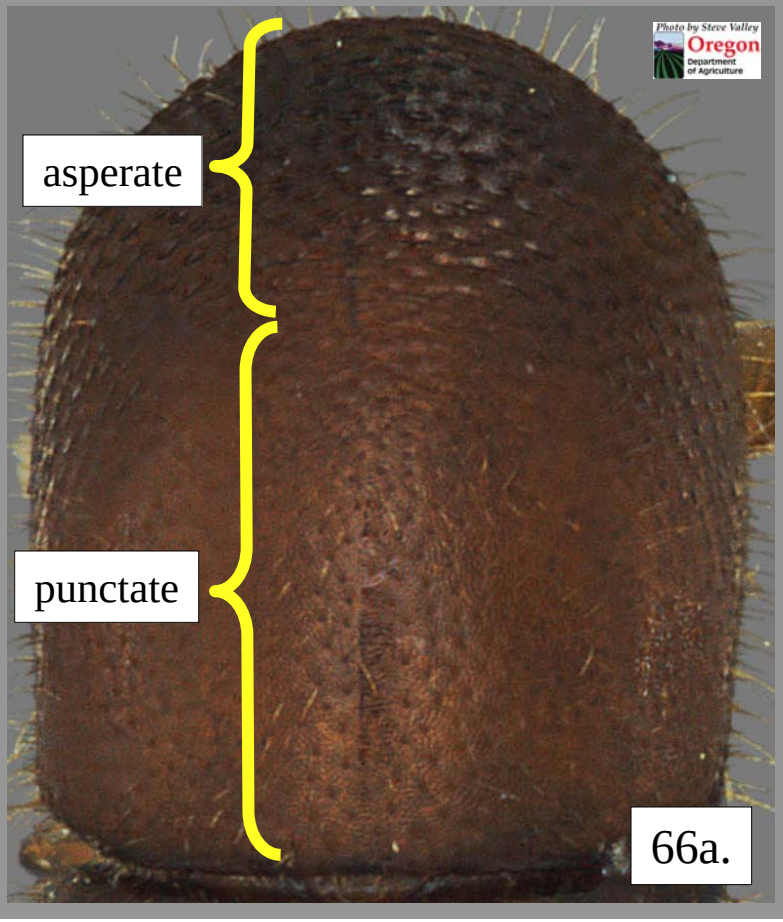
65d: Segments not visible at apex posterior face.

65f: 1st segment enclosing those following.

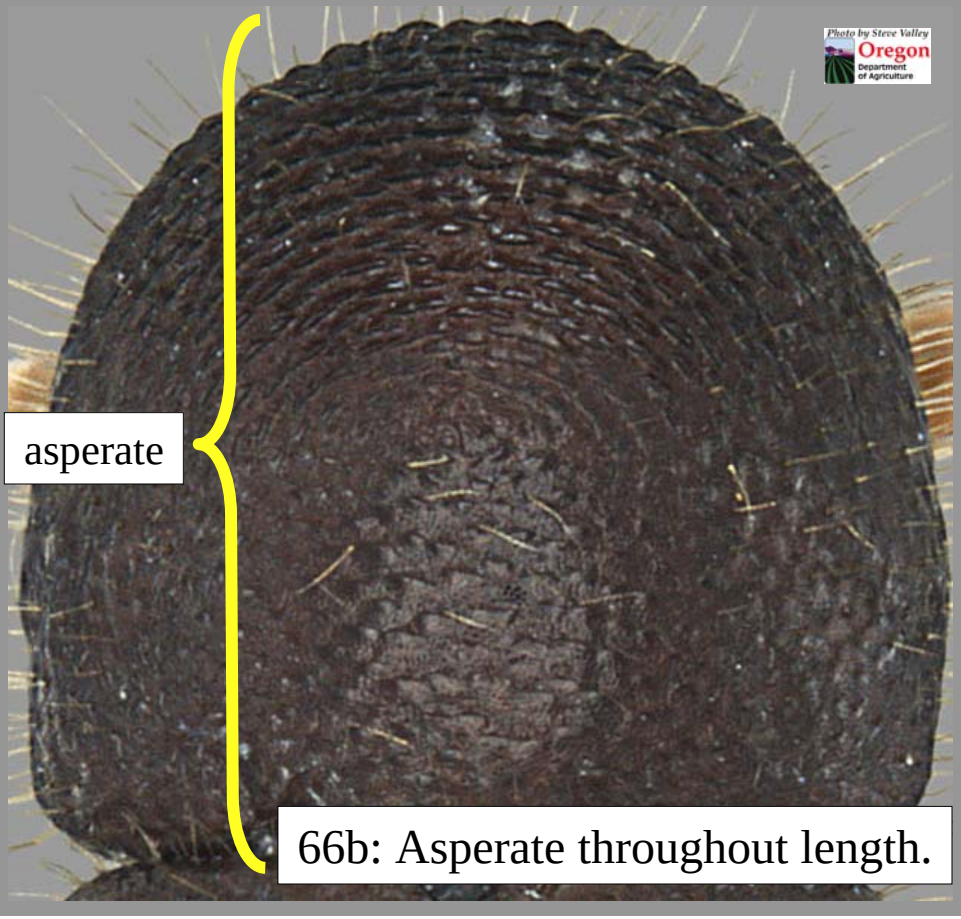
66 (65)

Pronotum asperate only on anterior half, posterior half of pronotum often punctate (**a**)……..……..…67

Pronotum asperate throughout length (**b**)……..……..STOP



66a.

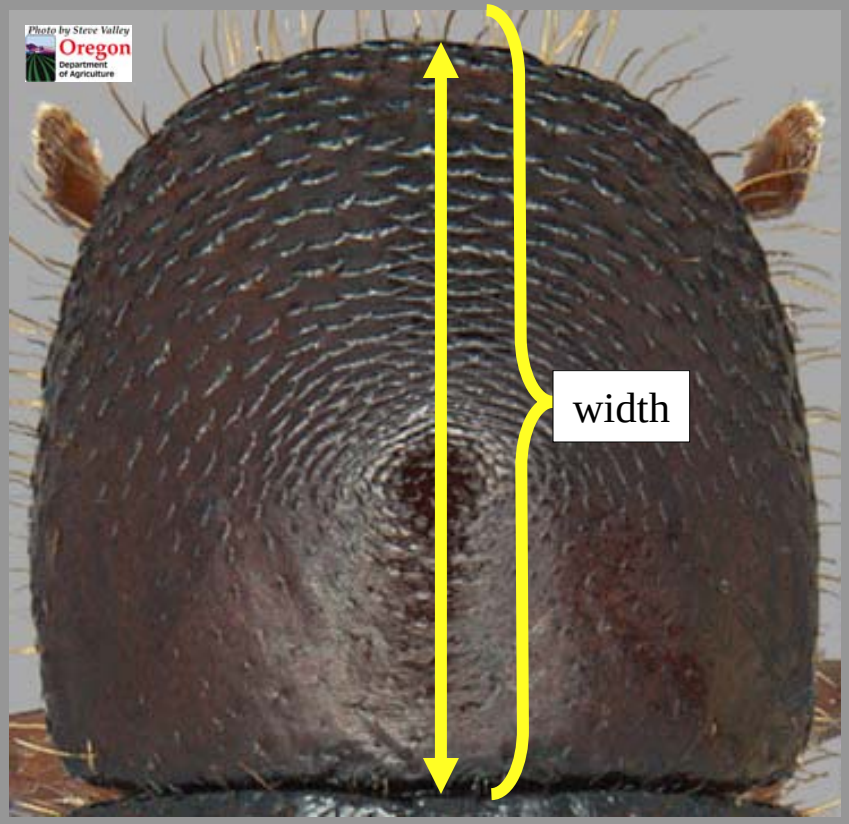


66b: Asperate throughout length.

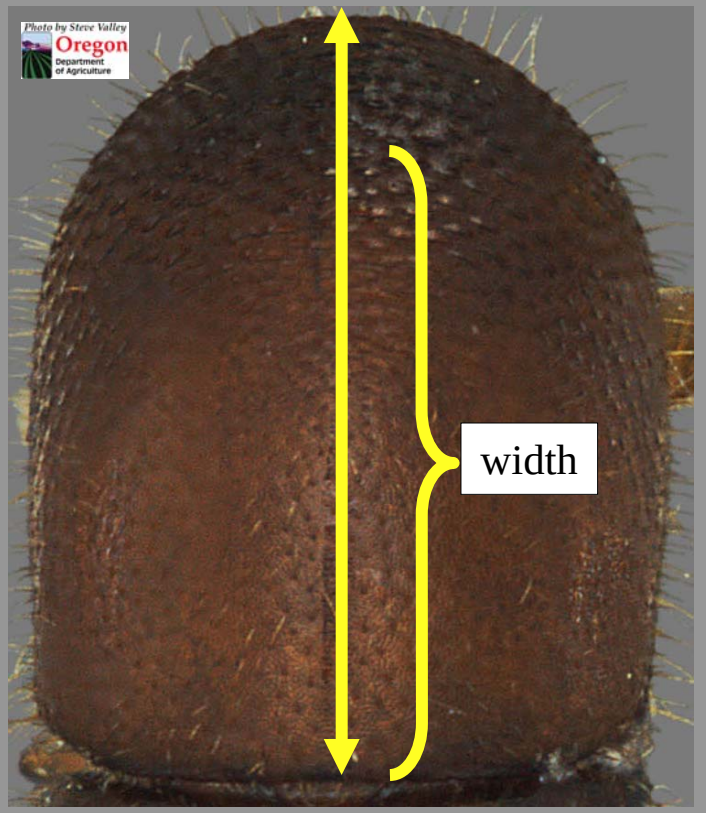
67 (66): Part I

Pronotum as wide as long, or wider (**a**); posterolateral margin of elytral declivity subacutely elevated from apex to interstria 7 (**c**); elytral punctures in rows, vestiture sparse, uniseriate (**e**)……..…68

Pronotum longer than wide (**b**); posterolateral margin of elytral declivity rounded (**d**); elytral punctures and vestiture confused, vestiture abundant (**f**)……69



67a: Pronotum wide as long, or wider.



67b: Pronotum longer than wide.

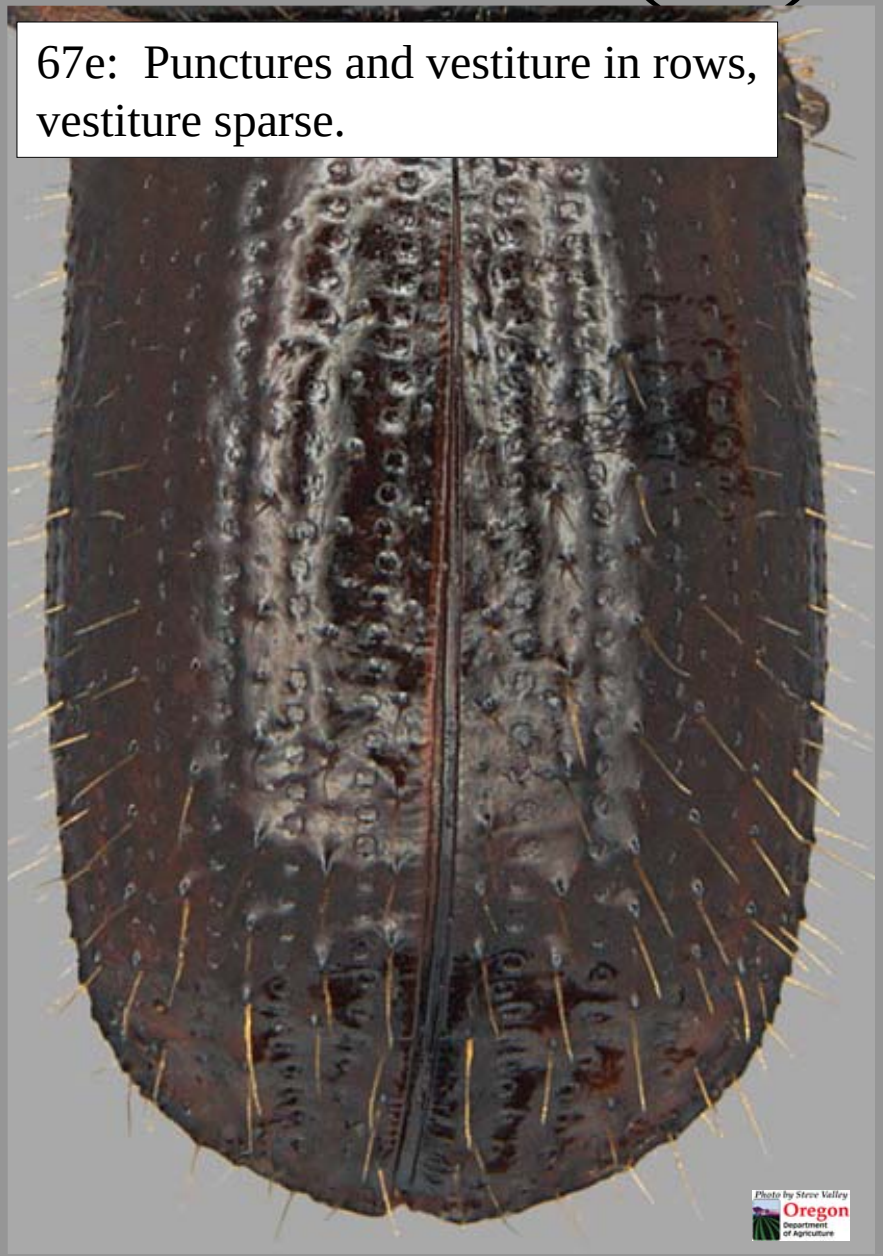
67 (65): Part II

67c: Posterolateral margin elevated.

