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DYNASTINAE)**

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STRATEGUS SYPHAX (FABR.): A DESCRIPTION OF THE
THIRD INSTAR LARVA AND PUPA (COLEOPTERA:
SCARABAEIDAE: DYNASTINAE)

BRETT C. RATCLIFFE¹ AND FORTUNÉ CHALUMEAU²

ABSTRACT

The third instar larva and pupa of *Strategus siphax* (Fabr.) are described, and a key is presented for the known larvae of the genus *Strategus*.

Strategus siphax (Fabr.) (Figs. 1-2) is a moderately large dynastine (to 53 mm) which occurs in Guadeloupe in the French West Indies (Chalumeau and Gruner 1977; Ratcliffe 1976). Virtually nothing is known of its life cycle. Larvae have been found on rare occasions in decaying tree trunks in the rain forest of Basse-Terre. On Grands-Fonds they have been found in compost heaps (sugar cane leaves and horse or cow manure) and in the decaying trunks of the "poirier tree" (*Tabebuia pallida* Myers: Bignoniaceae). Adult activity is primarily from July to October. The immature stages have not been previously characterized, but with the procurement of 2 larvae and a pupa by Chalumeau in 1977, we take this opportunity to present descriptions of these stages in an attempt to further contribute to the knowledge of the genus *Strategus*.

Larval descriptions exist for only 3 of the 30+ species in the genus, and these were provided by Ritcher (1944, 1966). We have included below a key to larval *Strategus* by incorporating *S. siphax* into Ritcher's key, and we are hopeful that this key will be continually expanded and re-written as additional larvae are recognized and described. The description of *S. siphax* which follows is based on the 2 larvae and single pupa mentioned above, and the terminology follows that of Ritcher (*loc. cit.*).

Strategus siphax (Fabr.)

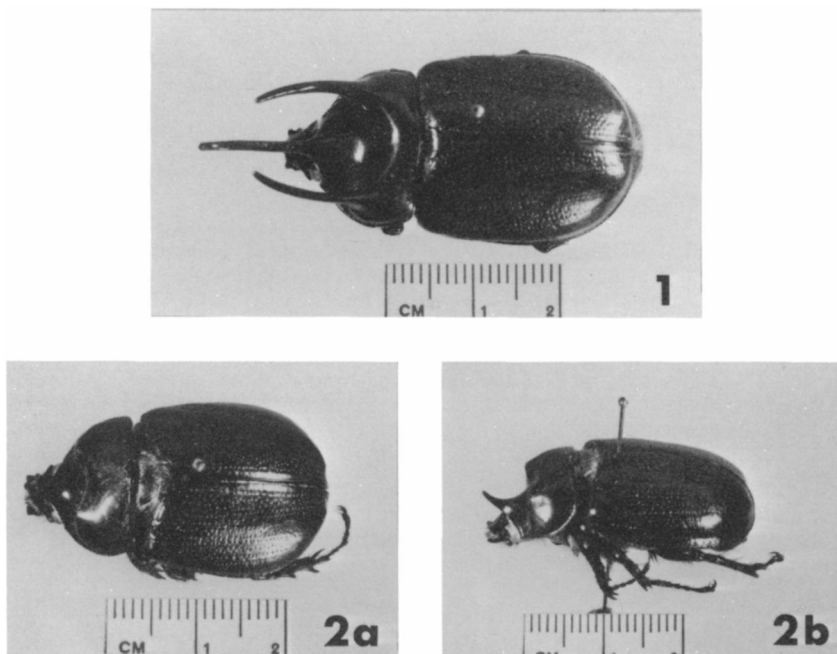
THIRD STAGE LARVA
(Figs. 3-16)

Larva scarabaeiform. Length 49.2 and 68.8 mm in specimens at hand; width of head capsule 12.2 mm in both specimens.

