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IDENTIFICATION OF LATE-INSTAR NYMPHS OF COCKROACHES (BLATTODEA)

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Abstract.—A dichotomous key to late-instar nymphs of 12 cockroach species common in the United States is presented. Notes on biology, distribution, and taxonomy are given.

Key Words: Insecta, Blattodea, late-instar nymphs, descriptions, dichotomous key

More than 3600 species of cockroaches are known worldwide, 69 of which are found in North America. Fifteen to twenty of these species are of economic importance as nuisance pests. Classification of cockroaches has undergone many changes. Rehn (1951) classified adult cockroaches based on wing characteristics. Princis (1960) provided a comprehensive history of cockroach taxonomy and reported previously unknown information on cockroach evolution. McKittrick (1964) grouped the cockroaches with mantids based on evolutionary studies, morphology of genitalia and proventriculus, and oviposition behavior. Cornwell (1968) provided a thorough review of the history of cockroach classification. He took the reader from 1758 when all cockroaches were placed in the genus *Blatta,* in the order Coleoptera, through the revision of Imms' *Textbook of Entomology* (Richards and Davies 1957) in which cockroaches are placed in their own order, Dictyoptera. Cockroaches are currently placed in the order Blattodea as recognized by the Entomological Society of America (Bosik 1997).

Dichotomous keys to the cockroaches are primarily restricted to the adult stage (Blatchley 1920, Rehn 1950, Pratt and Stojanovich 1962, Dakin and Hays 1970) except for those by Powell and Robinson (1980), Fisk (1987), and Gordon (1992). Powell and Robinson (1980) included only first-instar nymphs of five *Periplaneta* species and Gordon (1992) distinguished the mid-instar nymphs of *Periplaneta americana* and *P. fuliginosa.* Fisk (1987) included nymphs of 16 cockroach species with identification based on comparative characters.

Because behavior and habitat preference differ substantially among species, and development of effective control strategies depends on correct identification, a dichotomous key to late-instar cockroach nymphs is needed. The present work provides a means of identifying 12 of the pest species found in North America.

MATERIALS AND METHODS

Based on their pest status, late-instar nymphs of 12 species of cockroaches representing 3 families (Blaberidae, Blattellidae, and Blattidae) are included in this key. A cockroach may go through 5 to 12 molts before reaching the adult stage. The individual specimens were selected for size (approximately the same size as the adult of the same species). Exact instar was not known for each individual. Specimens of the following eight species were obtained

from colonies maintained by the Clemson University Urban Entomology Laboratory: *Blattella germanica* (L.), *Supella longipalpa* (F.), *Periplaneta americana* (L.), *Periplaneta australasiae* (F.), *Periplaneta brunnea* Burmeister, *Periplaneta fuliginosa* (Serville), *Blatta orientalis* (L.), and *Parcoblatta lata* (Brunner). Three species (*Blattella asahinai* Mizukubo, *Panchlora nivea* [L.], and *Eurycotis floridana* [Walker]) were obtained from the USDA-ARS laboratory in Gainesville, Florida. One species, *Blattella vaga* Hebard, was obtained from Virginia Polytechnic Institute and State University, Blacksburg, Virginia.

Ten to twenty specimens of each species were examined for morphological differences, using a dissecting microscope (WILD Heerbrugg Switzerland M5-3984).

Three species of cockroaches in this key are wingless as adults. These wingless species, on close examination, have truncated wings (*B. orientalis* (female), *E. floridana*), or wing pads (female *P. lata*). This character may confuse the identification of the adult form with a late-instar nymph of another species. All characters used in this key can be seen when the specimen is viewed dorsally.

