paratypes), 21-IV-1930 (2 ♀ paratypes), and 31-IV-1930 (1 ♀ paratype). Holotype, allotype, and paratypes are reared from *Vernonia augustifolia* Michx. var. *scaberrima* (Nutt.) Gray, all collected by D. J. Nicholson. Holotype and allotype in U.S.N.M., no. 76477; paratypes in FSCA.

Neaspilota floridana is very close to *N. alba*. The differences between them lie chiefly in the length and thickness of the setae situated at the sides of the proctiger of the ♂ genitalia. The setae in *floridana* are much longer (Fig. 1G, H), paler, and less dense than in *alba;* (Fig. 2E) the remainder of the proctiger in *floridana* bears longer setae than in *alba,* which makes the setae appear less crowded. The ovipositor and ovipositor sheath of *alba,* about 2.9 mm and 1.2 mm, respectively, are much longer than those of *floridana.*

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MOLE CRICKETS AND PASTURE GRASSES: DAMAGE BY *SCAPTERISCUS VICINUS*, BUT NOT BY *S. ACLETUS* (ORTHOPTERA: GRYLLOTALPIDAE)

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ABSTRACT

Scapteriscus vicinus and *S. acletus* juveniles and adults were held in outdoor cages planted with plugs of Pensacola bahiagrass and coastal bermudagrass. Densities were 11 or 22 per m^2 of soil surface and 308 or 616 per m^2 of grass; alternative food was provided in half the cages. *S. vicinus* significantly reduced forage yield and stand of both grasses, but damage to bahiagrass was much greater than to simultaneously available bermudagrass. *Scapteriscus acletus* adults and juveniles had little if any effect on either grass.

RESUMEN

Juveniles y adultos de *Scapteriscus vicinus* y *S. acletus* se mantuvieron dentro de jaulas en las cuales se plantaron pedazos de pasto bahía, *Paspalum*

notatum Flugge, *cv.* 'Pensacola', y pasto bermuda, *Cynodon dactylon* (L.) Pers. *cv.* 'Coastal'. Las densidades fueron o 11 o 22 por m² de la superficie de tierra y 308 o 616 por m² de pasto; alimentos alternativos fueron puestos en la mitad de las jaulas. *Scapteriscus vicinus* redujo significativamente el rendimiento y la densidad de ambos pastos, pero el daño a pasto bahía fue más que al pasto bermuda. *Scapteriscus acletus* poco afectó los pastos.

Two species of mole crickets are believed to be major pests of pasture grasses in Florida (e.g. Reinert et al. 1981). The fact that *Scapteriscus vicinus* is predominantly herbivorous while *S. acletus* is predominantly carnivorous (Matheny 1981) calls for critical assessment of their relative roles in causing the damage attributed to them. Field experiments designed to assay the 2 species for their effects on stand and forage production in bahiagrass have been unsuccessful in proving damage by either species (Walker 1979, Walker et al. 1982). The present experiments were designed to maximize opportunity for damage by confining large numbers of mole crickets with small amounts of 2 grasses in outdoor cages and, in half of the tests, giving them no alternative food.

METHODS

Twenty-four cylindrical cages were made by fitting 1.5-m-diam., 30-cm-high wading pools with lids made of polyester fabric glued to hoops of 13-mm-diam. PVC pipe. A 0.4 x 0.4-m drain, covered with aluminum screening, was installed in each cage bottom, and a 20-cm-high aluminum partition bisected each cage. The cages were placed in a field with their partitions oriented north-south and filled with sterilized sandy topsoil to the height of the partition. On 12 March 1981, four 10-cm-diam. plugs of Pensacola bahiagrass were set in an arc on one side of the partition and 4 plugs of coastal bermudagrass were similarly set on the other. The partition delimited the areas assigned the 2 grasses and prevented root competition but did not impede mole crickets moving on the soil surface. In half the cages the bahiagrass was on the east side, in the other half, on the west.