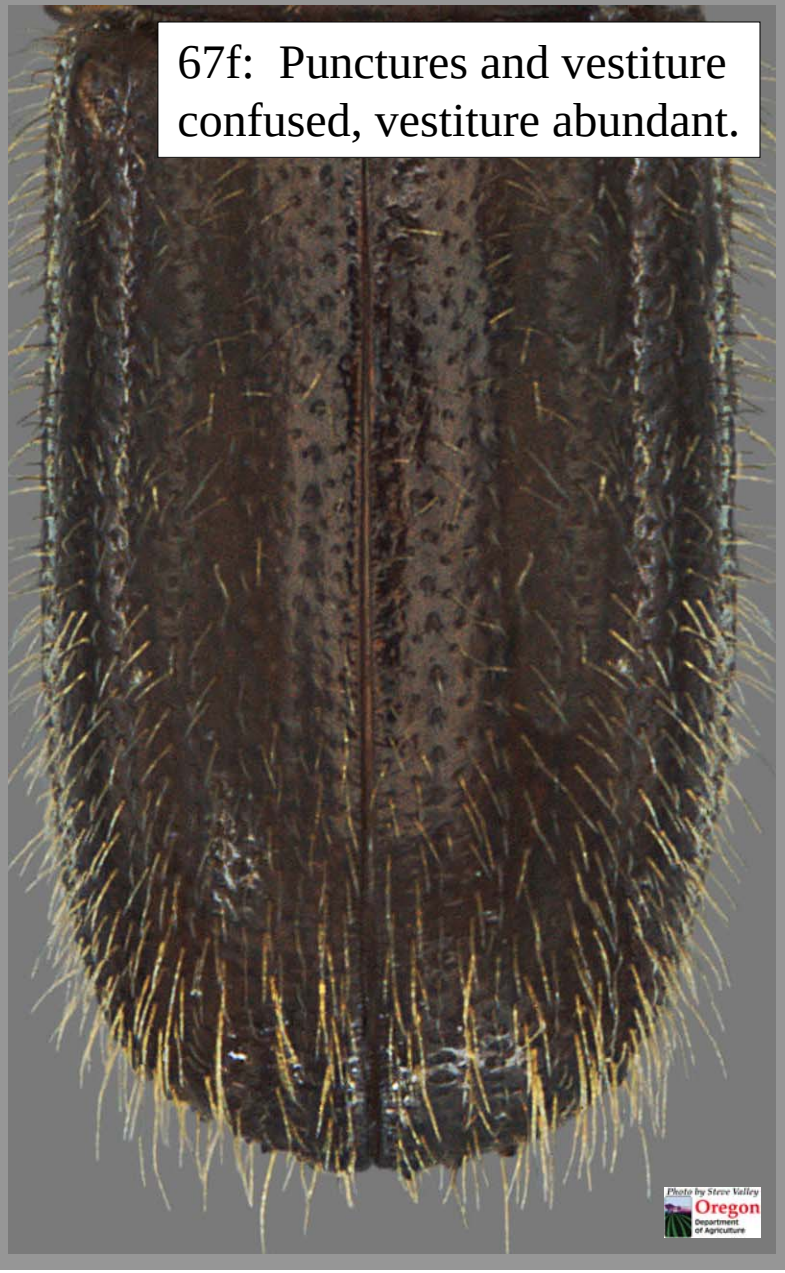
67d: Posterolateral margin rounded.

67 (65): Part III

67e: Punctures and vestiture in rows, vestiture sparse.



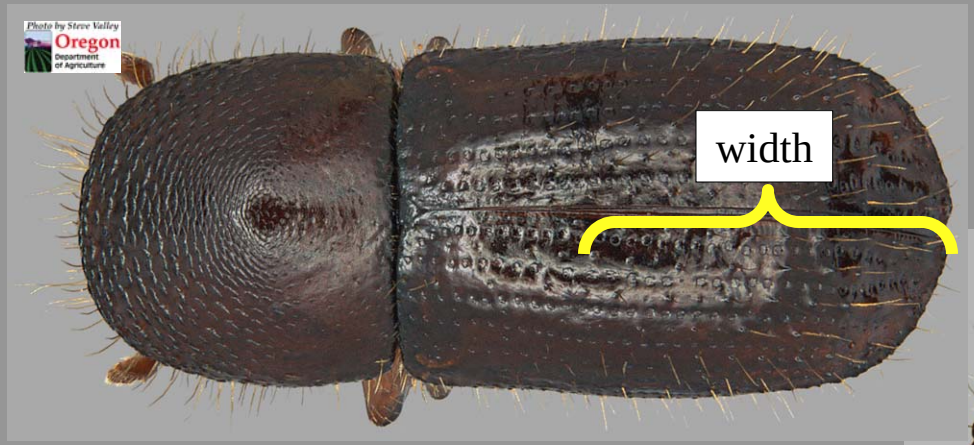
67f: Punctures and vestiture confused, vestiture abundant.



68 (67): Part I

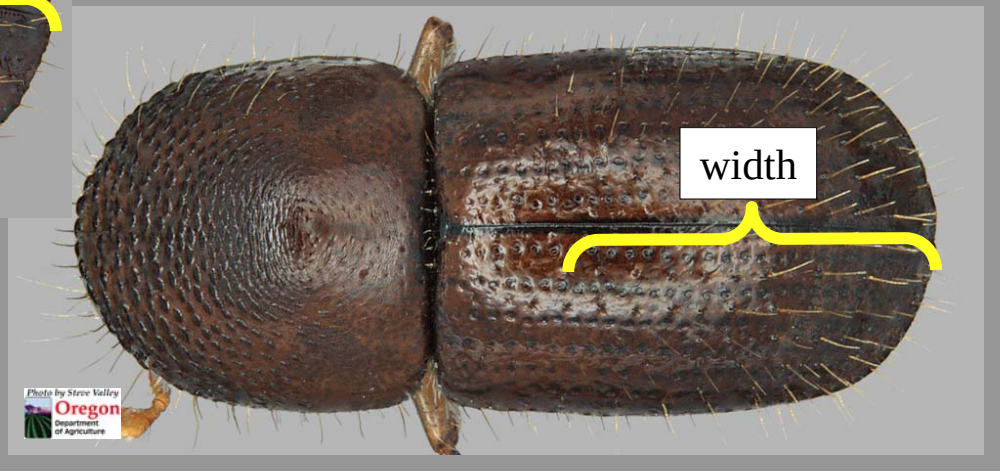
Body more slender, elytra 1.5 times long as wide (**a**); pronotum subquadrate, anterior margin weakly procurved and at most weakly serrate (**c**); elytral declival profile weakly convex (**e**); body length at least 3.5 mm; portrait (**g**)……*Euwallacea validus* (Eichoff) ♎

Body stout, elytra about 1.2 times long as wide (**b**); pronotum nearly subcircular, anterior margin distinctly procurved and coarsely serrate (**c**); elytral declival profile more strongly convex (**e**); body length less than 2.5 mm……STOP

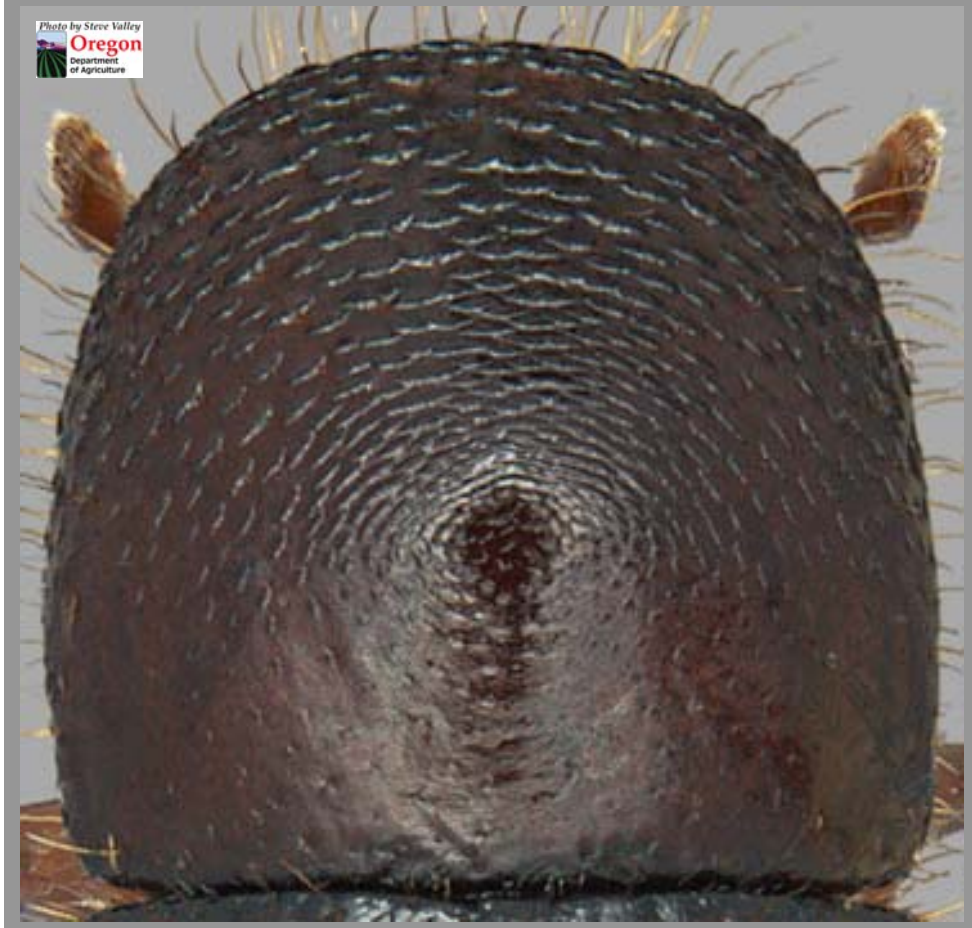


68a: Body slender.

68b: Body stout.



68 (67): Part II

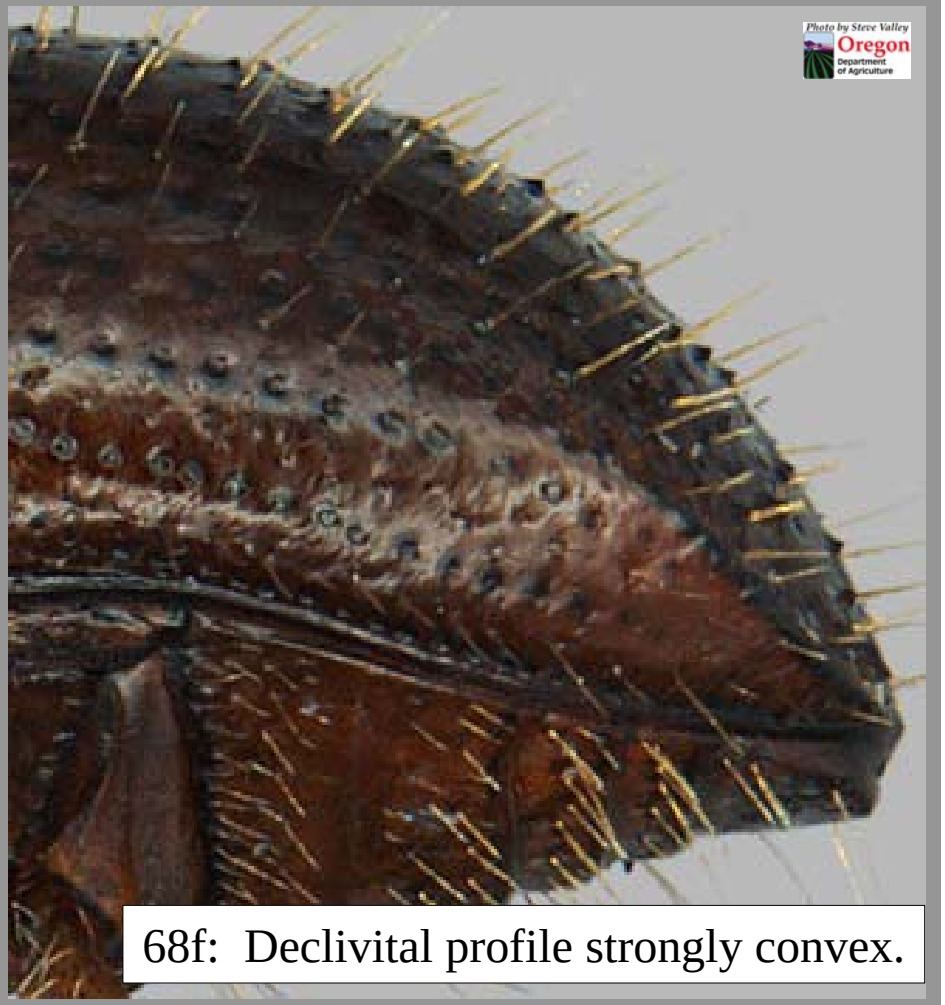


68c: Pronotum subquadrate, anterior margin weakly procurved and weakly serrate.

68d: Pronotum subcircular, anterior margin procurved and coarsely serrate.

68 (67): Part III

68e: Declivital profile flattened.



68f: Declivital profile strongly convex.

68 (67): Part IV

Euwallacea validus (Eichoff) ♎

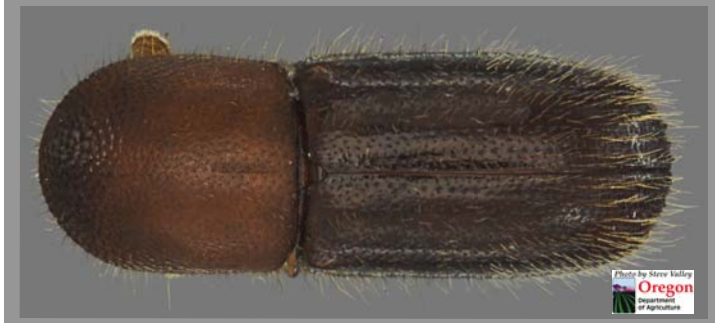
68g.