Key to Late-Instar Cockroach Nymphs

1. Body tan. Thorax with 2 dark brown to black parallel lines 2
– Body color variable. Thorax without parallel lines 4
2. Abdomen with 2 tan dots on some or all tergites in center of dark longitudinal area. Abdomen with tan markings on lateral edges separated by dark brown markings between tergites (note: All above characters may vary slightly or may not be present). . . . . *Blattella germanica* (Fig. 2)
– Abdomen with markings different from above 3
3. Abdomen with tan, horizontal bar on some or all tergites in center of dark longitudinal area. Body with black, vertical line through center. Cercus dark brown to black on terminal ends. Abdomen with tan markings on lateral edges separated by dark brown markings between tergites (note: All above characters may vary slightly or may not be present) . . . . . *Blattella vaga* (Fig. 3)
– Abdomen with tan, horizontal bar bearing anterior emargination on some or all tergites in center of dark longitudinal area. Body without black, vetical line. Cercus tan with dark brown to black markings on terminal ends. Abdomen with tan markings on lateral edges not separated by dark brown markings between tergites (note: All above characters may vary slightly or may not be present) . . . . . *Blattella asahinai* (Fig. 4)
4. Cercus longer than distance between their bases 5
– Cercus shorter than distance between their bases 10
5. Body variably black and tan. Pronotum with black horizontal bar bearing anterior and posterior median emarginations . . . . . *Periplaneta australasiae* (Fig. 5)
– Body uniform reddish-brown or with black on lateral edges of abdominal tergites or tan with dark brown markings. Pronotum with markings different from above. 6
6. Pronotum dark brown with tan on lateral edges. 2nd and 3rd thoracic sclerites with horizontal dark brown markings. Length less than 15 mm . . . . . *Supella longipalpa* (Fig. 1)
– Pronotum with markings different than above. 2nd and 3rd thoracic sclerites without horizontal dark brown markings. Length greater than 15 mm 7
7. Pronotum dark with little color variation. Male with styli shorter than 10th tergite . . . . . *Periplaneta fuliginosa* (Fig. 6)
– Pronotum with some color variation, darkened areas. Styli variable 8
8. Abdomen black, with lighter areas in center of tergites. 10th tergite truncate . . . . . *Parcoblatta lata* (Fig. 7)
– Abdomen with color pattern different from above. 10th tergite notched 9
9. Male with styli slightly longer than distance between their bases. Cercus with last segment twice as long as wide (Fig. 8a) . . . . . *Periplaneta americana* (Fig. 8)
– Male with styli shorter than distance between their bases. Cercus with last segment less than twice as long as wide (Fig. 9a) . . . . . *Periplaneta brunnea* (Fig. 9)
10. Body black. Cercus longer than 10th tergite . . . . . *Blatta orientalis* (Fig. 10)
– Body light brown or dark red and black. Cercus as long as, or shorter than, 10th tergite 11
11. Body dark red in center, with black laterally. 9th abdominal tergite with posterior corners prolonged backward into sharp points. Thoracic and abdominal lateral margins forming a smooth line in dorsal view. 10th tergite

shorter than cercus . . . . . *Eurycotis floridana* (Fig. 11)

– Body uniformly reddish brown. 9th abdominal tergite without points. Thoracic and abdominal lateral margins not forming a smooth line in dorsal view. 10th tergite longer than cercus . . . . . *Panchlora nivea* (Fig. 12)

Notes on Species

Supella longipalpa (Fig. 1).—The brown-banded cockroach nymph has a broad black stripe on the pronotum and other black markings on the thorax. It is typically less than 15 mm. This species is found throughout the United States in relatively sanitary conditions such as office buildings. It prefers temperatures over 27°C and is often found above floor level. It will infest furniture, and deposit egg cases behind picture frames and appliances.

Blattella germanica, B. asahinai, and B. vaga are similar species. The German, Asian, and field cockroach nymphs are tan with two broad, dark brown to black longitudinal stripes on the thorax. Because these species are so similar to one another, multiple characters must all be used for identification of species. As late-instar nymphs there are differences in body size between these three species. However, these size variations may overlap.

Blattella germanica (Fig. 2).—When body length is compared to the other two *Blattella* species represented in this key, it usually is the median. The German cockroach is perhaps the most economically important of all cockroach pests. It is found throughout the United States in human habitations, and rarely outside.

Blattella vaga (Fig. 3).—The field cockroach nymph is typically smaller and lighter in color than *B. germanica* and *B. asahinai.* It is found in the southwestern United States in irrigated fields and yards.