The cages were assigned to 4 blocks. The 6 cages in each block were randomly designated as control-fed, control-starved, *vicinus*-fed, *vicinus*-starved, *acletus*-fed, and *acletus*-starved. Cages designated "fed" were sprinkled with 10 ml of finely ground 21% protein dog chow each week; for those designated *vicinus*, 8 female and 2 male sound-trapped *vicinus* (Walker 1982) were released on each side on 1 April, *acletus* cages were stocked, in the same manner, with *acletus* on 14 April. All grass was clipped to a height of 2 cm on 30 April, 2 June, and 24 June, and the clippings dried and weighed. Cages were fertilized and watered after each cutting. On 2 May, 24 hr after watering, the linear extent of tunneling by adults was estimated for each half of each pool; the range was 0 to 3.5 m. By June, tunnels of progeny were often extensive and coalescing, making length an impractical measure of their extent. On June 12, 24 hr after watering, areas covered by juvenile tunnels were estimated to the nearest 10% of each half pool; the range was 0-100%.

At the end of the experiment using adults, the cages were set up anew to assay for juvenile damage. Plugs of grass were taken from the control

cages and nourished in a greenhouse, and juvenile mole crickets (i.e. progeny) were collected from the treated cages and held and fed in buckets of soil. Each cage was heightened, to raise the lid above anticipated growth of grass, by encompassing it with a 1.5-m-diam., 51-cm-high sheet-aluminum cylinder. On 24 July, the 24 cages were fumigated with methyl bromide, killing all remaining grass and mole crickets. The six cages in each of the four blocks were randomly assigned to the 6 categories used before. On 27 July, four 10-cm plugs of each grass were transplanted into each cage as before. On 28 July, 40 *vicinus* juveniles, 20 per side, were released in each of the 8 *vicinus* cages, and 40 *acletus* juveniles were similarly released in each *acletus* cage. The juveniles measured 5 to 20 mm in length, with those of *vicinus* averaging ca. 15 mm and those of *acletus*, ca. 10 mm. Cages designated "fed" were given 15 ml of ground dog chow weekly. Grass was clipped and weighed monthly as before: viz. on 28 August, 28 September, and 29 October. Fertilizer was applied 24 August and 28 September.

Analyses of variance were run on the square roots of the forage estimates and on the estimates of tunneling. Fisher's protected least significant difference procedure was then used to compare treatment means (Steel and Torrie 1980).

RESULTS

Tests for damage by adults (1 or 14 April-24 June)

S. vicinus adults, but not those of *acletus*, caused significant damage to the two grasses (Tables 1 and 2). Bahiagrass exposed to 20 fed or starved *vicinus* adults produced only 34% and 9% as much forage as the average of the bahiagrass controls. Reduction in yield of bermudagrass was less, with the corresponding figures being 74% and 41%. Likewise, *vicinus* adults substantially reduced the stand of bahiagrass, especially if they were denied

TABLE 1. FORAGE PRODUCTION (AVERAGE TOTAL DRY WEIGHTS, IN GRAMS, OF GRASS CLIPPED AT MONTHLY INTERVALS) OF PENSACOLA BAHIA-GRASS AND COASTAL BERMUDAGRASS IN EXPERIMENTAL CAGES. VALUES IN THE SAME COLUMN WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT ($P\alpha$ = 0.05). "FED" CAGES WERE PROVIDED A WEEKLY RATION OF GROUND DOG CHOW; "STARVED" ONES WERE NOT.

Species	Pensacola Bahia		Coastal Bermuda	
Status	adults	juveniles	adults	juveniles
Control				
Fed	169a	40a	284ab	100a
Starved	178a	22b	334a	56b
S. acletus				
Fed	156a	41a	338a	36c
Starved	175a	37ab	337a	69ab
S. vicinus				
Fed	59b	0c	229b	12d
Starved	16c	0c	126c	3d

TABLE 2. LOSS OF GRASS STAND IN EXPERIMENTAL CAGES HAVING FOUR 10-cm PLUGS OF PENSACOLA BAHIAGRASS ON ONE SIDE AND 4 OF COASTAL BERMUDAGRASS ON THE OTHER. (EACH TREATMENT HAD 16 PLUGS OF EACH GRASS.) WHEN TABLE ENTRY IS ITALICIZED, STAND LOSS FOR THAT TREATMENT WAS SIGNIFICANTLY GREATER THAN FOR THE CORRESPONDING CONTROL (X^2, P<.05).

