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## ADVENTIVE *ONTOPHAGUS* (COLEOPTERA: SCARABAEIDAE) IN NORTH AMERICA: GEOGRAPHIC RANGES, DIAGNOSES, AND NEW DISTRIBUTIONAL RECORDS<sup>1</sup>

E. Richard Hoebeke<sup>2</sup>, Kyle Beucke<sup>3</sup>

**ABSTRACT:** Five Old World species of the dung beetle genus *Onthophagus* (*nuchicornis*, *depressus*, *bonasus*, *gazella*, and *taurus*) are presently recorded in the United States, Canada, and Mexico. The current North American range of each, based on numerous literature records, specimens from private collections, from the insect collections of Cornell University and the Carnegie Museum of Natural History, and our own collecting, is mapped. A brief diagnosis, habitus photographs, and illustrations of other diagnostic features are provided to aid in accurate identification of these adventive species. We also report the presence of *O. gazella* in 2 new states in the U.S. (Kansas, Tennessee), and of *O. taurus* in 6 new states in the U.S. (Missouri, New York, Pennsylvania, Ohio, Tennessee, West Virginia).

Species of dung-burying beetles (Scarabaeidae: Scarabaeinae) have been intentionally introduced into North America to assist the native dung beetle fauna in their efficaceous and rapid removal of livestock feces from pastureland (Fincher 1981, Hunter and Fincher 1985). Some of the adventive species of the genus *Onthophagus* Latreille are quickly becoming the most dominant members of the dung beetle fauna in pastures in the United States, and the geographic range of these species is changing with their dispersal into new habitats.

Prior to 1970, 37 species of *Onthophagus* were recorded in the United States and Canada (Howden and Cartwright 1963), including 2 species<sup>3</sup> additional species (*taurus*, *gazella*, and *bonasus*) have been either intentionally released or discovered in the United States.

Between 1985-87, 3 other exotic species of *Onthophagus* [*sagittarius* (F.), *binodis* Thunberg, and *nigriventris* d'Orbigny] have been released in Texas to aid in the control of the horn fly, but these have not become established (refer to Fincher 1990) and they are not discussed further in this paper.

Of the 5 species of non-indigenous *Onthophagus* now recorded in North America, 4 (*nuchicornis*, *depressus*, *taurus*, and *gazella*) are securely established and the status of 1 (*bonasus*) is equivocal. Here, we review and map the

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known geographic distribution of these exotic *Onthophagus* in the United States, Canada, and Mexico based on available records in the literature, and on new data gleaned from specimens examined in the private collections of Kyle Beucke, Kipling W. Will, Robert A. Androw, and Darren A. Pollock, and from the collections of Cornell University (Ithaca, NY) and the Carnegie Museum of Natural History (Pittsburgh, PA). We also provide a brief diagnosis and habitus illustration of each of these species to aid in their identification.

The following acronyms are used to indicate deposition of specimens: private collections of Kyle Beucke (KBC), Kipling W. Will (KWC), Robert A. Androw (RAAC), and Darren A. Pollock (DAPC); Cornell University Insect Collection (CUIC), and Carnegie Museum of Natural History (CMNHC).

## SPECIES ACCOUNTS

### *Onthophagus nuchicornis* (L.)

**Geographic Range:** *Onthophagus nuchicornis*, a common and widespread dung beetle occurring throughout much of Europe, the British Isles, and western Asia, is also widely distributed in North America. All previously recorded North American distributional data (taken from Howden and Cartwright 1963; Hatch 1953, 1971; Macqueen and Beirne 1975; Morris 1983; Cervenka and Moon 1991; and McNamara 1991) and additional locality records taken from voucher specimens in the Cornell University Insect Collection and from the private collections of D. A. Pollock and R. A. Androw are mapped in Figure 1.

This Old World dung beetle is firmly established in western Canada (Alberta and British Columbia), in the northwestern United States (Idaho, Montana, and Washington), in eastern Canada (Ontario, Quebec, Newfoundland, New Brunswick, and Nova Scotia), and in a vast area of the northeastern United States (Connecticut, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin). McNamara (1991) also recorded *O. nuchicornis* from the prairie province of Manitoba.