Blattella asahinai (Fig. 4).—The Asian cockroach nymph is typically 2 to 3 mm longer than *B. germanica.* Most individuals have three small black dots arranged in a triangle, a character not always observed in *B. germanica* or *B. vaga.* Found primarily outdoors in Florida, it occasionally enters structures.

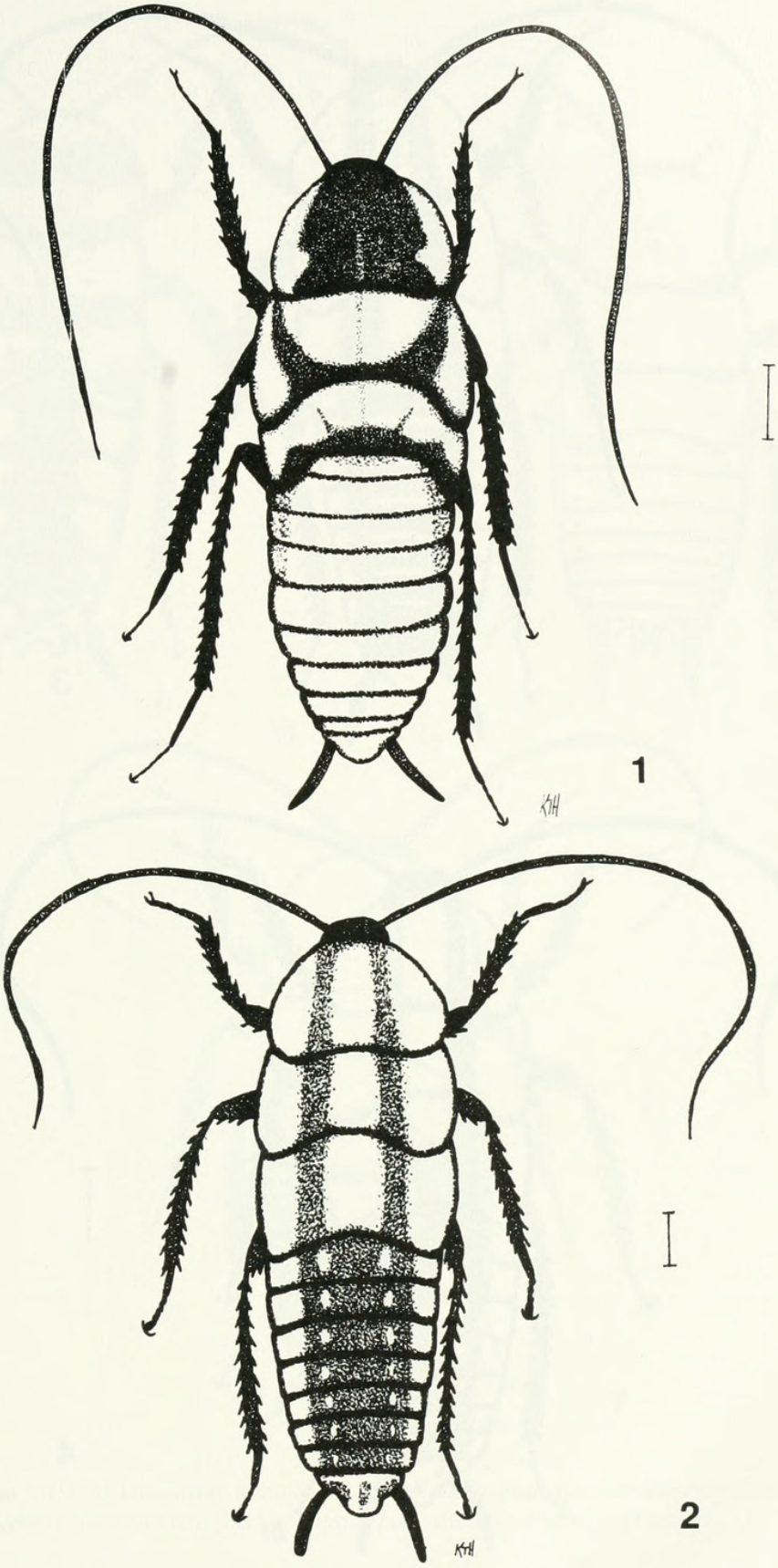
Parcoblatta lata (Fig. 7).—The broad wood cockroach nymph has a uniformly reddish brown thorax. The abdomen is mostly black with lighter markings in the center of the first three to four tergites. The 10th tergite is pointed and unnotched. It is found throughout the United States in wooded habitats. Adult females are wingless. Adult males will occasionally enter buildings.

