A RECORD POPULATION OF *PSEUDOMETHOCA SIMILLIMA* (SMITH) (HYMENOPTERA: MUTILLIDAE)—(Note). Mutillid wasps are often encountered in the field as isolated individuals or as several individuals within a small area. Reports in the literature describing collections of large numbers of mutillid wasps are usually totals taken over a period of time, often from areas of several acres or more (C. E. Mickel, 1928. U. S. Nat. Mus. Bull. 149:351 p.; W. E. Ferguson, 1962. Univ. Calif. Publ. Ent. 27:1-92.) The purpose of this note is to report a large, isolated, extremely dense population of *Pseudomethoca simillima* (Smith) in Highlands County, FL ca. 6.4 km west of Sebring. The area, ca. 10 by 5 m in a semicircular shape, consisted of fine white sand with a light scattering of dead live oak leaves. On 20 March 1978, 12 females were taken in a few minutes. On 20 March 263 females were collected in 1.5 hr (1:30-3:00 PM EST)—a collection rate of 1 female every 41 seconds per collector. The average density collected during that time was almost 1.7 individuals/m² surface area. The individuals exhibited almost no variation in size, shape, or coloration suggesting that they represent a small isolated gene pool and that all may have fed as larvae on one species of uniformly sized host bee or wasp. No individuals were collected in the woods surrounding the area nor on the other side of the paved road forming the central boundary of the semicircular area. During the collecting we did not observe a single male mutillid wasp, nor did we see any individuals or burrows of potential hosts. A voucher series from this collection is placed in the University of Georgia Collection. We believe this represents not only the largest single reported collection of a mutillid species but also a population with the greatest density of individuals per unit area. This population would provide an excellent opportunity to study the population dynamics of a parasite-host relationship.—JUSTIN O. SCHMIDT AND ALLAN W. HOOK, Dept. of Entomology, University of Georgia, Athens, GA 30602.

TERRESTRIAL TRAIL-FOLLOWING BY THREE SPECIES OF PREDATORY STINK BUGS—(Note). Entomophagous insects use a variety of cues to find their hosts. Some use aerial trails in prey location; various predators locate trees infested with bark beetles by utilizing air born pheromones released by the beetles (Camors, F. R., Jr. and T. L. Payne, 1973. Environ. Ent. 2:267-70). Airborne kairomes stimulate searching behavior in the predator *Chrysocon cornea* Stephens which preys upon the eggs of *Heliothis zea* (Lewis, W. J. et al. 1977. J. Chem. Ecol. 3:483-7). Some parasitoids utilize terrestrial trails in host location. The parasitoid *Solenotus begini* (Ashmead) follows the leaf mine of its host, *Phytomyza atricornis* Meigen (Doult, R. L. 1957. J. Econ. Ent. 50:378-4). *Apanochro melanocelis* (Ratzeberg) locates its moth host, *Lymatrina dispersa* L. by following silk webbing (Weseloh, R. M. 1977. Environ. Ent. 5:1128-32). However, there are no published accounts of predatory insects using terrestrial trails to locate prey. This laboratory study was conducted to determine if 3 species of predatory stink bugs can follow terrestrial trails which consist of either
hemolymph of cabbage looper pupae, *Trichoplusia ni* Hübner, or frass of the eastern tent caterpillar, *Malacosoma americanum* F.

The stink bugs *Euthyrhynchus floridanus* L., *Alcaecorrhynchus grandis* Dallas, and *Podisus maculiventris* Say are polyphagous predators, feeding on various lepidopterous and chrysomelid larvae, pentatomid nymphs, curculionids, and grasshopper nymphs (Mead, F. W. 1976. Fla. Dept. Agric. and Consumer Serv. Ent. Circ. 174). The stink bugs were collected as 2nd and 3rd instars along the wooded perimeters of Lake Alice in Gainesville, FL. They were fed geometrid moth pupae and fresh string beans. They were not fed pupae 1 week prior to exposure to the terrestrial trails. Experiments were conducted during the 12th and 13th hours of a 14h photophase.

Artificial frass trails were formed by mixing 0.25 ml water with 7.5-15 mg of frass from 4th instar eastern tent caterpillars. The mixture was then painted onto paper with a small brush. Hemolymph trails were formed by macerating a cabbage looper pupa in a drop of water and then painting this mixture onto paper. All trails were L-shaped with axes of 15 cm and 9 cm. Tap water trails were used as controls.

The stink bugs followed frass trails in ca. half of the trials. A trial consisted of presenting a single bug with a single frass or hemolymph trail and a water trail. Three different *A. grandis* individuals were employed in 8 trials. One individual was used in 4 trials and the other 2 individuals were used in 2 trials each. The frass trails were followed completely in 6 of the 8 trials. Twenty-three different *E. floridanus* individuals were employed in 64 trials. Eighteen *E. floridanus* individuals were each used in 3 trials and 5 individuals were each used in 2 trials. The *E. floridanus* bugs followed frass trails completely in 31 of the 64 trials. Eighteen different *P. maculiventris* bugs were used in 40 trials in which 19 trails were followed completely. In these 40 trials, 6 bugs were used 3 times, 10 bugs were used twice, and 2 bugs were used once.