Cranium (Fig. 3): surface coarsely rugopunctate, becoming grossly rugopunctate on frons (F), postclypeus (PSC), and labrum (L); preclypeus (PC) nearly smooth, apex of labrum setigerously punctate. Color piceous; mandibles (M) darker; vertex, preclypeus, and apex of labrum lighter. Posterior angle of frons longitudinally depressed from epicranial suture (ES) to not quite middle of frons; epicranial suture distinct, deeply impressed, slightly less than half as long as frontal suture. Frontal suture (FS)

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Figs. 1-2. *Strategus siphax* (Fabr.), adult male; major (Fig. 1) and minor (Fig. 2) development.

not as deeply impressed as epicranial suture but distinct, arcuate. Clypeofrontal suture (CS) deeply impressed, distinct. Frons with following arrangement of setae: a single, strong posterior frontal seta (PFS) near midpoint of lateral margin of frons on each side; a single, strong exterior frontal seta (EFS) on each side behind precoila (PCL); 1 small and 2 minute anterior frontal setae (AFS) near anterior margin of frons either side of middle; each anterior angle (AA) of frons with 4 strong setae. Epicranium (E) with about 15 dorsoepicranial setae (DES) on each side, setae large and small mixed, some abraded away. Ocellus (O) present posterior to base of antenna (A), indistinct.

Clypeus: form trapezoidal. Postclypeus (PSC) with a single anterior clypeal seta (ACS) either side of midline near anterior margin; 3 exterior clypeal setae (ECS) present along each lateral margin. Preclypeus lightly sclerotized.

Labrum: form subovate, apex asymmetrically bilobed, left lobe (in frontal view) smaller. A single, strong seta (here named anterior labral seta: ALS) either side of middle anteriorly; about 15 setae (here named posterolateral labral setae: PLLS) on each side posterolaterally; apex on left side (in frontal view) with about 11 setae, right side with about 21 setae.

Antenna (Figs. 3-5): 4-segmented; first (basal) and third segments about 2/3 as long as second segment, fourth segment a little shorter than first or third. Apical segment subfusiform, with 12 dorsal sensory spots (DSS) ap-