Periplaneta australasiae (Fig. 5).—The Australian cockroach nymph is easily distinguished by its coloration, it is black and tan and has a dark horizontal bar with anterior and posterior emarginations on the pronotum. The adults share this character. This species is most commonly found in both indoor and outdoor situations in the coastal states of the southern United States and portions of California.

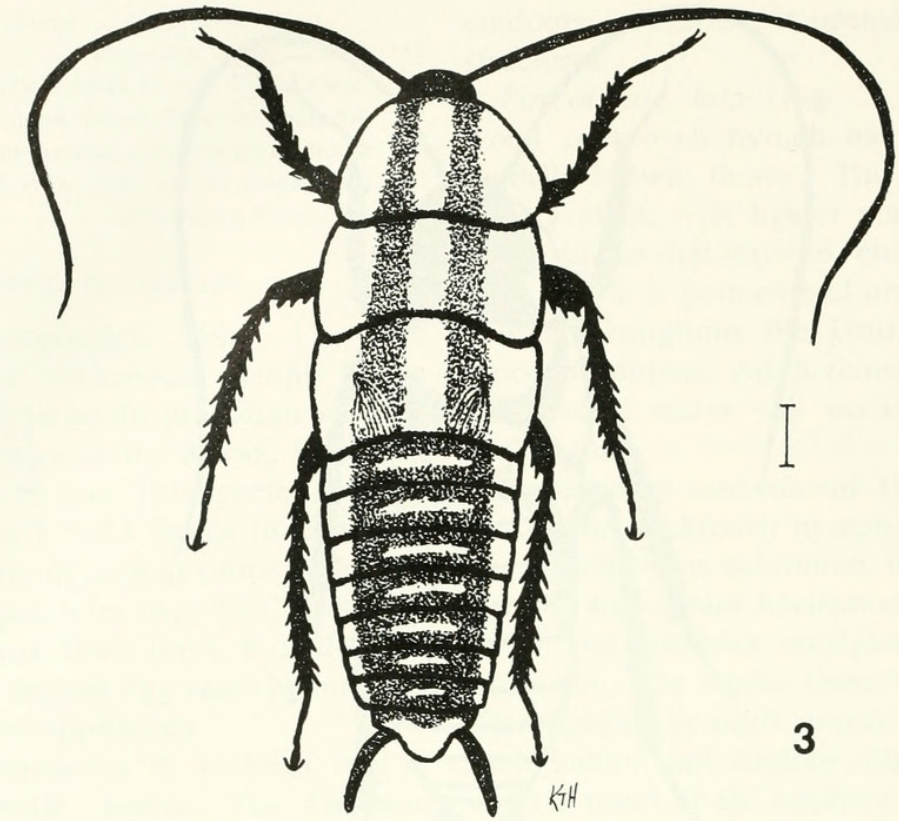
Periplaneta fuliginosa (Fig. 6).—The smokybrown cockroach nymph, very similar to *P. americana* and *P. brunnea,* can be distinguished by its uniform reddish brown color. It is found in the southeastern United States in hot, humid areas in and around structures.