69 (67): Part I

Color of pronotum (sometimes of elytra also) yellowish brown (**a**); elytral declivity dull (**c**); smaller, total body length ~2.2 mm (**e**); portrait (**f**)…...*Xyleborus californicus* Wood ♎ ☼ ☹

Color of pronotum and elytra dark brown (**b**); elytral declivity shining (**d**); larger, total body length ~3.2 mm (**e**); portrait (**g**)……..…*Xyleborus pelliculosus* Eichoff ♎ ☼ ☹

69a: Pronotum yellowish brown.



69b: Pronotum dark brown.

69c: Declivity dull.

69d: Declivity shining.

69 (67): Part II

1 mm

1 mm

69e: Relative sizes of *Xyleborus californicus* (left) and *Xyleborus pelliculosus* (right).

69 (67): Part IV

Xyleborus californicus Wood ♎ ☼ ☹

69f.

69 (67): Part III

Xyleborus pelliculosus Eichoff ♎ ☼ ☹

69g.

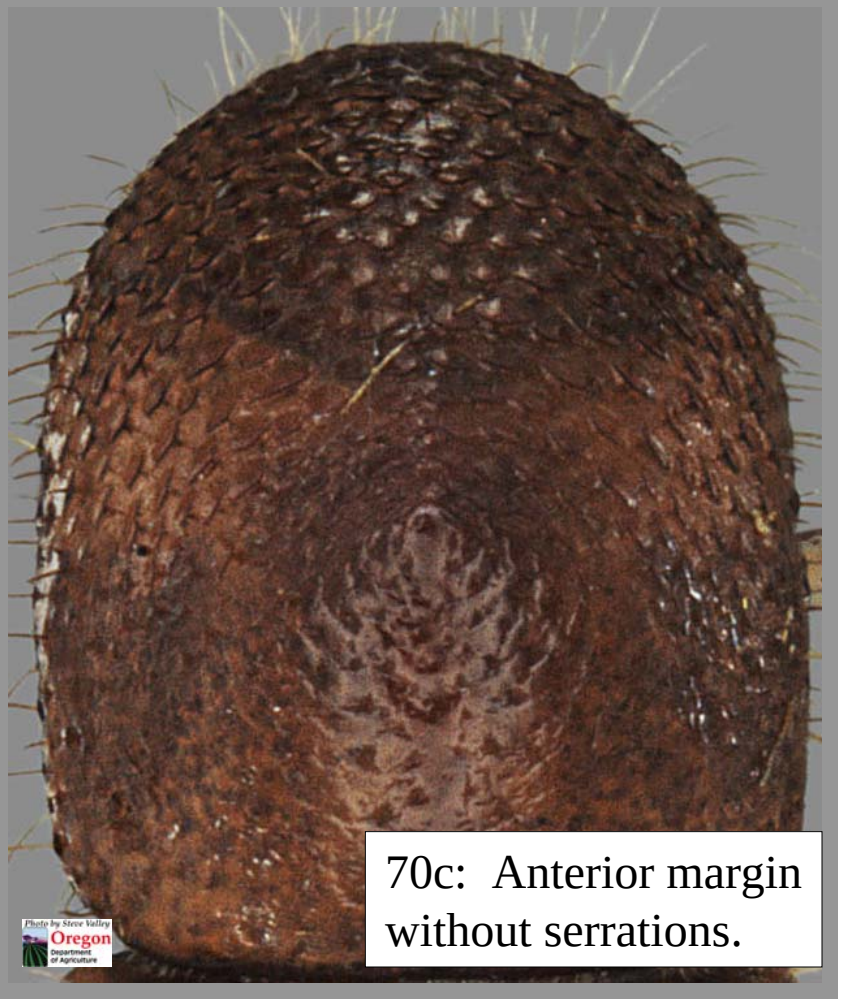
70 (65)

Anterior margin pronotum with distinct small (**a**) or large (**b**) serrations……..…71

Anterior margin pronotum without serrations (**c**)…….STOP

70a: Anterior margin with small serrations.

70b: Anterior margin with large serrations.

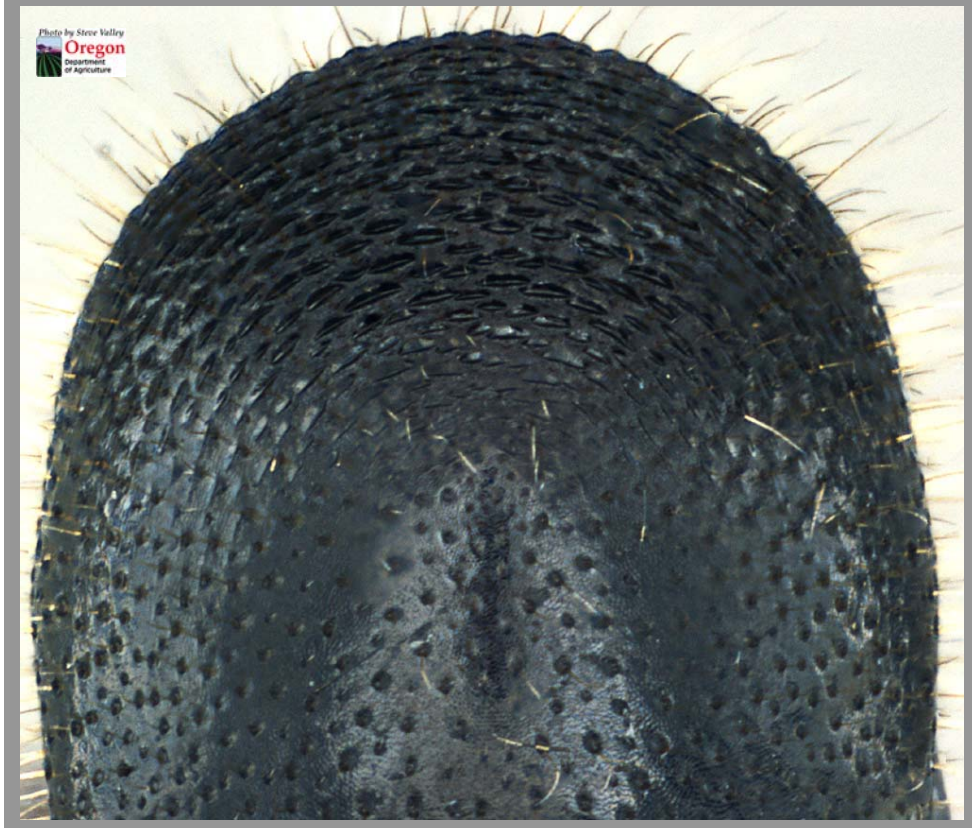


70c: Anterior margin without serrations.

71 (70)

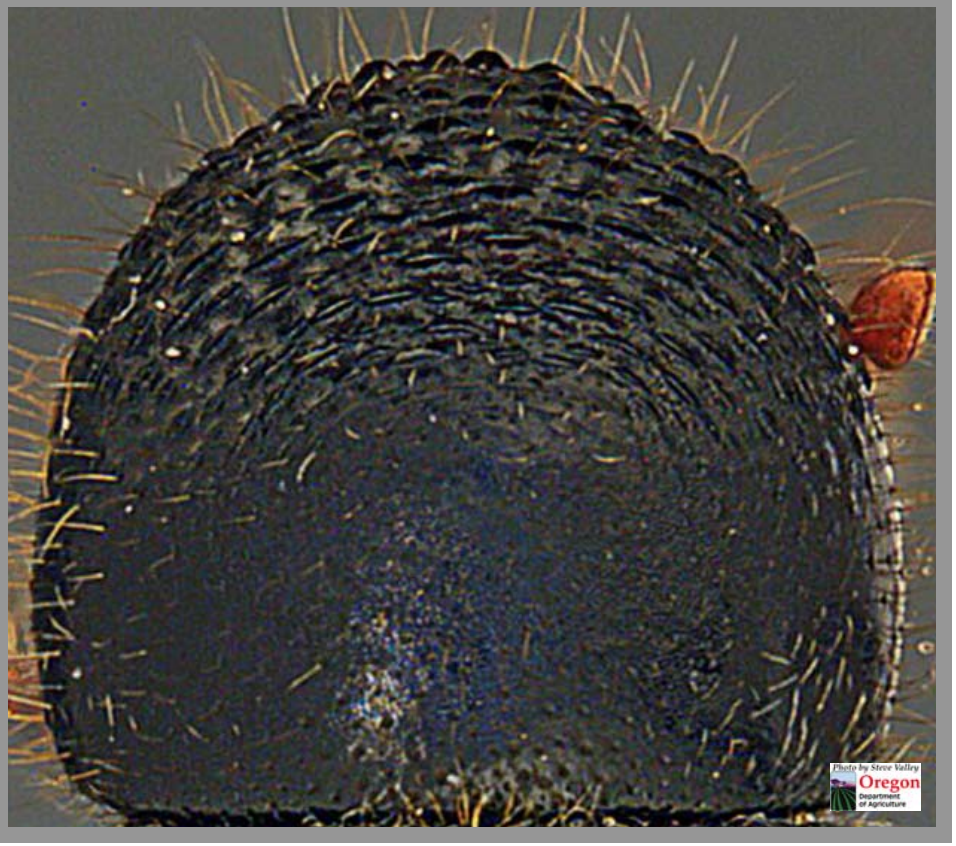
Anterior margin of pronotum with small serrations (**a**)……..…..72

Anterior margin of pronotum with several coarse serrations (**b**)……STOP



71a: Anterior margin with small serrations.

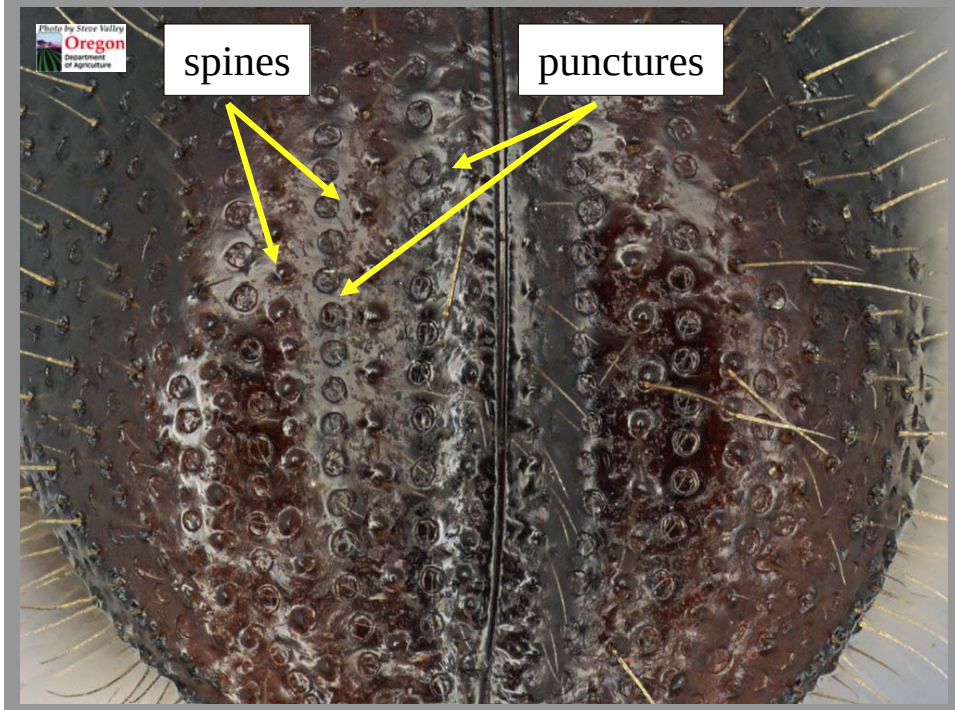
71b: Anterior margin with large serrations.



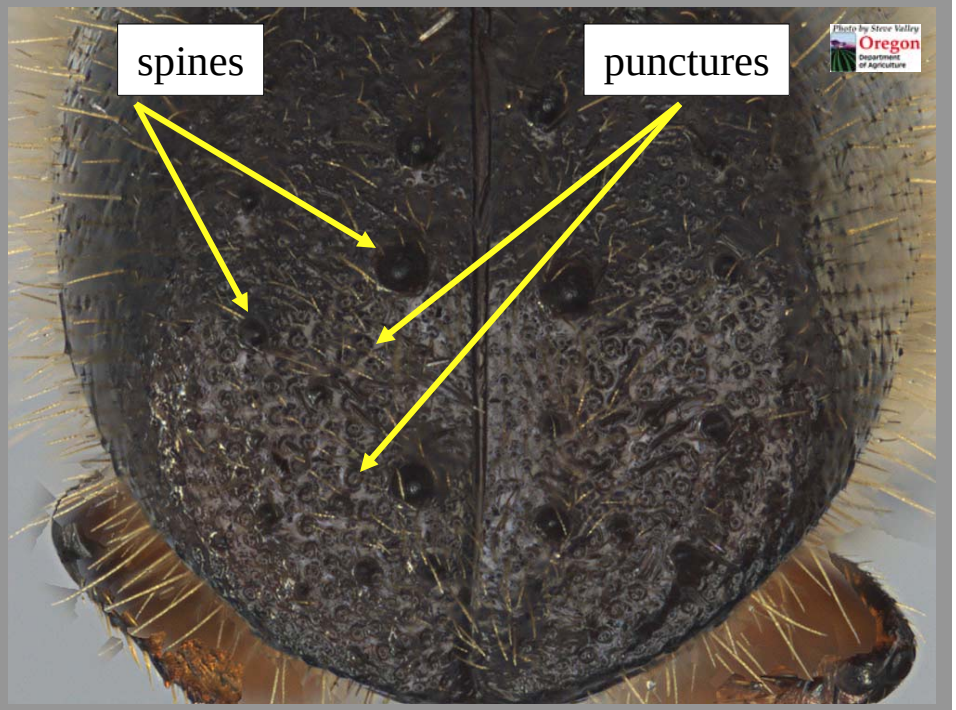
72 (71): Part I

Elytral declivity with interstrial spines smaller than strial punctures (**a)**; declivity sparsely setose (**c, d**); total body length ~3.0 mm, mature color black (**f**); portrait (**g**)……..……*Xyleborus atratus* Eichoff ☼ ☹

Elytral declivity with large spines, much larger than strial puncture (**b**); declivity heavily setose (**d, e**); total body length ~4.0 mm, mature color reddish brown (**f**)…..……..……STOP



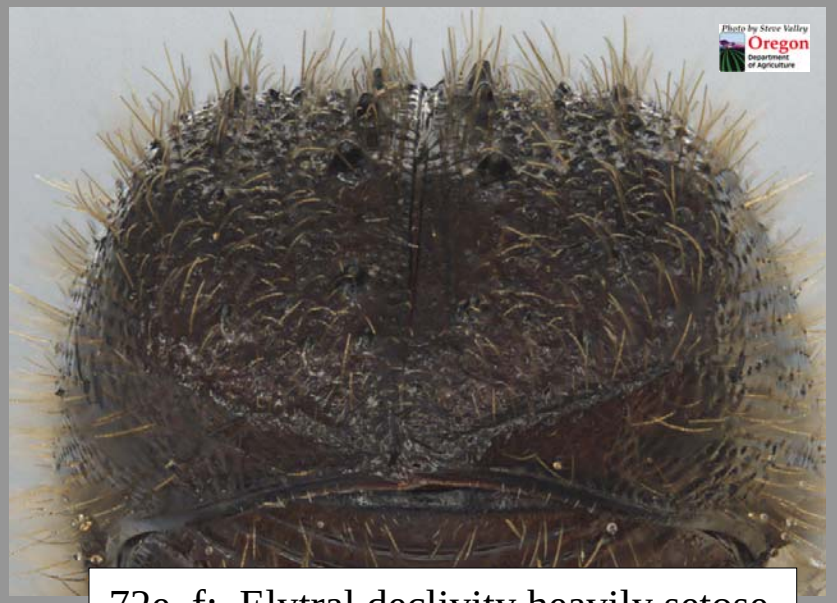
72a: Interstrial spines smaller than strial punctures.