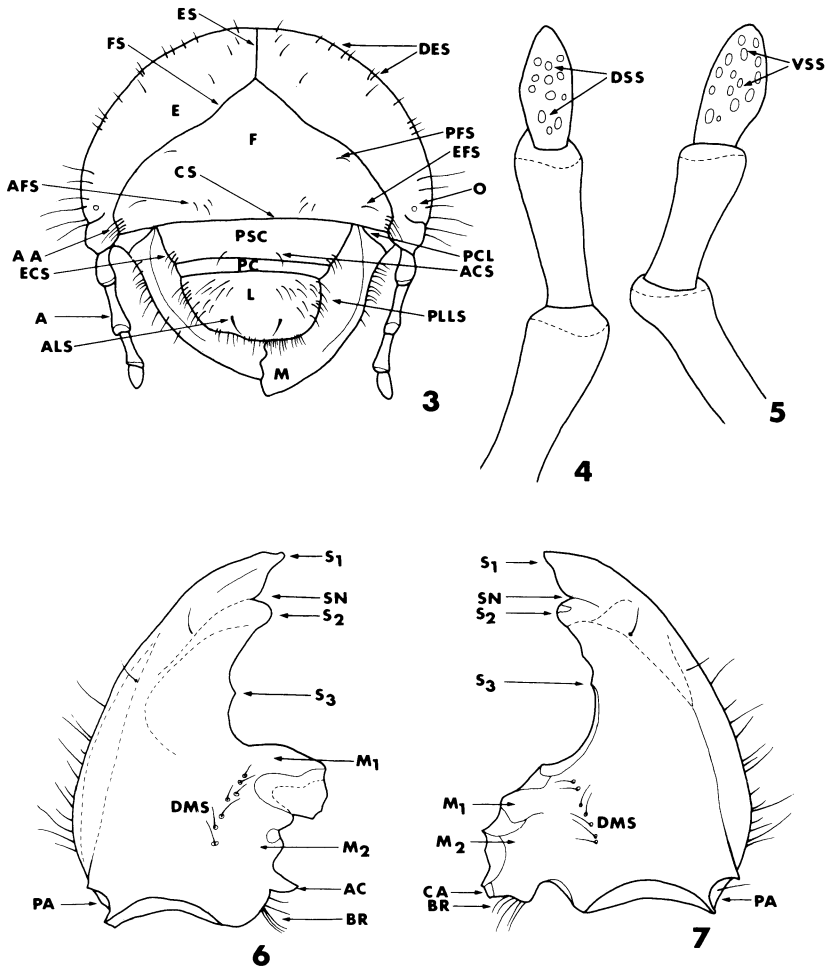
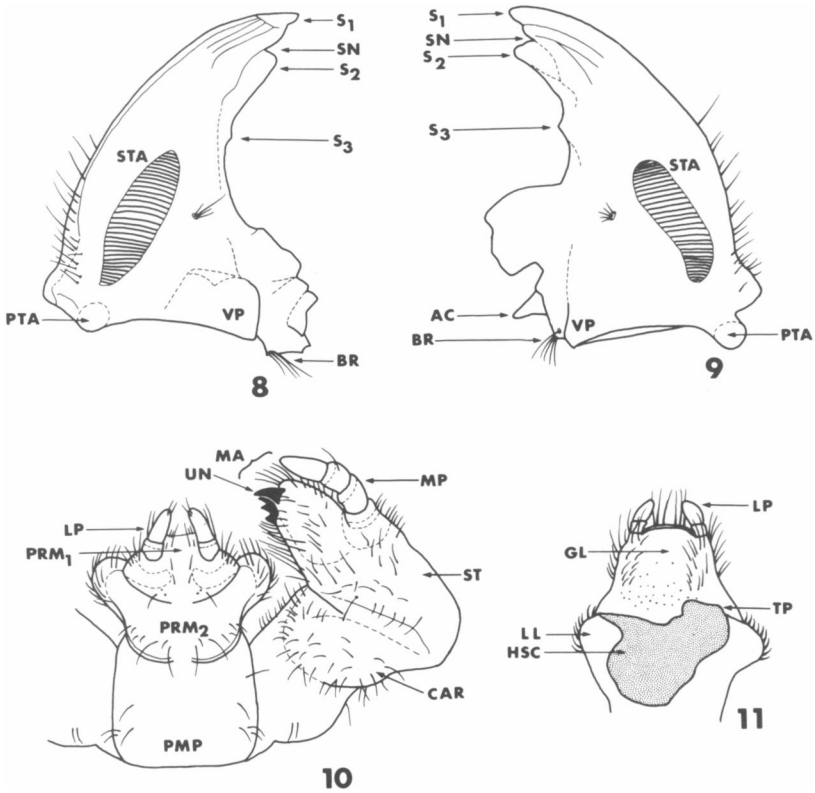


Fig. 3. Frontal view of head of 3rd stage larva. A, antenna; AA, setae of anterior angle of frons; ACS, anterior clypeal seta; AFS, anterior frontal setae; ALS, anterior labral seta; CS, clypeal suture; DES, dorsoepicranial setae; E, epicranium; ECS, exterior clypeal setae; EFS, exterior frontal seta; ES, epicranial suture; F, frons; FS, frontal suture; L, labrum; M, mandibles; O, ocellus; PC, preclypeus; PCL, precoila; PFS, posterior frontal seta; PLLS, posterolateral labral setae; PSC, postclypeus. *Fig. 4.* Dorsal aspect of last segment of right antenna. DSS, dorsal sensory spots. *Fig. 5.* Ventral aspect of last segment of right antenna. VSS, ventral sensory spots. *Figs. 6-7.* Dorsal aspect of mandibles. AC, acia; BR, brustia; DMS, dorsomolar setae; M₁, first molar lobe; M₂, second molar lobe; PA, preartia; SN, scissorial notch; S₁₋₃, scissorial teeth.



Figs. 8-9. Ventral aspect of mandibles. As in Figs. 6-7 plus: PTA, postar-tis; STA, stridulatory area; VP, ventral process. Fig. 10. Ventral aspect of labium and left maxilla. CAR, cardo; LP, labial palpus; MA, mala; MP, maxillary palpus; PMP, postmentum; PRM₁₋₂, sclerites of prementum; ST, stipes; UN, uncus. Fig. 11. Dorsal aspect of labium. GL, glossa; HSC, hypopharyngeal sclerome; LL, lateral lobe; LP, labial palpus; TP, truncate process.

proximating 4 transverse rows of 3 spots each (Fig. 4), and with 15 ventral sensory spots (VSS) lacking any geometric pattern (Fig. 5).