This Palearctic species is believed to have been accidentally introduced into northeastern North America prior to the 1840s. Melsheimer (1844) described the species *Onthophagus rhinoceros* from Pennsylvania which was later found to be a junior synonym of *O. nuchicornis*, the Old World species. Henshaw (1887) reported this species being taken from cattle droppings in the Magdalen Islands in the Gulf of the St. Lawrence in 1881. Later, specimens of *O. nuchicornis*, "doubtless introduced with ballast refuse," were captured near Camden, New Jersey (Bland 1889). By the late 1890s and early 1900s, it was reported in the Canadian Maritimes (New Brunswick, Nova Scotia) and Quebec (Evans 1899, Roy 1899, Fletcher 1904). Earliest records of *O. nuchicornis*

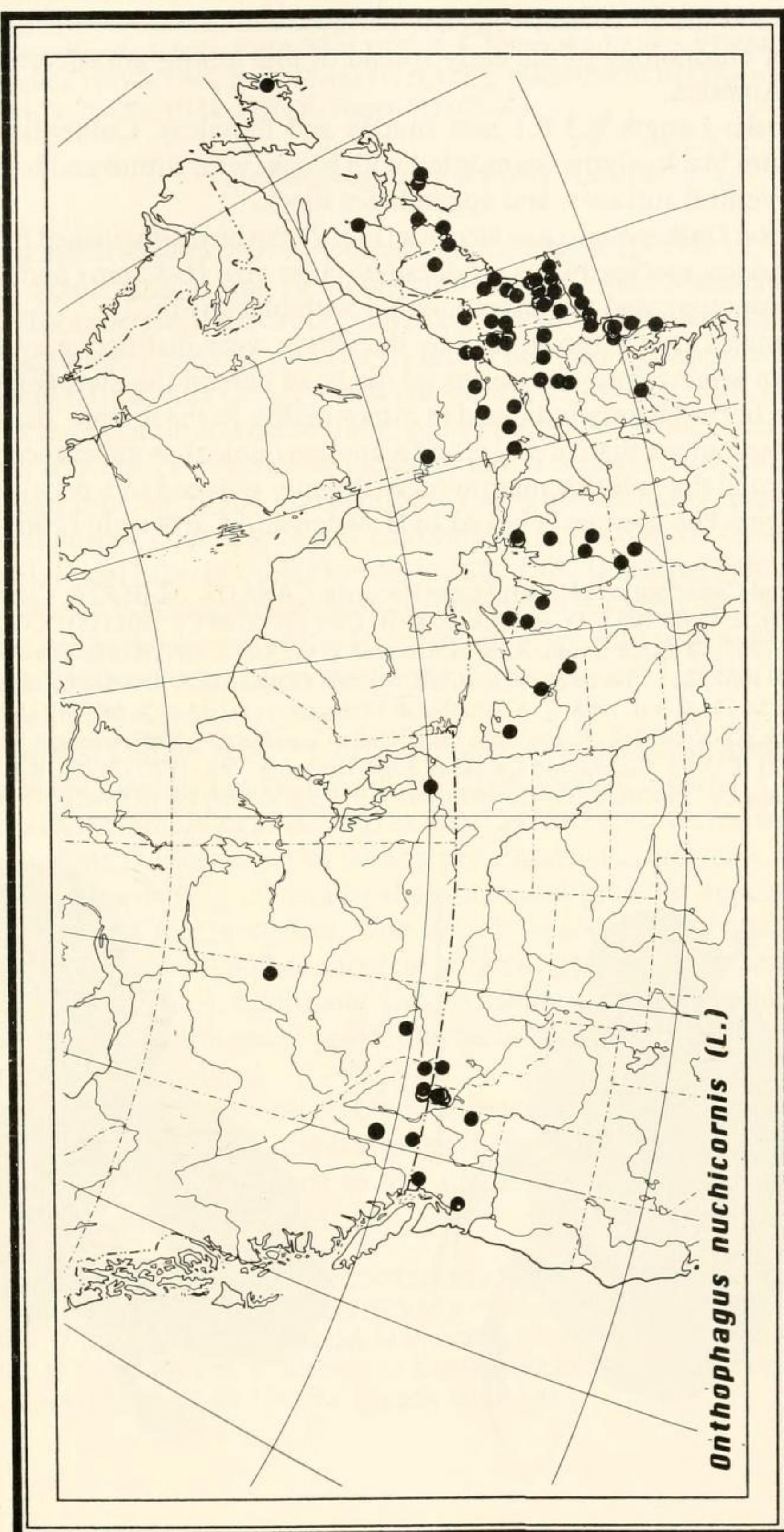


Fig. 1. Known distribution of *Onthophagus nuchicornis* in North America.

in the Pacific Northwest include collections made in southeastern British Columbia in 1945 (Hatch 1953). The occurrence of *O. nuchicornis* in the Pacific Northwest and the Northeast suggests multiple introductions. Brown (1940) gave a brief chronology of the early spread of this immigrant species in eastern North America.

**Diagnosis:** Length 6.3-8.1 mm (males and females). **Coloration.** Head and pronotum black; elytra tan mottled with black, with suture and base black; pygidium, ventral surfaces, and appendages black.

**Remarks:** *Onthophagus nuchicornis* (Fig. 2) can be distinguished from other North American species by its moderately large size (6-8 mm) and its black head and pronotum, and tan elytra mottled with black (Fig. 2).