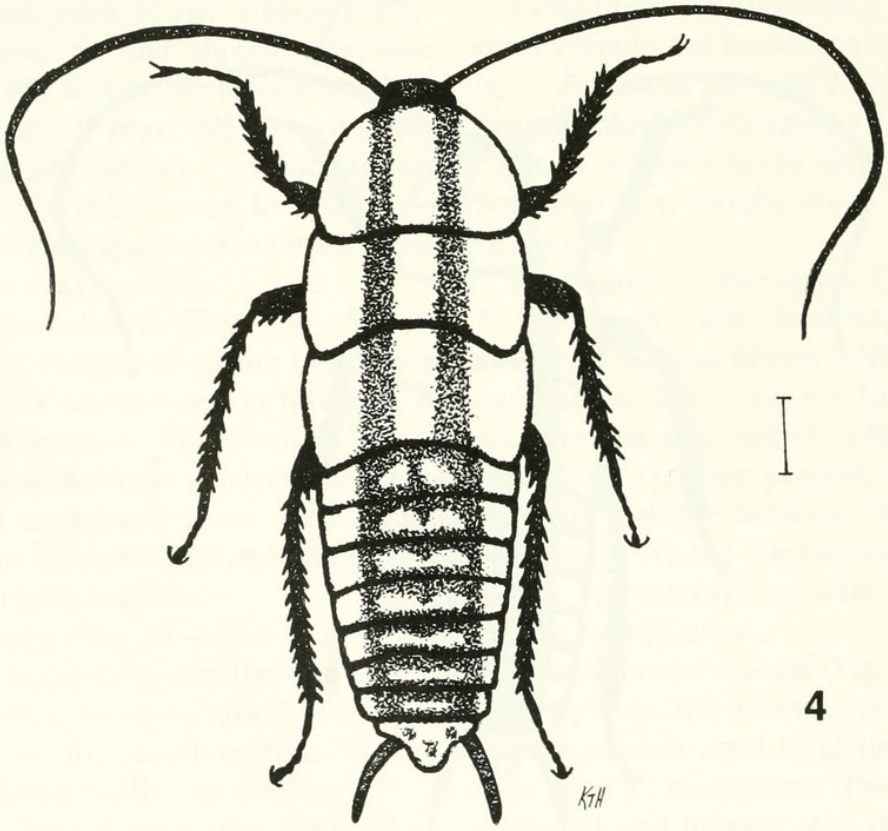
Periplaneta americana (Fig. 8).—Like *P. brunnea,* the American cockroach nymph is reddish brown with variable darkened areas. The cerci are long and slender and the last segment is twice as long as it is wide. If styli are present, they are longer than the distance between their bases. This species is found throughout the United States in association with buildings and warm, humid areas.

Periplaneta brunnea (Fig. 9).—The cerci and styli on the brown cockroach are the key characters used to distinguish this species from *P. americana.* The cerci are more flattened and broader and the last segment is not twice as long as it is wide. If styli are present, they are shorter than the distance between their bases. The brown cockroach is found around buildings in the southeastern United States.