72b: Spines larger than strial punctures.

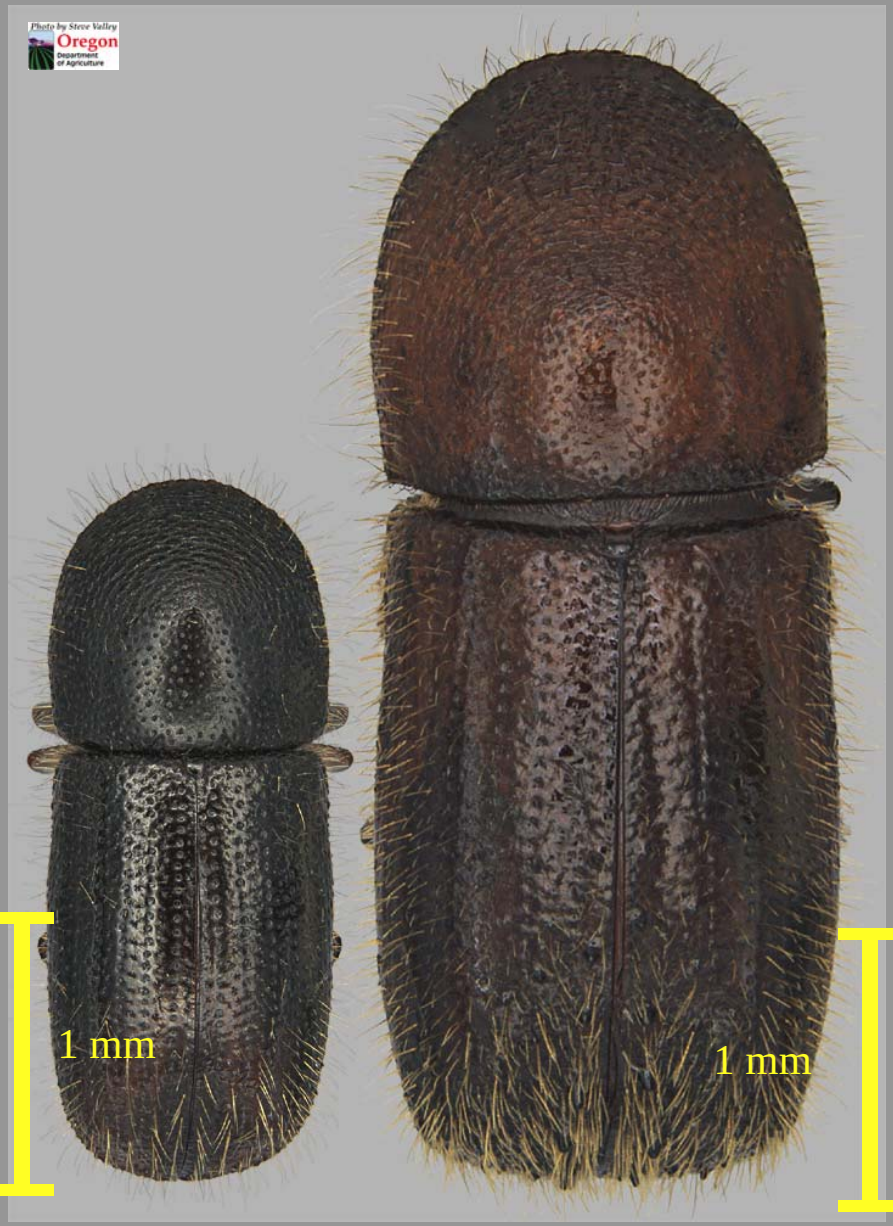
72 (71): Part II

72c, d: Elytral declivity sparsely setose.



72e, f: Elytral declivity heavily setose.

72 (71): Part III



72f: Relative sizes of *Xyleborus atratus* (note dark color), on left, and STOP species (note reddish brown color), on right.

72 (71): Part III

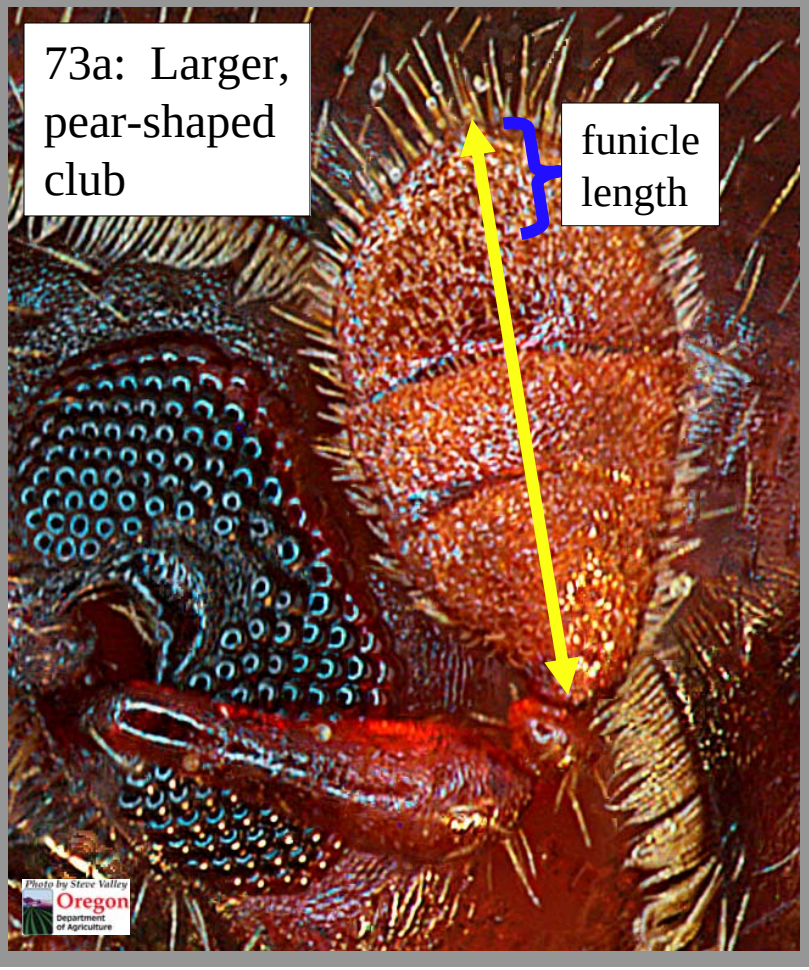
Xyleborus atratus Eichoff ☼ ☹

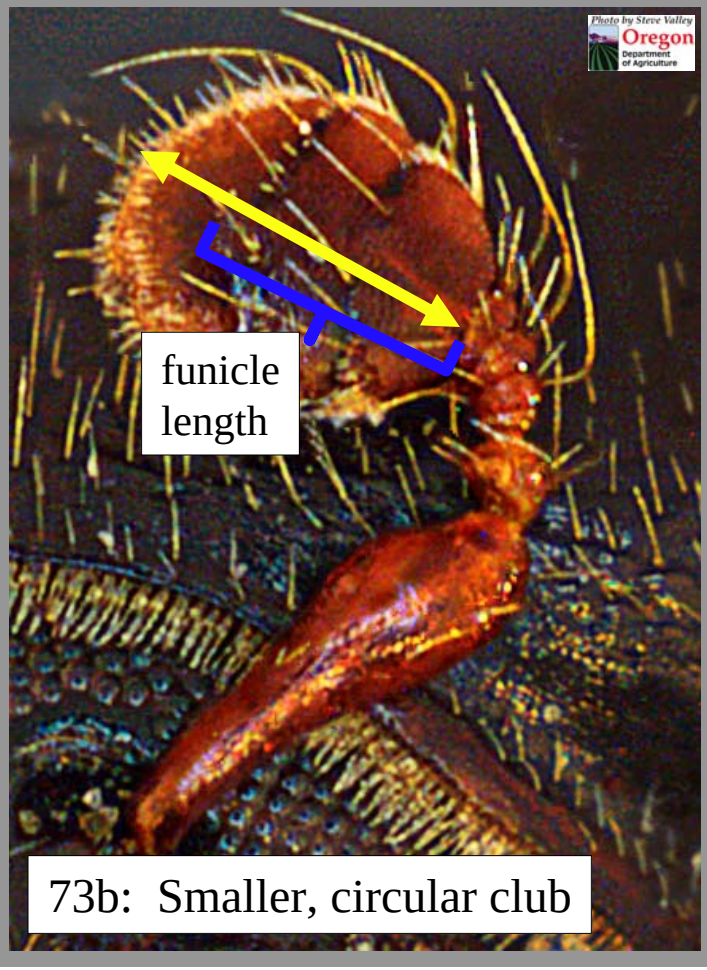
72g.

73 (19)

Antennal club very large, > 3 times funicle length, in broadest aspect pear-shaped (narrow at base, broad at apex) (**a**); funicle 1- or 2-segmented (**a**)……74

Antennal club smaller, < 2 times funicle length, in broadest aspect circular (about equal width at both base and apex) (**b**); funicle 5-segmented (**b**)……..76



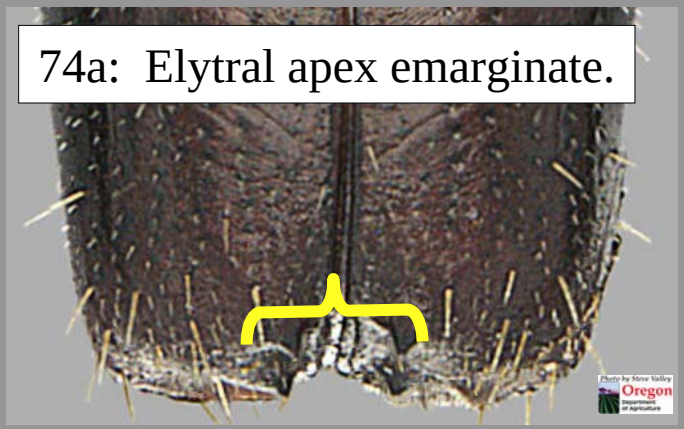


74 (73): Part I

Elytral apex emarginate at suture (dorsal view) (**a**); posterior surface of protibia tuberculate (**c**); antennal funicle 2-segmented (the 2nd segment is small and hard to see) (**e**); body slender (**g**)……..……75

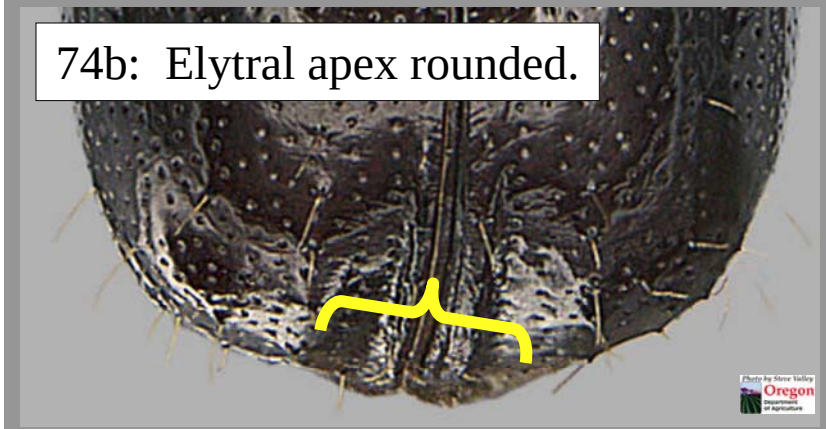
Elytral apex rounded at suture (dorsal view) (**b**); posterior surface of protibia smooth (**d**); antennal funicle 1-segmented (**f**); body stout (**h**)..……..STOP

74a: Elytral apex emarginate.