Stage Species Status	Pensacola Bahia		Coastal Bermuda	
	Plugs lost (%)	Plugs lost or with ≦10 live stems (%)	Plugs lost (%)	Plugs lost or with ≦10 live stems (%)
Adults (n=20, April-June 1981)				
Control				
Fed	0	0	0	0
Starved	0	0	0	0
S. acletus				
Fed	0	0	0	0
Starved	0	0	0	0
S. vicinus				
Fed	*6*	*19*	0	0
Starved	*50*	*88*	6	6
Juveniles (n=40, July-Oct. 1981)				
Control				
Fed	19	25	12	25
Starved	0	6	0	6
S. acletus				
Fed	6	6	0	0
Starved	6	6	0	6
S. vicinus				
Fed	*88*	*100*	*38*	*81*
Starved	*100*	*100*	*38*	*75*

other food; on the other hand, they did not destroy a significant percent of bermudagrass plugs (Table 2, top half).

Adult *vicinus*, but not *acletus*, tunneled more on the bahiagrass side of their cages than on the bermudagrass side (Table 3). *S. acletus* tunneled significantly more than *vicinus* on the bermudagrass side but not on the bahiagrass side.

Near the end of the tests for damage by adults, tunneling of their progeny was greater in the fed cages than the starved cages, but only for *vicinus* was the difference significant (Table 3).

Tests for damage by juveniles (28 July-29 October)

S. vicinus juveniles devastated the bahiagrass plugs, eliminating forage production (Table 1), and causing nearly 100% loss of stand (Table 2). Their effect on bermudagrass was less severe, but forage production fell to 15% and 4% of the average of the bermudagrass controls and 38% of the plugs were killed.

TABLE 3. MEAN ESTIMATES OF TUNNELING BY MOLE CRICKETS IN EXPERI-
MENTAL CAGES HAVING FOUR 10-cm PLUGS OF PENSACOLA BAHIA-
GRASS ON ONE SIDE AND 4 OF COASTAL BERMUDAGRASS ON THE
OTHER. (CONTROL CAGES HAD NO TUNNELING.)

Species Status	Meters of tunneling by adults[1] (2 May)		Proportion of area tunneled by progeny[2] (12 June)	
	Bahia	Bermuda	Bahia	Bermuda
S. acletus				
Fed	1.2	1.2	0.25	0.22
Starved	1.5	2.4	0.12	0.12
S. vicinus				
Fed	1.8	0.9	0.62	0.58
Starved	1.2	0.6	0.18	0.20

[1]Adults of *vicinus* tunneled more (ANOVA) in bahiagrass than in bermudagrass. Adults of *acletus* tunneled more in bermudagrass than did those of *vicinus* (ANOVA), and starved *acletus* tunneled more in bermudagrass than did either fed or starved *vicinus* (LSD). No other differences were significant (P = 0.05).

[2]Fed *vicinus* had more tunneling by progeny than did starved *vicinus* (ANOVA). The tunneling by progeny of fed *vicinus* in each grass exceeded that by those of starved *vicinus* in both grasses (LSD). No other differences were significant (P = 0.05).

S. acletus juveniles had no significant effect on stand or forage production in bahiagrass nor on stand in bermudagrass (Tables 1 and 2). However, fed *acletus* nymphs caused a significant reduction in forage production in bermudagrass when compared to the fed control (Table 1). Surprisingly, the starved control produced significantly less bahiagrass than either the fed control or fed *acletus*.

DISCUSSION

These experiments suggest that *acletus* is not a major source of damage to pastures and that researchers trying to alleviate damage to Florida pastures should direct their efforts principally to *vicinus*. The population densities used in these experiments were 11 and 22 per m^2 of soil and 308 and 618 per m^2 of transplanted grass, for adults and 5-20 mm juveniles respectively. J. A. Reinert (unpublished) reported densities as high as 126 per m^2 in tree spade samples of damaged bermudagrass, but the highest published counts of mole crickets in field studies are 6 and 7 per m^2 (Barry and Suber 1975, Short and Koehler 1980). Because the experimental densities were probably unrealistically high, the damage by *vicinus* may have been exaggerated. On the other hand, lack of severe damage by *acletus* at the same densities suggests that under no field circumstances is *acletus* damaging to established bahia- or bermudagrass. The present data do not exonerate *acletus* relative to possible damage to grass seedlings or sprigs or to vegetable crops. In preliminary studies, D. J. Schuster (personal communication, 1981) implicated *acletus* in cutworm-like damage to tomato seedlings.