Mandibles (Figs. 6-9): subtriangular, asymmetrical. Scissorial (cutting) area with 3 scissorial teeth (S_{1-3}), first and second teeth large and blade-like and separated by scissorial notch (SN), third posterior tooth small. Dorsum of each mandible with a single, large seta caudolateral of scissorial notch. Left mandible (Figs. 6, 9) with molar area divided into 2 lobes, distal lobe (M_1) subquadrate, well developed, larger than proximal lobe (M_2); proximal lobe with a tooth-like projection, the acia (AC), near base on dorsal margin. Right mandible (Figs. 7, 8) with molar area also bilobed, lobes (M_1 and M_2) irregularly subquadrate to subtriangular, calx (CA) present on dorsal margin of proximal lobe. Dorsum of each mandible with a longitudinal row of 7 dorsomolar setae (DMS) on base of molar area; basomedial angle with a

brustia (BR) consisting of 5 large setae; basolateral angle with articulating area, preartia (PA). Venter of each mandible with large, ovate stridulatory area (STA) with approximately 30 transverse ridges; mesad of stridulatory area is a compact cluster of about 5 setae; basomedial angle with ventral process (VP); basolateral angle with knob-like postartia (PTA).

Maxilla (Fig. 10): with cardo (CAR), stipes (ST), mala (MA; fused galea-lacinia), and maxillary palpi (MP). Cardo subquadrate, longer than wide, divided into 3 sclerites. Stipes subquadrate, longer than wide. Galea with large uncus (UN) at apex, about 7 large setae laterad of uncus and 6 large setae caudad of uncus. Lacinia with 3 terminal unci fused at bases; apical uncus slightly larger than others which are subequal; approximately 12 large setae behind unci. Maxillary palpus with 4 segments, basal segment shortest, segments 2-3 subequal, apical segment longest and oblong-ovate; third segment with a lateroapical seta.

Labium (Figs. 10-11): ventral surface with large, subquadrate postmentum (PMP), subdivided prementum (distal PRM₁ and proximal PRM₂), and a pair of 2-segmented labial palpi (LP). Each lateral margin of postmentum with about 5 setae; proximal sclerite of prementum (PRM₂) with 15 setae across base. Dorsal surface of glossa (GL) without setae medially, surrounded by short, stout setae at base and numerous long, slender setae laterally; caudolaterad of bases of labial palpi are numerous long setae. Hypopharyngeal sclerome (HSC) located posterior to dorsal surface of labial glossa, concave medially, asymmetrical, produced on right side into a truncate process (TP) with anterior margin carinate. Lateral lobes (LL) with numerous setae.

Epipharynx (Fig. 12): form subovate, broader than long, apex asymmetrically bilobed. Clithrum absent. Corypha and right (in ventral view) acroparia joined to form a common apical region. Haptomerum (H) with zygom and epizygom fused; haptomeral process (HP) an elevated ridge, ridge entire, not interrupted. Acanthoparia (ACP) with 10-12 short, flat, sickle-shaped setae (here named sickleform setae of acanthoparia: SSA). Plegmata and proplegmata absent. Gymnoparia (GP) present. Chaetoparia (CPA) with many stout setae, setae becoming smaller laterally. Pedium (PE) longer than wide, without setae. Laeotorma (LT) narrowly elongate, pternotorma (PTT) rounded. Dexiotorma (DX) narrowly elongate with smaller posterior projection. Nesia present; left (in ventral view) nesium a triangular, sclerotized plate (SP), anteromedian corner elevated and carinate; right (in ventral view) nesium (sense cone: SC) in anterior part of median sclerotized plate, with 4 sensory pores. Mesad of right (in ventral view) crepis (CR) is a longitudinal group of 15 slender setae; mesad of left crepis is a longitudinal group of 8 slender setae.