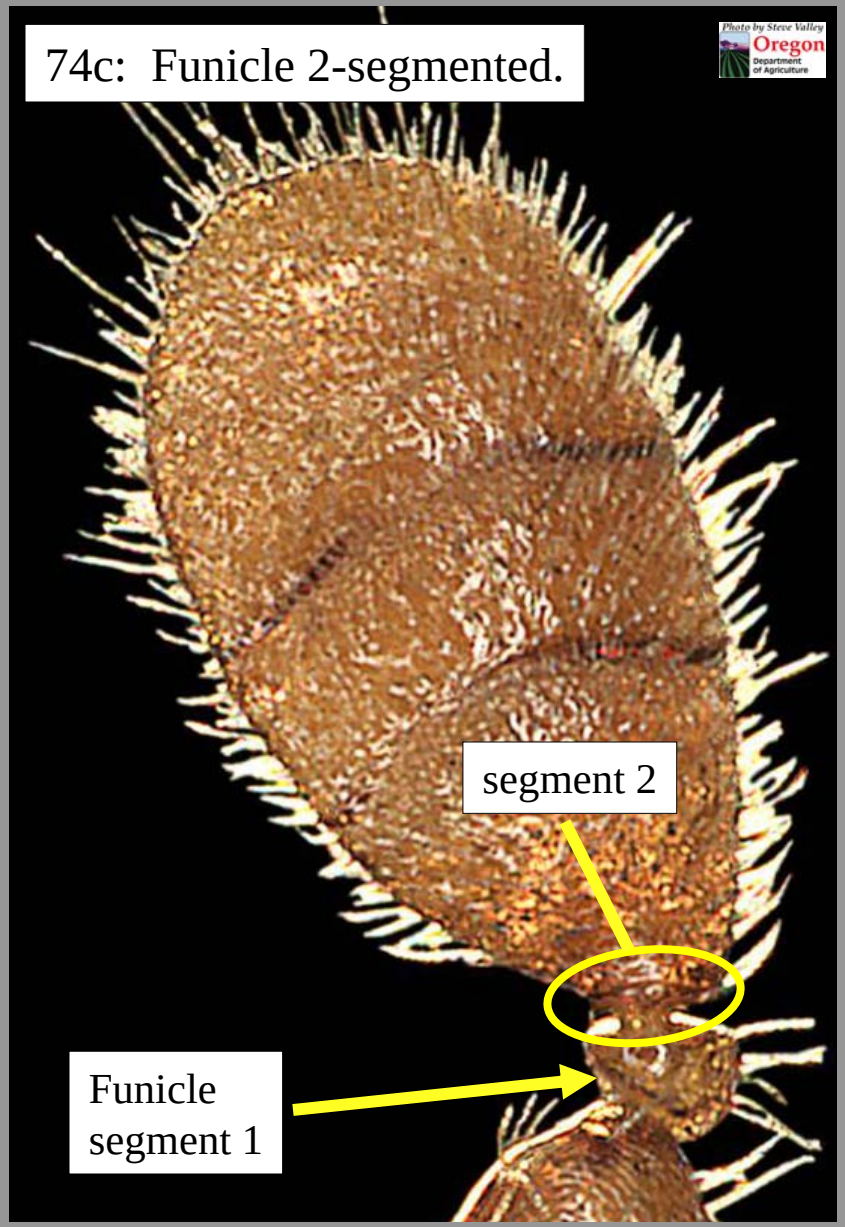
74c: Posterior of protibia roughened.

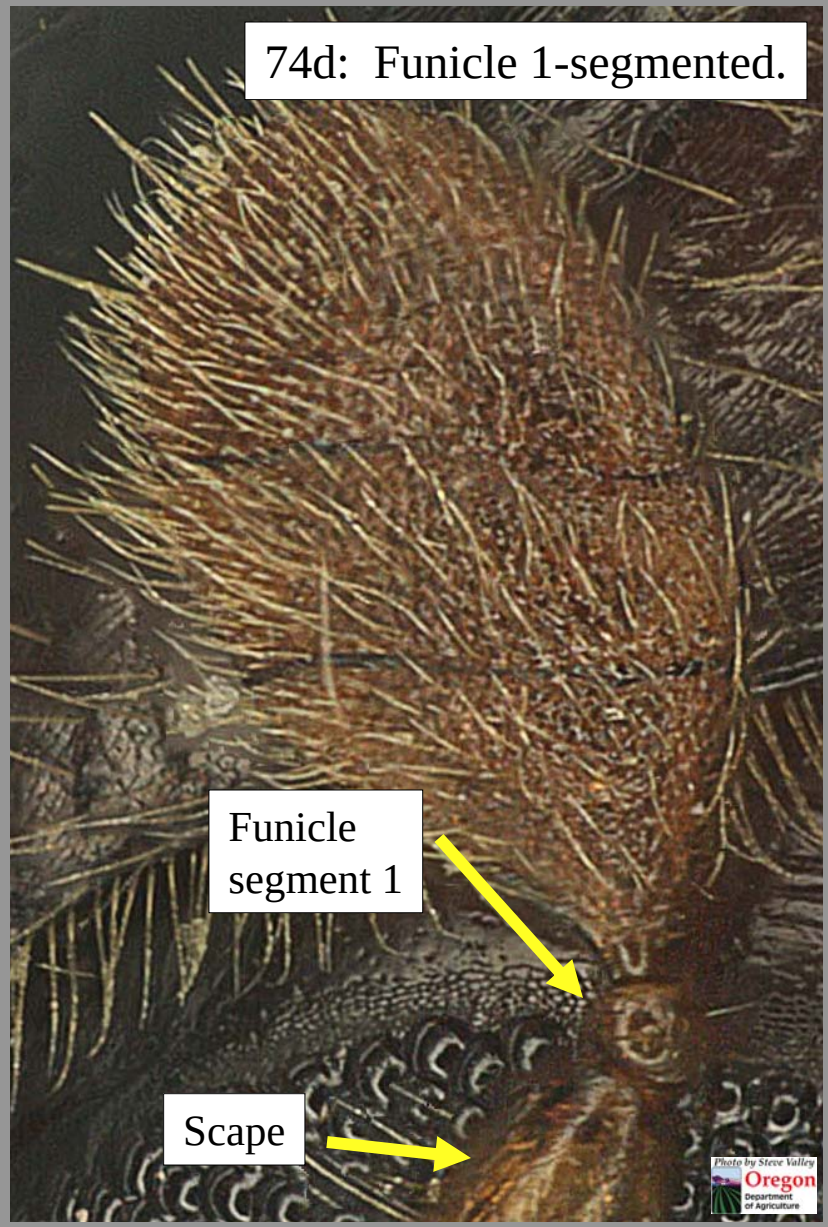
74b: Elytral apex rounded.



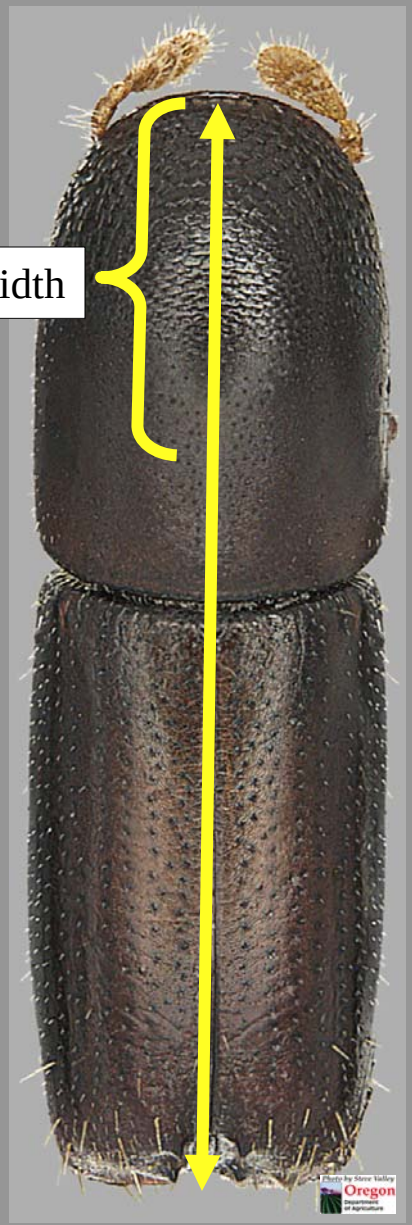
74d: Posterior of protibia smooth.

74 (73): Part II

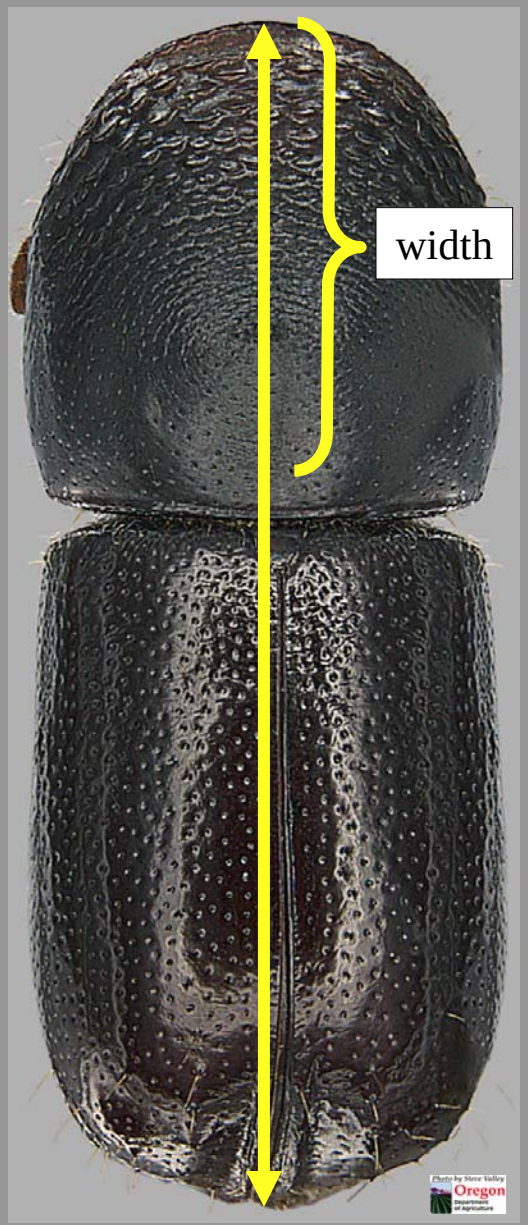

74c: Funicle 2-segmented.
Photo by Steve Valley
Oregon
Department of Agriculture
segment 2
Funicle segment 1


74d: Funicle 1-segmented.
Funicle segment 1
Scape
Photo by Steve Valley
Oregon
Department of Agriculture

74 (73): Part III



74e: Body slender.



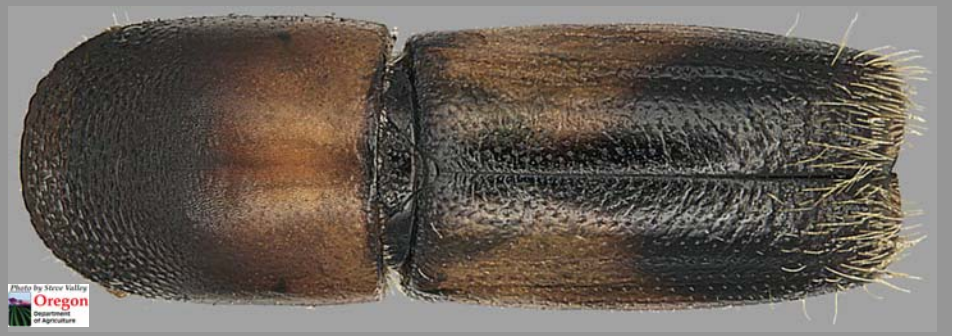
74f: Body stout.

75 (73): Part I

Elytra and pronotum uniformly brown (**a, b**); declivity with 2 pairs of widely separated tubercles and few seta (**d**); portrait (**f**)….*Monarthrum mali* (Fitch) ♎ ☼

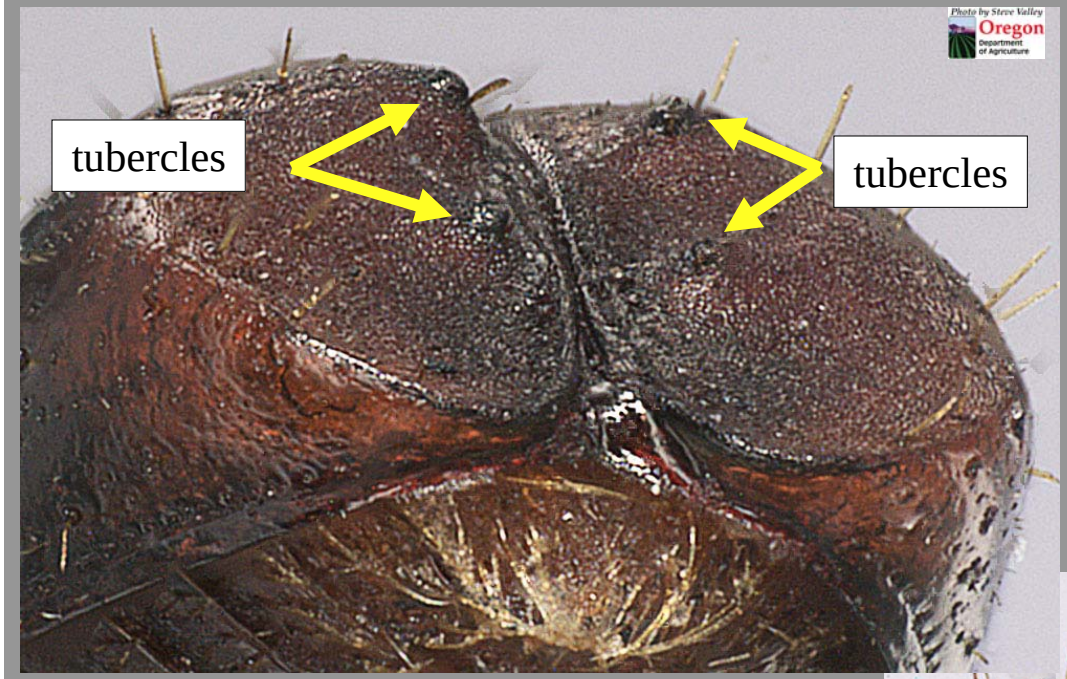
Posterior of pronotum and anterior of elytra pale yellow, rest brown (**c, d**); declivity with a single pair of small tubercles and many setae (**e**); portrait (**g**)……..…….*Monarthrum fasciatum* (Say) ♎ ☼

75a, b: Elytra and pronotum brown.