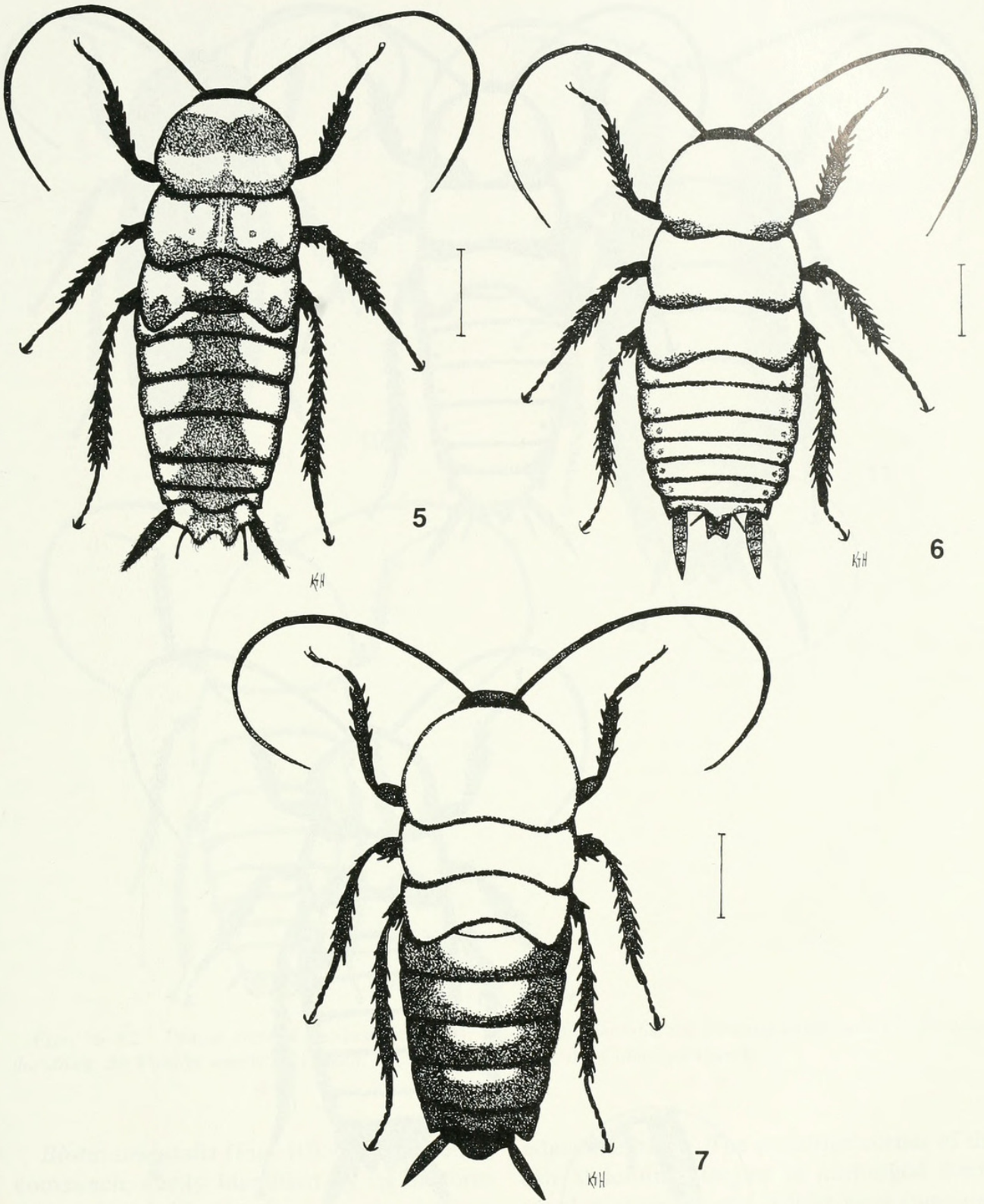


Figs. 1–2. Dorsal view of late-instar nymphs. 1, *Supella longipalpa,* the brown-banded cockroach. 2, *Blatella germanica,* the German cockroach.