Legs (Figs. 13-14): mesothoracic pair slightly longer than prothoracic pair, metathoracic pair slightly longer than mesothoracic pair. Each leg consists of long coxa (CX), a short, subgeniculate trochanter (TR), a femur (FE) a little longer than trochanter, a tibiotarsus (TT) slightly shorter than femur, and an apical claw (CL). Coxa with numerous, long, slender setae extending from base on each lateral surface towards posteroapical area of coxa where setae meet; anterior surface of coxa lacking setae. Trochanter and femur with numerous, long, slender setae laterally and ventrally, without setae dorsally except for 1-2 setae on apex of femur. Tibiotarsus with numerous, long, slender setae, apex with a ring of setae surrounding

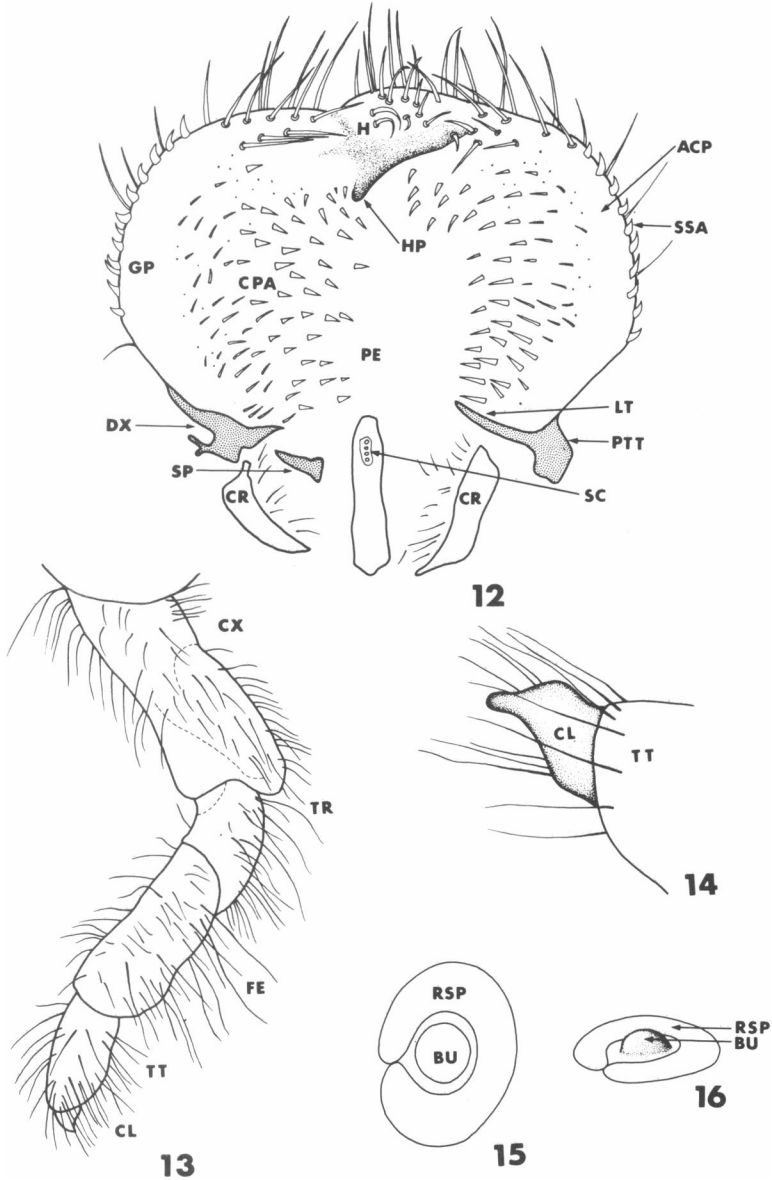
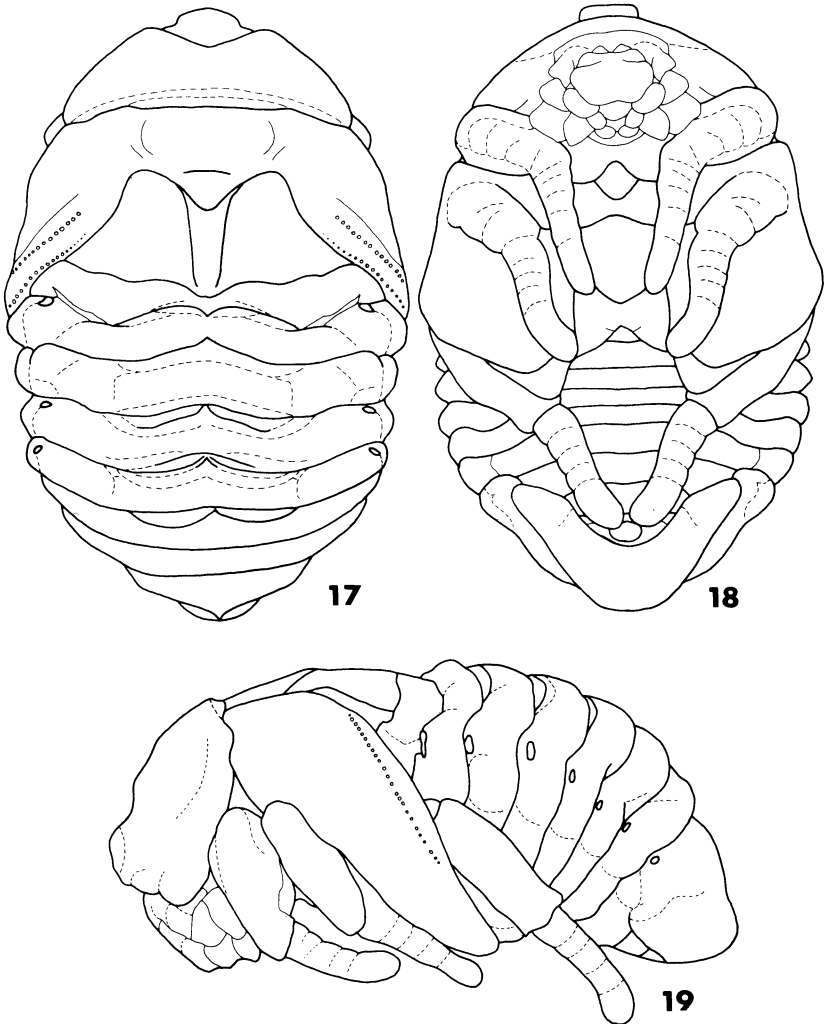