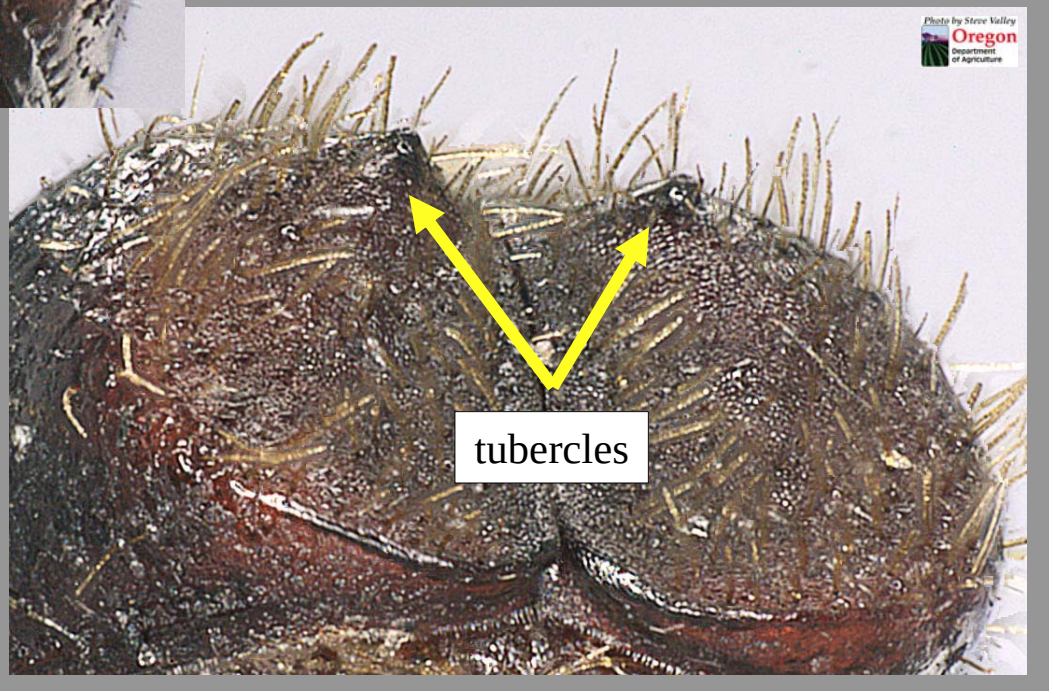
75c, d: Elytra and pronotum bi-colored.

75 (73): Part II



75e: Declivity with 2 pairs of tubercles and few setae.

75f: Declivity with single pair of tubercles and many setae.



75 (73): Part III

Monarthrum mali (Fitch) ♎ ☼

75g.

75 (73): Part IV

Monarthrum fasciatum (Say) ♎ ☼

75h.

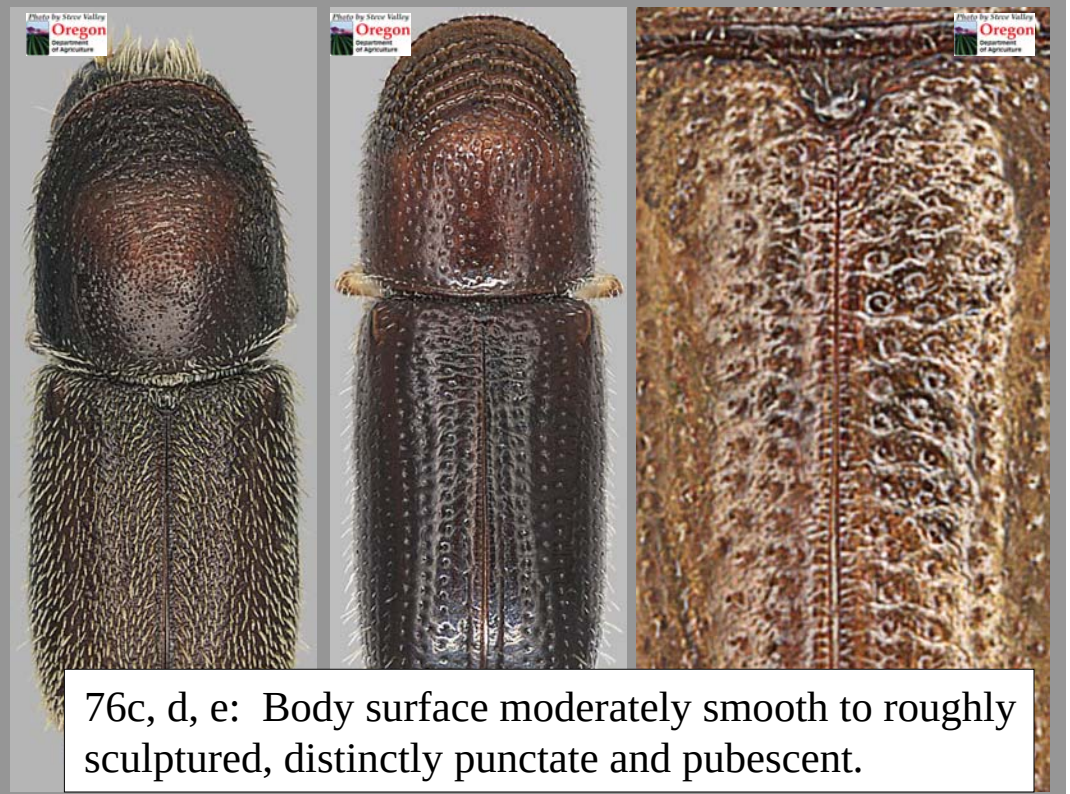
Photo by Steve Valley
Oregon
Department of Agriculture

76 (73): Part I

Body surface smooth, punctures small and shallow, pubescence scant (**a, b**); antennal club and funicle of female with long, curved setae (**f, g**); body very slender (**j**); portrait (**n**)……..……..……..*Gnathotrichus materiarius* (Fitch) ♎ ☼

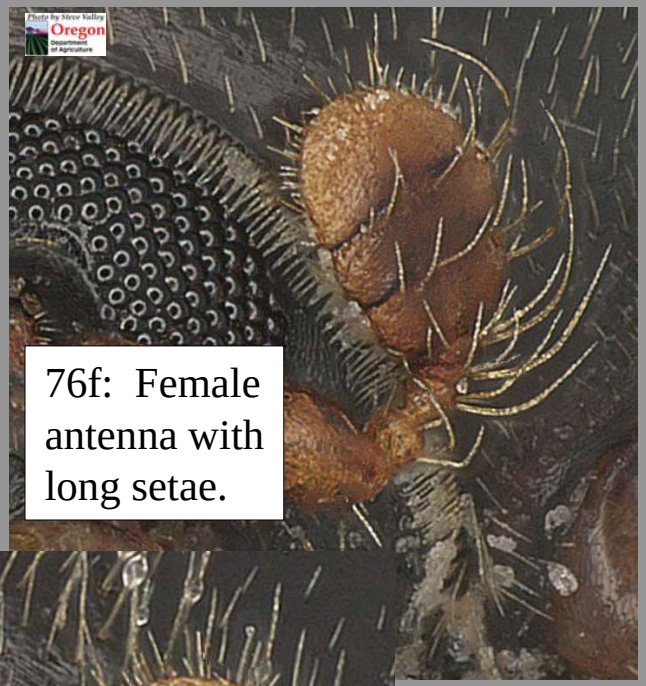
Body surface moderately smooth to rough, distinctly punctured and pubescent (some with scales) (**c-e**); antennal club and funicle of female devoid of special pubescence (**h, i**); body slender to stout (**k-m**)..……77

76a, b: Body surface smooth, punctures small, shallow, pubescence scant.



76c, d, e: Body surface moderately smooth to roughly sculptured, distinctly punctate and pubescent.

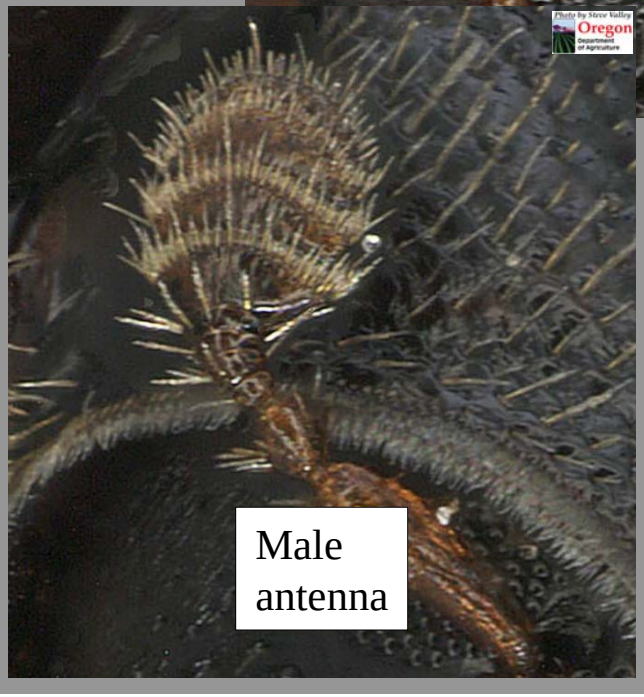
76 (73): Part II



76f: Female antenna with long setae.

Female antenna

76g: Male antenna with short setae.

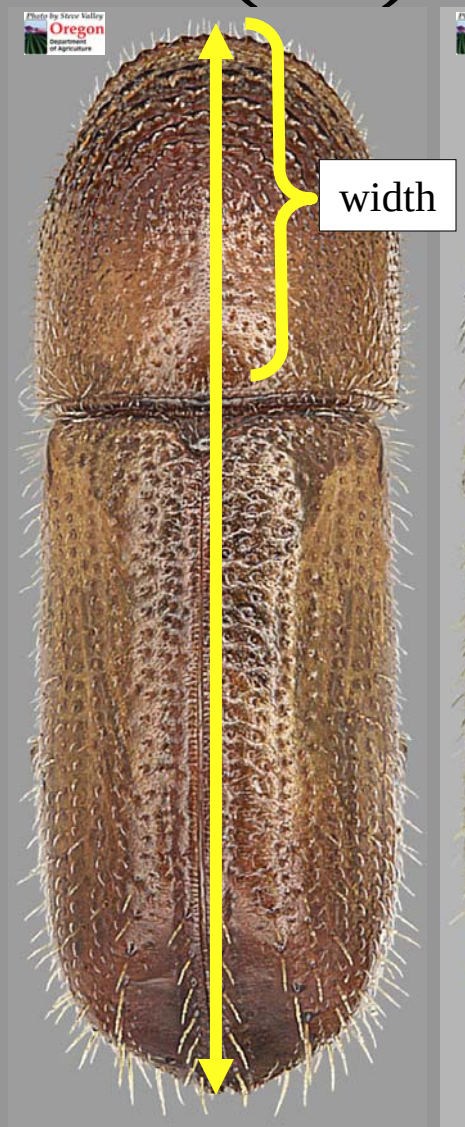


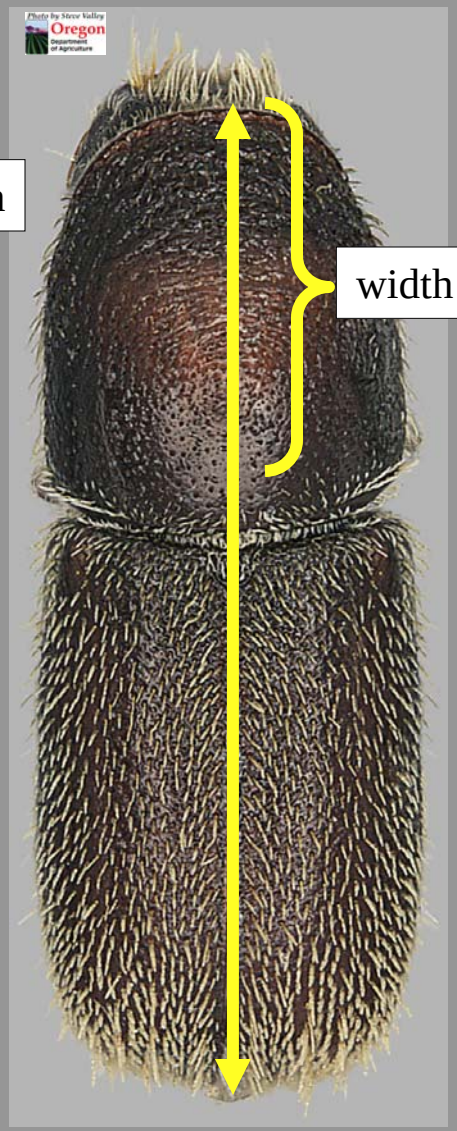
Male antenna

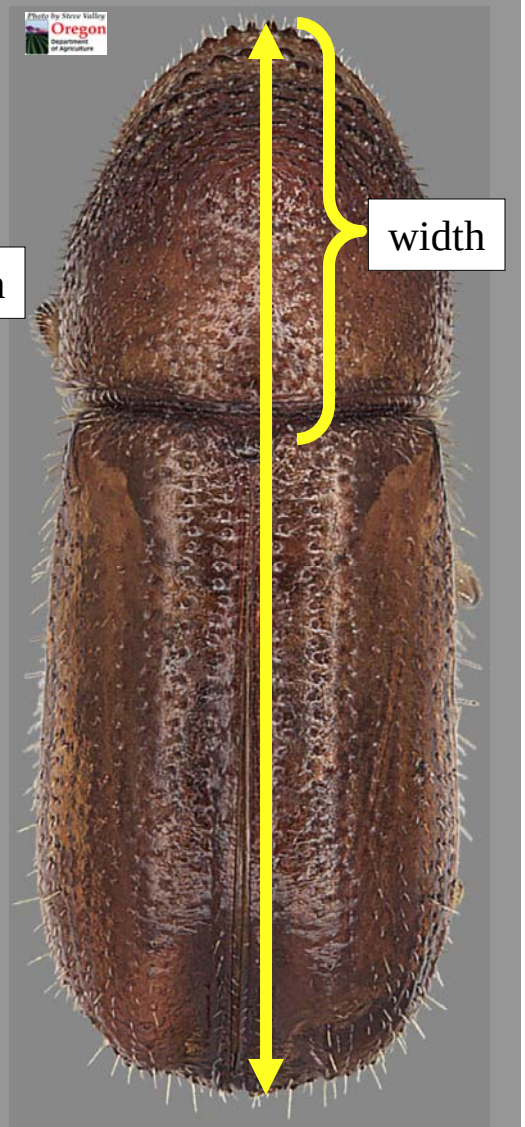
76h, i: Female and male antennae both without long, curved setae.