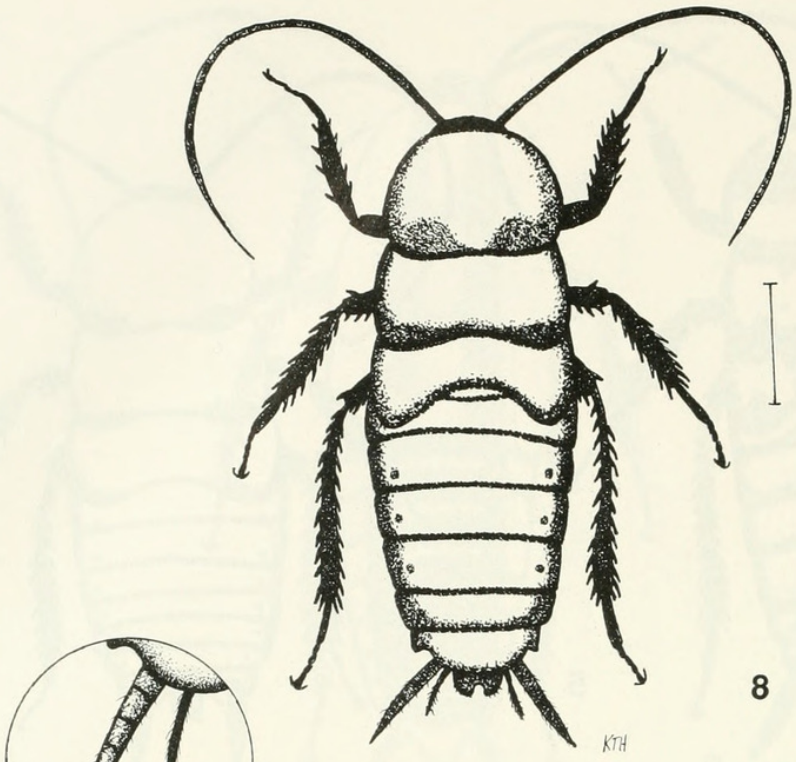


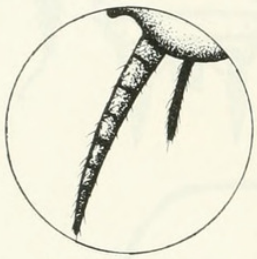


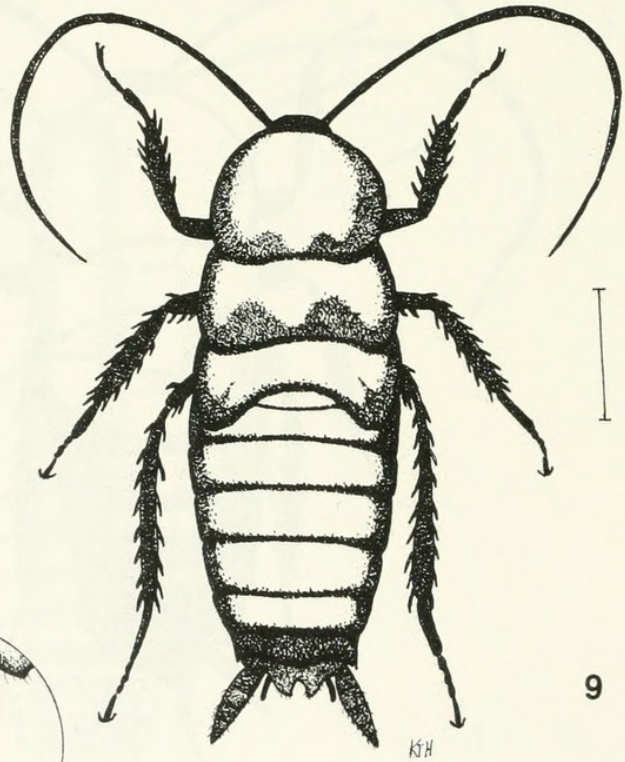
Figs. 3–4. Dorsal view of late-instar nymphs. 3, *Blatella vaga,* field cockroach. 4, *B. asahinai,* the Asian cockroach.

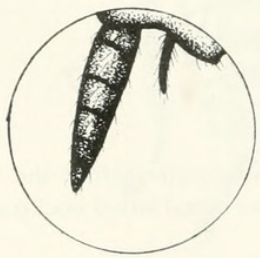


Figs. 5–7. Dorsal view of late-instar nymphs. 5, *Periplaneta australasiae*, the Australian cockroach, 6, *P. fuliginosa*, the smokybrown cockroach. 7, *Parcoblatta lata*, the broad wood cockroach.