Fig. 12. Epipharynx. ACP, acanthoparia; CPA, chaetoparia; CR, crepis; DX, dexiotorma; GP, gymnoparia; H, haptomerum; HP, haptomerous process; LT, laeotorma; PE, pedium; PTT, pternotorma; SC, sense cone; SP, sclerotized plate; SSA, sickleform setae of acanthoparia. *Figs. 13-14.* Lateral aspect of left mesothoracic leg and dorsal aspect of claw of same. CL, claw; CX, coxa; FE, femur; TR, trochanter; TT, tibiotarsus. *Figs. 15-16.* Lateral aspect of 5th abdominal spiracle and oblique view of same. BU, bulla; RSP, respiratory plate.



Figs. 17-19. Dorsal, ventral and lateral views of male pupa with minor horn development.

claw. Claw (Fig. 14) black, curved, pointed at apex, asymmetrical in dorsal view; base on ventral surface with 2 long setae, 2 additional setae on dorsal surface.

Body: Thorax with sclerite cephalodorsad of spiracle with 2 long and 4 short setae in a dorsoventral row. Abdomen with spiracle bearing area of first segment lacking setae above spiracle; spiracle bearing areas of segments 2-8 with numerous setae except on anteroventral area. Pleural lobes of abdominal segments 1-8 with 25 or more setae, anterior segments with more; sterna each with a transverse field of about 30 setae. Dorsa of

abdominal segment 8-9 each with a posterior, transverse row of sparse setae, setae long and short mixed, slender.

Anal Slit: transverse, curved. Upper anal lip with numerous short, small, conical setae; lower anal lip with about 80-90 short, small, conical setae and several longer setae near slit.

Raster: teges consists of approximately 80-90 short, conical setae similar to those of anal lips, setae occupying about half of area between lower anal lip and posterior margin of 9th abdominal segment.