76 (73): Part III

76j: Body always very slender.







76k, l, m: Body slender to stout.

76 (73): Part IV

Gnathotrichus materiarius (Fitch) ♎ ☼

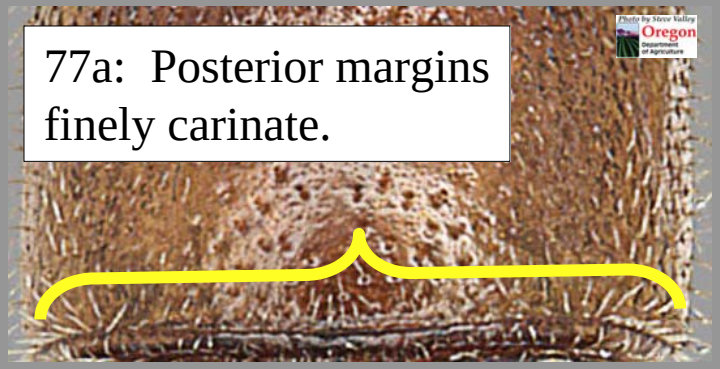
76n.

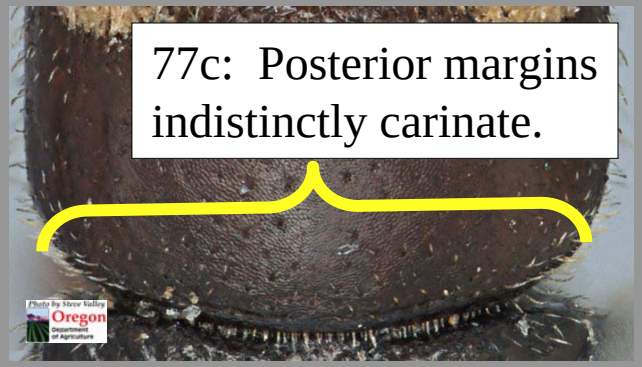
77 (76)

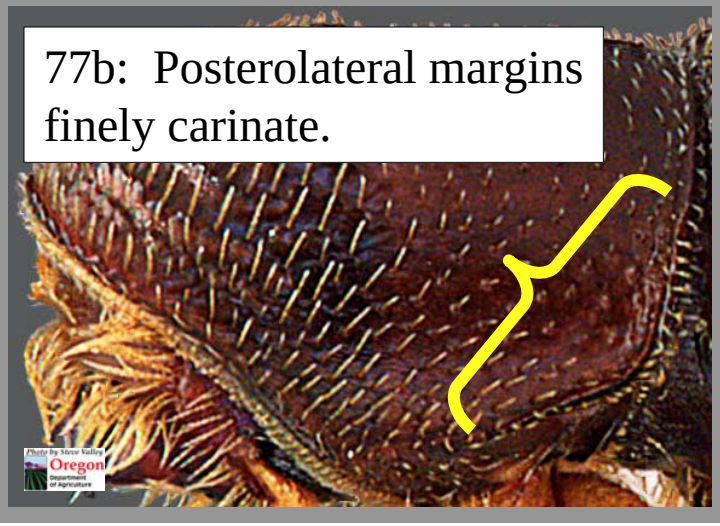
Posterior (**a**) and posterolateral (**b**) pronotal margins distinctly finely carinate……..…78

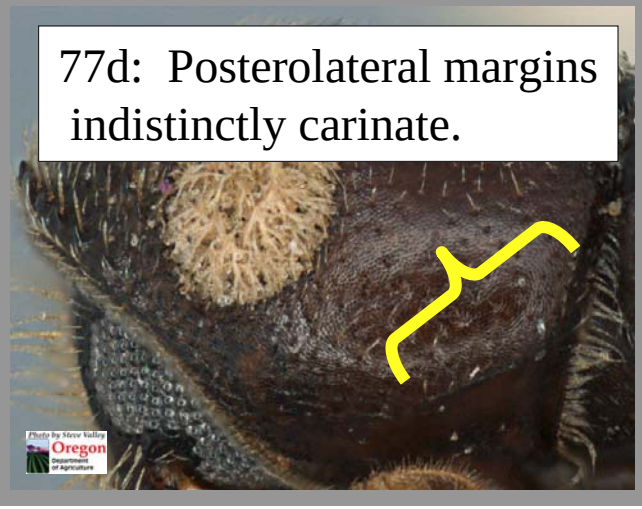
Posterior (**c**) and posterolateral (**d**) pronotal margins at most indistinctly finelycarinate…….STOP

anterolateral pronotal pubescent patches not present in all specimens





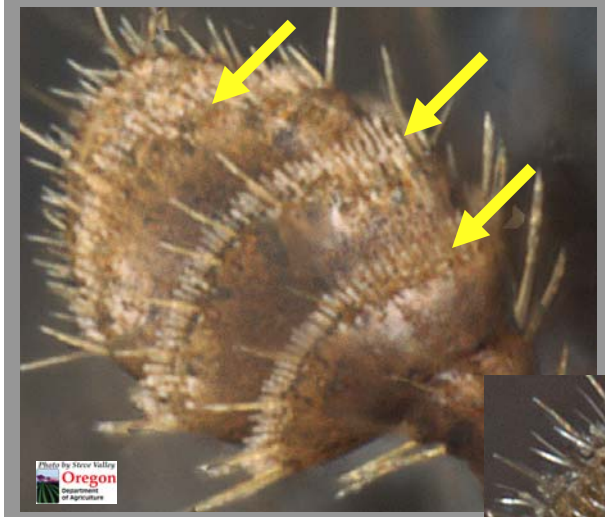




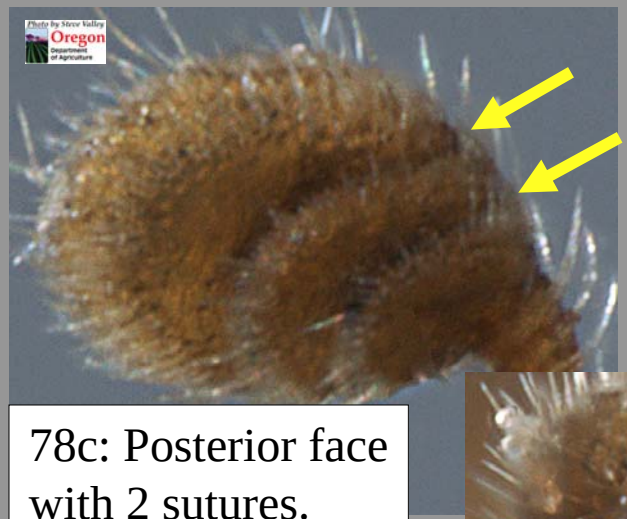
78 (77): Part I

Antennal club with at least 2 complete sutures (on both faces) indicated by setae (**a, c**); anterior dorsum of pronotum more strongly declivous (**e. f**)…....79

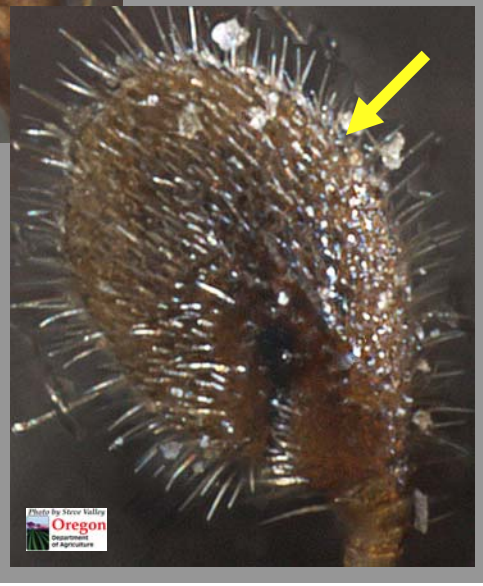
Antennal club with only one suture on anterior face (**b**) and without sutures on posterior face (**d**); dorsum of pronotum evenly rounded in profile (**g**)…..STOP



78a: Anterior face with at least 2 sutures.



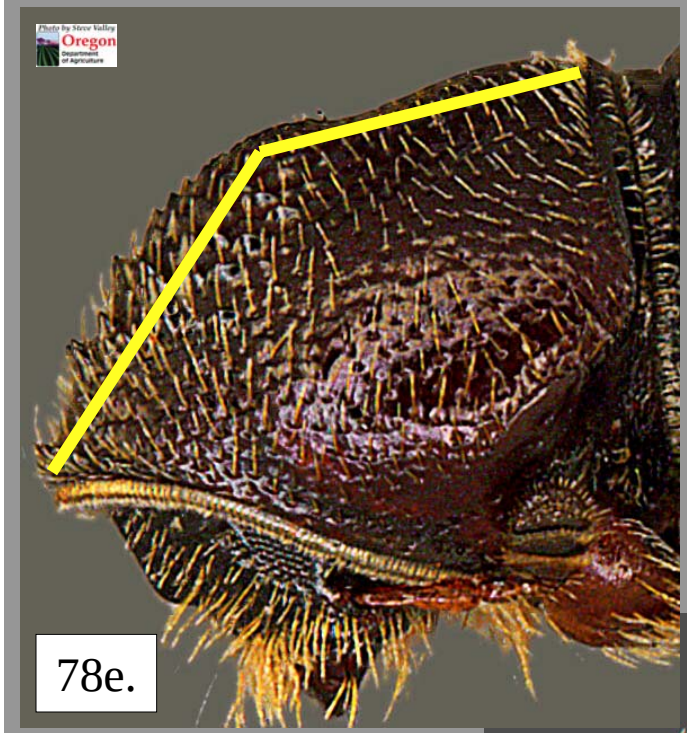
78c: Posterior face with 2 sutures.



78b: Anterior face with 1 suture.

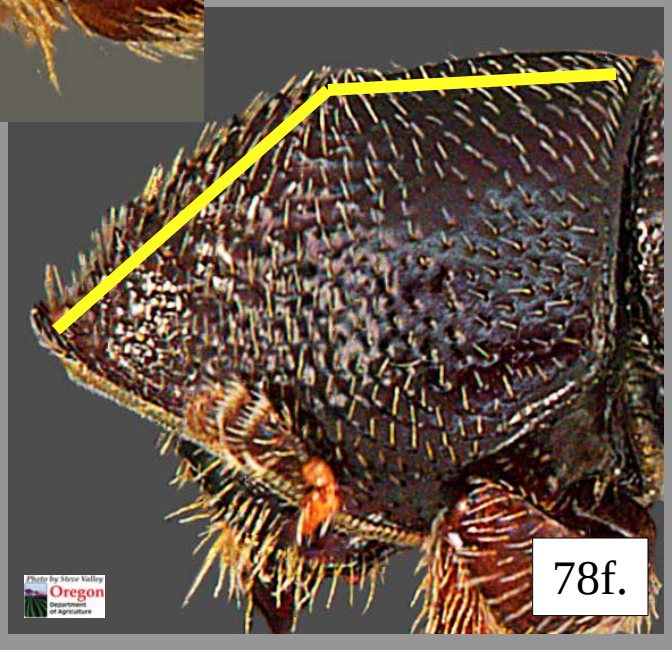
78d: Posterior face with no sutures.

78 (77): Part II

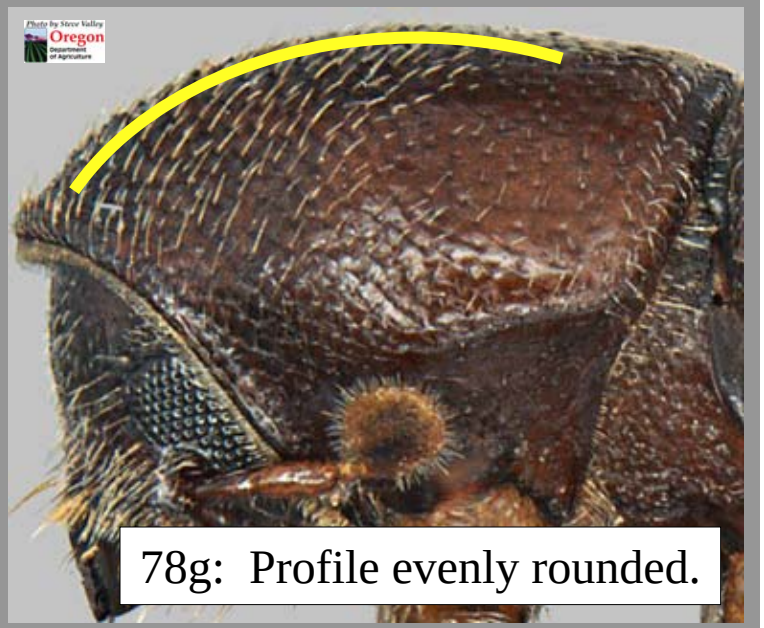


78e.

78e, f: Anterior profile declivous.



78f.