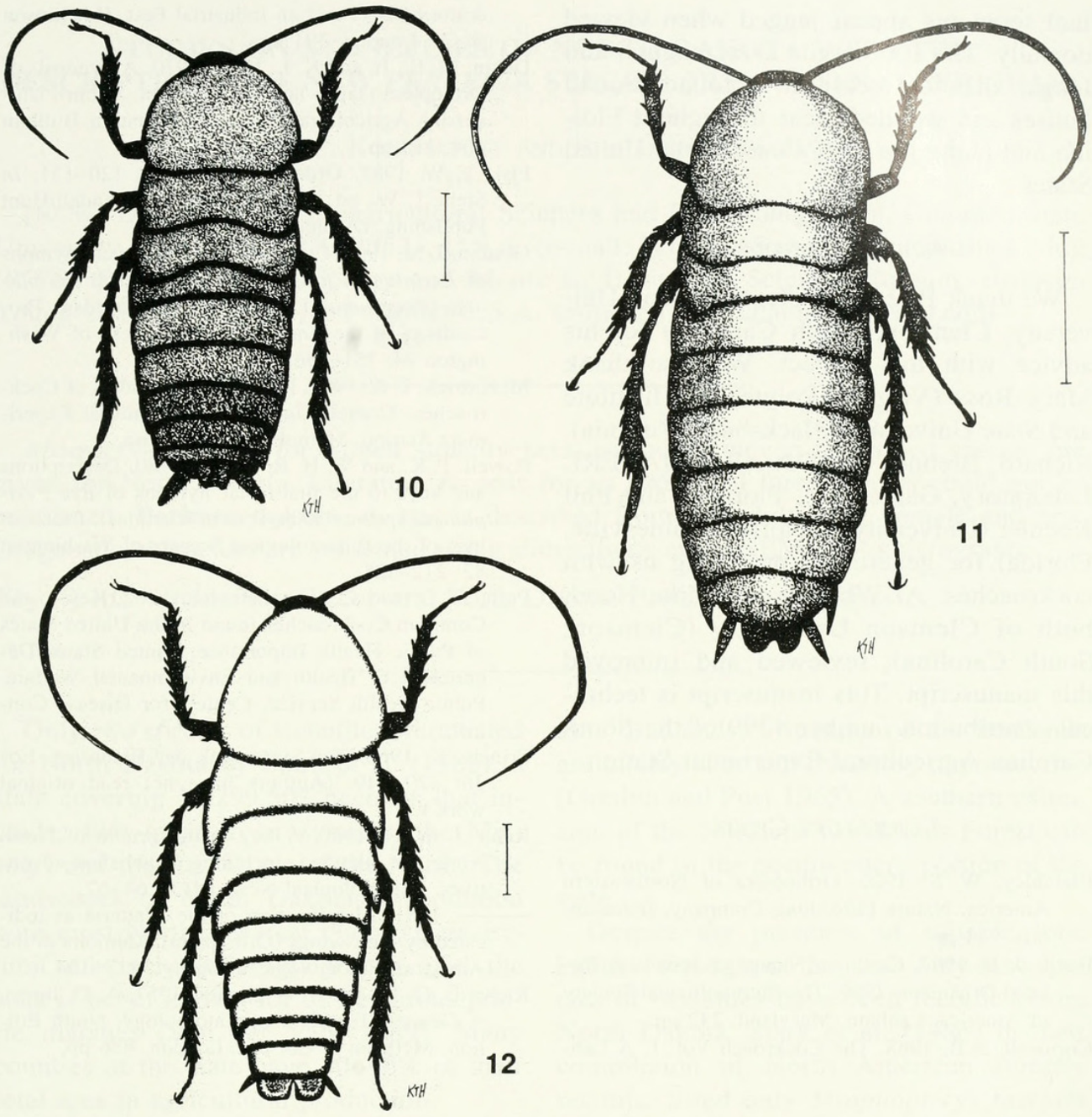








Figs. 8–9. Dorsal view of late-instar nymphs. 8, *Periplaneta americana,* the American cockroach; 8a = dorsal view of left cercus. 9, *P. brunnea,* the brown cockroach; 9a = dorsal view of left cercus, note size and shape of last segment.



Figs. 10–12. Dorsal view of late-instar nymphs. 10, *Blatta orientalis,* the Oriental cockroach. 11, *Eurycotis floridana,* the Florida woods cockroach. 12, *Panchlora nivea,* the Cuban cockroach.

Blatta orientalis (Fig. 10).—The Oriental cockroach, easily identified by its uniform dark, reddish-black color, can also have a shiny appearance. Adult females have truncated wings. It is found in and around structures over most of the temperate United States and Canada.

Eurycotis floridana (Fig. 11).—The Florida woods cockroach nymph is comparatively large (35 mm) and dark in color. The center of the body is dark red and the outer edges are black. The posterior corner of the 9th abdominal tergite is prolonged backward to sharp points. Adults have truncated wings. An important pest in Florida, it also is found in southeastern Georgia and along the lower Gulf and Atlantic coasts of the United States. The adult emits an oily liquid with a repellent odor.

Panchlora nivea (Fig. 12).—The Cuban cockroach nymph is reddish brown, and the lateral margins of the thoracic and abdom-

inal segments appear jagged when viewed dorsally. The 10th tergite is rectangular and longer than the cerci. It is found around houses and wooded areas throughout Florida and along the Gulf Coast of the United States.

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