Spiracles (Figs. 15-16): 1 pair thoracic spiracles and 8 pair abdominal spiracles. Each spiracle with a C-shaped respiratory plate (RSP) surrounding bulla (BU), lobes of respiratory plate nearly touching; bulla in the form of a strong, hemispherical, knob-like process. All spiracles subequal in size; thoracic spiracle 1.6 mm in length, 1.3 mm in width; abdominal spiracles 1.4-1.6 mm in length (gradually decreasing posteriorly), 1.1-1.5 mm in width (gradually increasing posteriorly).

PUPA
(Figs. 17-19)

Length 39.0 mm. Shape elongate, oval, very stout. Color dark testaceous. Head glabrous, bent sharply beneath thorax, mouthparts directed posteriorly; antennae, mandibles, and palpi recognizable. Pronotum glabrous, orbicular, transverse, widest at base, anteromedial pronotal horn (in male) present. Scutellum large, subtriangular, widest at base, base not clearly defined. Elytra closely appressed and curving ventrally around body, extending posteriorly to 5th abdominal segment; 2 rows of faint, large punctures discernible. Legs glabrous, tarsomeres delineated. Abdomen with 9 segments, glabrous except for a field of very small, fine setae on venter of last segment; spiracles present on segments 1-5, but in dorsal view first pair hidden by elytra and third pair hidden between segmental folds in specimen at hand.

KEY TO THE KNOWN LARVAE OF *Strategus*

- | | | |
|--------|---|---------------------------|
| 1. | Bullae of spiracles each with a raised knob-like or hemispherical process (Figs. 15-16) | 2 |
| 1'. | Bullae of spiracles convex but lacking a knob-like or hemispherical process | 3 |
| 2(1). | Dorsa of abdominal segments 8-9 posteriorly with many slender setae. Southern United States to central Brazil | <i>aloeus</i> (L.) |
| 2'. | Dorsa of abdominal segments 8-9 posteriorly with only sparse, slender setae. Guadeloupe | <i>syphax</i> (Fabr.) |
| 3(1'). | Last segment of antenna with about 6 dorsal sensory spots; claws short. Southeastern United States | <i>splendens</i> (Beauv.) |
| 3'. | Last segment of antenna with 12 or more dorsal sensory spots; claws long, curved. Eastern United States | <i>antaeus</i> (Drury) |

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BOOK REVIEW

Pine Barrens; Ecosystem and landscape, edited by Richard T. T. Forman. 1979. Academic Press Inc., 11 Fifth Ave., New York, NY 10003. Hardbound, 601 p., \$39.50.

The Pine Barrens region of N.J. has often been referred to as the largest wilderness area still remaining in the Washington, D.C. to the Boston, Mass. megalopolis. It is a region so vegetationally unique that it has intrigued world botanists for many years. Zoologists too have prepared species lists over the years although serious animal community studies are few. This outstanding volume on the ecology of the Pine Barrens has brought together much of the information available on the subject. Sponsored by the New Jersey Academy of Science and the William L. Hutcheson Memorial Forest Advisory Committee, the volume was edited by R. T. T. Forman and its 33 chapters written by 43 authors, most of whom have conducted research in the "Pines." The book is a fitting tribute to Murray Fife Buell, Eminent Ecologist, who loved and studied the Barrens for many years.

Although each of the 43 chapters is a self contained unit which can be read independently of the others, they are arranged so that one can begin by reading about the early exploitation of the region, its plant and animal products, its geology, soils, minerals, climate, streams and lakes, and then on to vegetation patterns, plants, animals and animal communities. It would be impossible to comment on each of the many chapters but I must comment on some. Chapter 4, Development of Pine Barrens Soils, by John Tedrow is excellent. Tedrow writes clearly, includes helpful diagrams and photographs, and gives the reader insight into the complexity of the Barrens. Another excellent chapter (10) discusses streams and lakes in the Pine Barrens and it is co-authored by Ruth Patrick, B. Matson and L. Anderson. Included in a table on insects of the Pine Barren river basins are 34 species of Coleoptera. The authors have brought together and summarized some rather scattered literature on the plants and animals and the chemical composition of surface waters in the area.