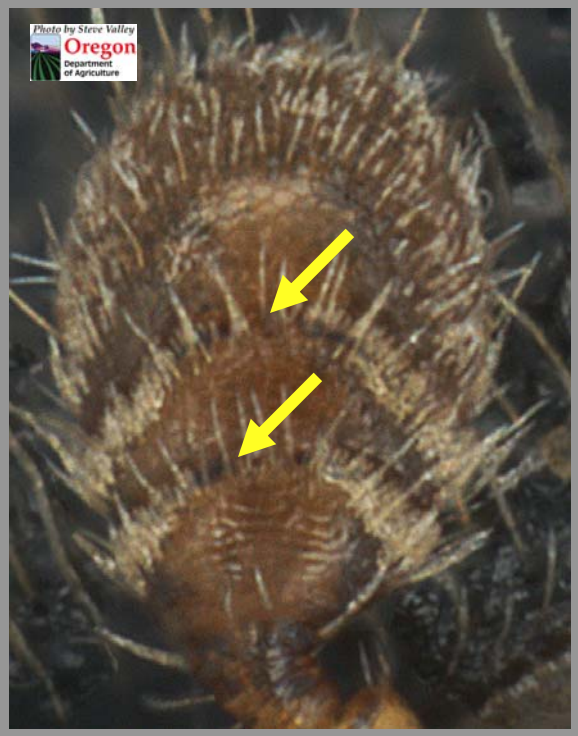


78g: Profile evenly rounded.

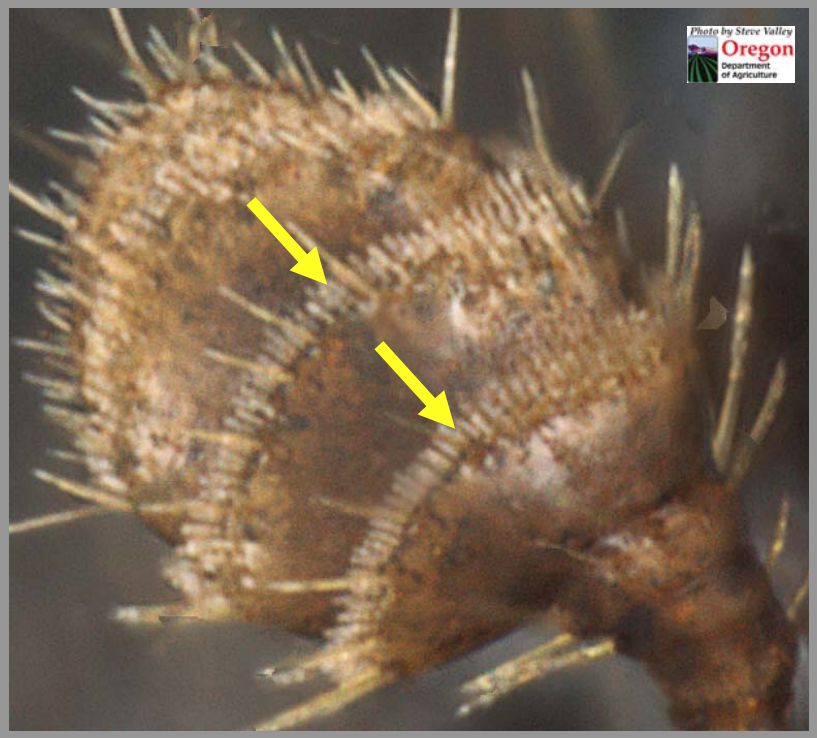
79 (78): Part I

First and second antennal club sutures septate (**a**); most pronotal asperities anterior of middle, transition from asperate to punctate surface abrupt (**c, d**)……80

Antennal club sutures not septate (**b**); lateral pronotal asperities extend posterior of middle, transition from asperate to punctate surface gradual (**d**)……..……STOP

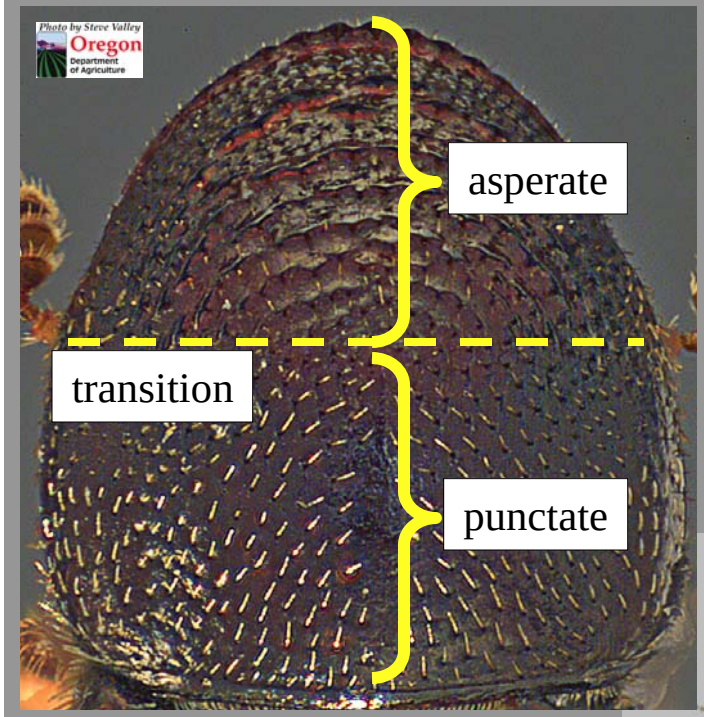


79a: 1st & 2nd sutures septate.

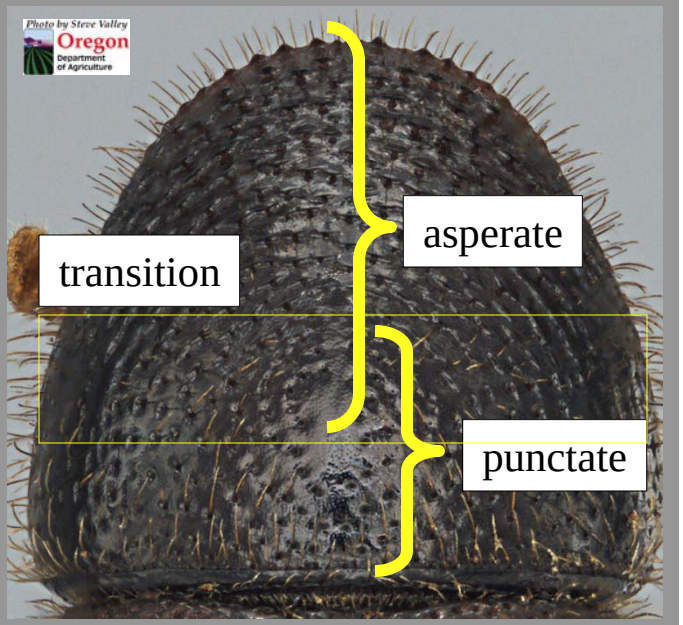


79b: 1st & 2nd sutures aseptate.

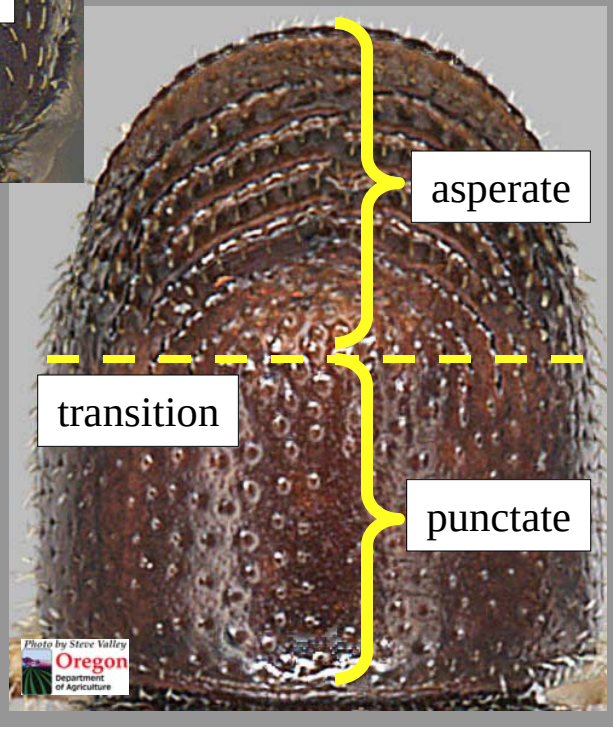
79 (78): Part II

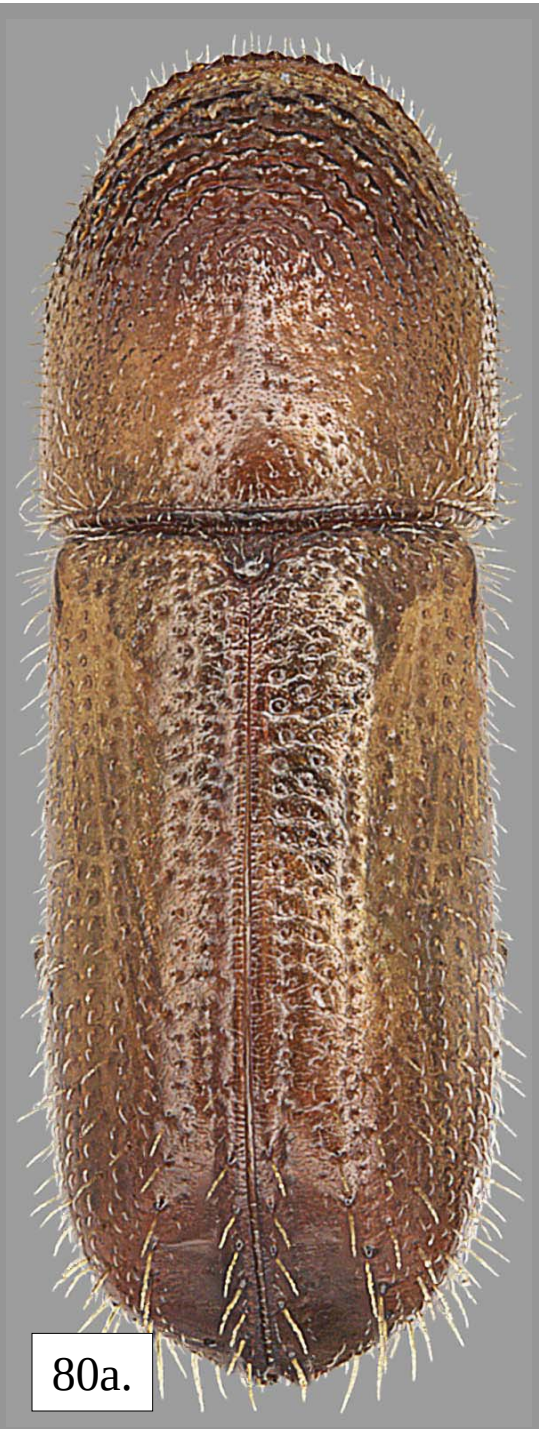


79e: Lateral asperities extend posterior of middle, transition gradual.



79c, d: Asperate anterior of middle, transition abrupt.





80a.

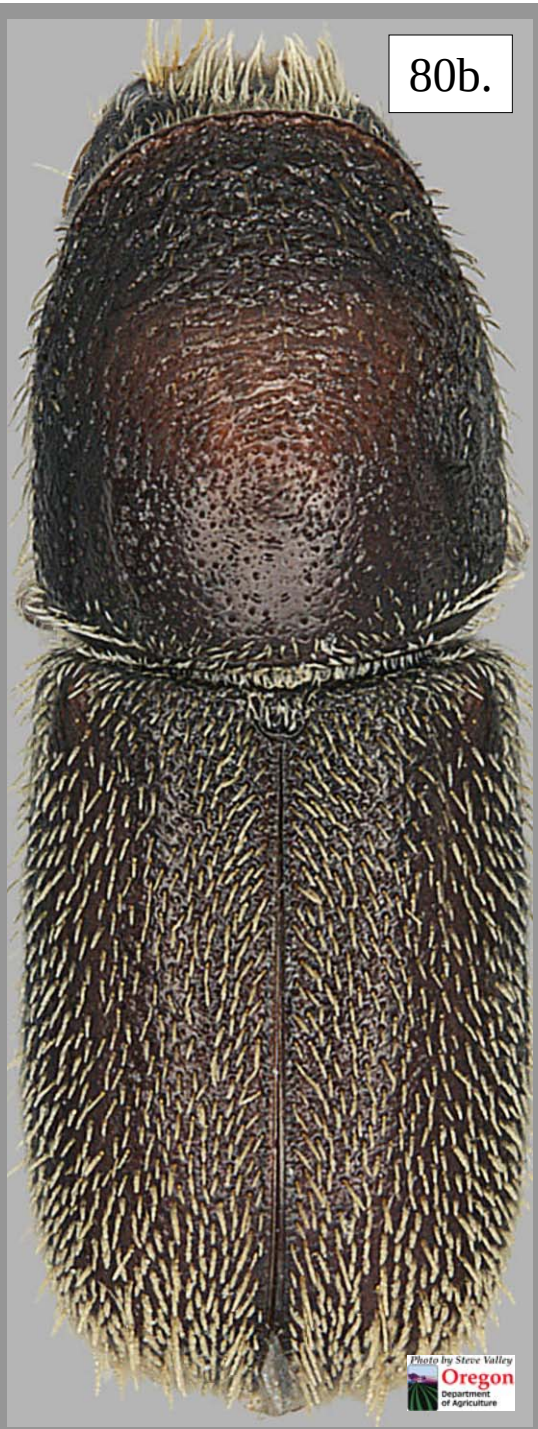
80 (79)

Pronotum and elytra more coarsely, less densely punctured (**a**); vestiture longer, less dense, always setose (**a**); portraits **(c-e)** …*Pityophthorus* spp. ♎ ☼

*Members of this speciose genus are difficult to identify beyond this point.

**Species of *Pityotrichus*, a rarely collected genus from the south-western U.S., may key here.

Pronotum and elytra minutely, densely punctured (**b**); vestiture very short, dense, almost always scale-like (**b**)…..……....STOP



80b.

81 (80): Part II

Pityophthorus spp. ♎ ☼