The amount of time taken to follow a frass trail varied greatly. The *A. grandis* individuals followed trails in 1.1 ± 1.0 min. The *E. floridanus* followed trails in 1.9 ± 1.4 min. and *P. maculiventris* individuals required 2.7 ± 2.2 min. Analysis of variance yielded no significant difference among the species.

Hemolymph trails were followed less consistently than frass trails. Five different *A. grandis* bugs were presented with a hemolymph trail, but the trail was followed only once. Seven different *E. floridanus* individuals followed hemolymph trails completely in 8 of 20 trials. Six *E. floridanus* individuals were each used in 3 trials and 1 individual was used in 2 trials. Water trails, used as controls in each trial were never followed.

Stereotyped behavior typified the responses of the stink bugs to artificial terrestrial trails. The antennae were swept across the trail or tapped along the surface of the trail. The rostrum was protruded and slowly tapped along the trail in front of the predator. Occasionally, the stink bugs would pause to groom the antennae or rostrum by simultaneously running the tibial spines of the forelegs down the antennae or rostrum. Frequently, *E. floridanus* would shake its abdomen rapidly and violently when it encountered a trail as it does when it encounters food. Frequently, the predators defecated on the trail. The possibility that defecation inhibits other predators from following the trail is being investigated.
The employment of antennae and rostrum in the detection of terrestrial trails may greatly enhance the ability of predatory pentatomids to locate prey. Selection for utilization of kairomones in prey location may be especially strong in predators with small eyes, like these pentatomids.—D. K. McLain, Dept. of Biology, Emory Univ., Atlanta, GA 30322.

FALL ARMYWORM IN FLORIDA PASTUREGRASS: 1977¹, ²—(Note). Armyworms are a cyclical pasture pest characterized by population outbreaks in certain years. In 1977, Florida pastures, hay fields and forage crops were attacked by large numbers of fall armyworms, Spodoptera frugiperda (J. E. Smith). Damaging populations of record densities were reported by researchers, especially in the drought-stricken (Northern) areas of Florida (Anon. 1977, Coop. Plant Pest Rep. 2(31), 584).

Effectiveness of armyworm control in Florida pastures with certain insecticides was reported by P. G. Koehler, R. J. Gouger and D. E. Short (1977; Fla. Ent. 60:103-4). This study was conducted to determine the extent of the armyworm problem on pastures and forages and to evaluate the effectiveness of certain insecticides.

Three insecticides were evaluated for fall armyworm control in August 1977. The insecticides included in the present study were: permethrin (Ambush®), carbaryl (Sevin 4 Oil®) diluted in water and oil, carbaryl (Sevin 80% SI®), and methomyl (Lannate L®). All materials were applied by air with a Cessna Ag-Plane (188 series) equipped with a Telsland spray system. The carbaryl oil formulation was applied 2 ways: diluted 1:1 in fuel oil and diluted 1:1 in water with 1.89 liter emulsifier (Blend®). Both were applied at 1.12 kg AI/ha with 30 D4 nozzles. Permethrin, methomyl, and carbaryl WP were applied in 28.08 liters of water/ha at 0.112, 0.252, and 1.12 kg AI/ha, respectively. Six experimental plots were established within a pasture as 6 swaths, 18.29 m wide running the length of the pasture. One plot was left as a check area; the others were treated with insecticides on 13 August 1977.

Armyworm populations were sampled in a coastal bermudagrass, Cynodon dactylon (L.), pasture near Hague, FL, at 4 time intervals: 1 h pretreatment, 24, 48, and 72 h posttreatment. A frame (237 cm²) was randomly thrown into each treatment area 10 times on each sampling date. The grass within the area of the frame was shaken so the armyworms would fall to the ground. All armyworm larvae were collected from the area within the frame and taken to the laboratory for identification and counting. All the specimens collected were S. frugiperda. Percent control was calculated by comparing pretreatment with posttreatment larval counts.

A telephone survey of county agents was conducted on 11 August 1977, involving 35 counties in the designated drought-stricken areas of Florida. The remaining 32 counties were surveyed by mail. The purpose of the survey was to determine the extent of the fall armyworm problem in pastures and the effectiveness of control measures which were being implemented. On 24 May 1978, a follow-up survey was conducted in all 67 counties to determine the amount of methomyl applied for armyworm control.

¹Lepidoptera: Noctuidae.
²Univ. Florida Agricultural Experiment Station Journal Series No. 1390.