Any discussion of mole cricket damage in Florida should include 2 other species: *Scapteriscus abbreviatus* and *Neocurtilla hexadactyla*. *S. abbreviatus*, like *acletus* and *vicinus*, was introduced about 80 years ago from

South America; however, it is flightless and has not spread inland from its several sites of introduction (Walker and Nickle 1981). On the basis of early reports (Hebard 1915) and more recent observations by J. A. Reinert at Fort Lauderdale (personal communication, 1981), we suspect that *abbreviatus* resembles *vicinus* more than *acletus* in its effects on grasses. *S. abbreviatus* may prove to be a more important pest than *acletus*. *N. hexadactyla* occurs in heavy moist soils (Blatchley 1920, Hayslip 1943), and we know of no evidence that it causes significant damage.

Four findings of this study merit further comment: (1) Adults in all treatments produced progeny (Table 3, right columns). Judged by amount of tunneling, progeny production went from highest in fed *vicinus* to lowest in starved *acletus*. These rankings are in keeping with the other findings of the study, though the source of nourishment in the starved cages of *acletus* is uncertain. Other mole crickets (dead or alive) and minor amounts of grass are possibilities. (2) Forage production in control cages was 3- to 8-fold greater during the adult study (12 March-24 June) than during the juvenile study (27 July-29 October) (Table 1). In addition to having 10 days less to grow, the grass in the latter study was not as vigorous when transplanted and received less sunlight because of higher cage walls. (3) In the control cages of the juvenile study, 10 (of 64) grass plugs died or were greatly reduced, whereas in the *acletus* cages the corresponding figure was 3. We do not know what caused the differential loss of stand, but an algal crust formed on the soil of the controls, whereas soil in the *acletus* cages was kept loose and friable by tunneling mole crickets. (4) Fed *acletus* juveniles reduced forage production by bermudagrass when compared to fed controls but not to starved controls. Starved *acletus* juveniles did not reduce bermudagrass production relative to either starved or fed controls (Table 1). The fact that fed controls in the juvenile study produced nearly twice as much forage as the starved controls (Table 1; both were fertilized) demonstrates that unexplained forces were at work; nonetheless, we propose that a contributing factor to the reduction of forage by fed juveniles relative to starved ones was that more survived and grew, making their feeding, or tunneling, or both, more damaging.

The most important question left unanswered by this study is what is the relation between *vicinus* density and degree of damage—i.e. what are the lowest densities that cause important damage? If these densities are as low as or lower than those encountered in the field, *vicinus* stands convicted of what it and *acletus* have long been accused.

Another question worth investigating is how *vicinus* damages grass—is it by feeding on the shoots, by feeding on the roots, by tunneling, or by some combination of the above? The means of damage should give clues to finding or developing resistant varieties of pasture grasses.

The techniques developed in these studies can be easily modified to answer the questions posed above and to learn more about what grass and vegetable cultivars are damaged by the 4 species of mole cricket in Florida, and to screen for resistance to damage by mole crickets.

ACKNOWLEDGEMENTS

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TWO NEOTROPICAL DERBID GENERA WITH OBSERVATIONS ON WING ROLLING (FULGOROIDEA, HOMOPTERA)

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ABSTRACT

Dawnarioides hispaniolus n. sp. from the Dominican Republic, and a new genus, *Neodawnaria*, with 4 new species, *woldai* from Panama, *jamaicensis*, *ecuadorensis*, and *hondurensis*, are described.

Changes are made in Fennah's (1952) key to the genera of Cenchreini to adapt it to the New World only, with *Dawnarioides* placed differently, *Neodawnaria* added, and *Phrygia* (Achilidae) deleted. Also added is *Ipsnola*