Major males can be recognized by the single, very distinctive, cylindrical median horn arising from the vertex of the head behind the eyes (Fig. 3), but this median horn is barely indicated in minor males. In the female, the pronotal outline is less convex than in males and a median conical protuberance projects slightly beyond the anterior margin (occasionally reduced to a poorly defined arcuate ridge). The species is keyed in Howden and Cartwright (1963).

**Additional Canadian and United States Records:** CANADA: ALBERTA: Clear Lake, 16 km. E. Stavely, 25-VIII-1984, D. Pollock, J. & B. Cam (2) (DAPC). BRITISH COLUMBIA: Alberni, 4-IX-1957, G. Stace Smith, A. & H. Dietrich (1) (CUIC). ONTARIO: Ottville, 18-VI-1961, 11-VIII-1962, L. L. Pechuman (2) (CUIC). UNITED STATES: INDIANA: Pulaski Co., Jasper-Pulaski St. Pk., 2-VII-1988, R. A. Andrew & M. Brattain (1) (RAAC). MICHIGAN: Allegan Co., Saugatuck, 22-V-1972, E. R. Hoebeke (3) (CUIC). Gogebic Co., Watersmeet, 4 VII-1975, J. K. Liebherr (2) (CUIC). Kalamazoo Co., Gull Lake Biol. Sta., VII-1970 (3) (CUIC). MINNESOTA: Hubbard Co., Hubbard, 3,4-IX-1979, 9-IX-1979, 17-V-1980 (4) (RAAC). NEW HAMPS-



Figs. 2-3. *Onthophagus nuchicornis*. 2, dorsal habitus, major male. 3, head, major male, fronto-lateral aspect. Scale line for Fig. 2 = 5.0 mm.

SHIRE: *Strafford Co.*, W. Milton, no date (1) (CUIC). MARYLAND: *Worcester Co.*, Assateague Isl., 11-V-1957, R. G. Beard (3) (CUIC). NEW YORK: *Cayuga Co.*, Sterling, 18-V-1967, D. G. Nielson (1) (CUIC). *Essex Co.*, Mt. MacIntyre top, 19-VI-1941, 27-VI-1941, H. Dietrich (3) (CUIC). *Suffolk Co.*, Montauk Pt., no date (1) (CUIC); Shelter Isl., 14-VI-1944, R. Latham (1) (CUIC); Stony Brook, Scholar Field, 23-V-1980, J. S. Miller (2) (CUIC). VERMONT: *Addison Co.*, no locality, 19-VII-1963, R. A. Morse (1) (CUIC). WASHINGTON: *Thurston Co.*, Rocky Prairie, 4 mi. S. Tenino, 10-IV-1976, R. Hagen (1) (CUIC).

### *Onthophagus depressus* Harold

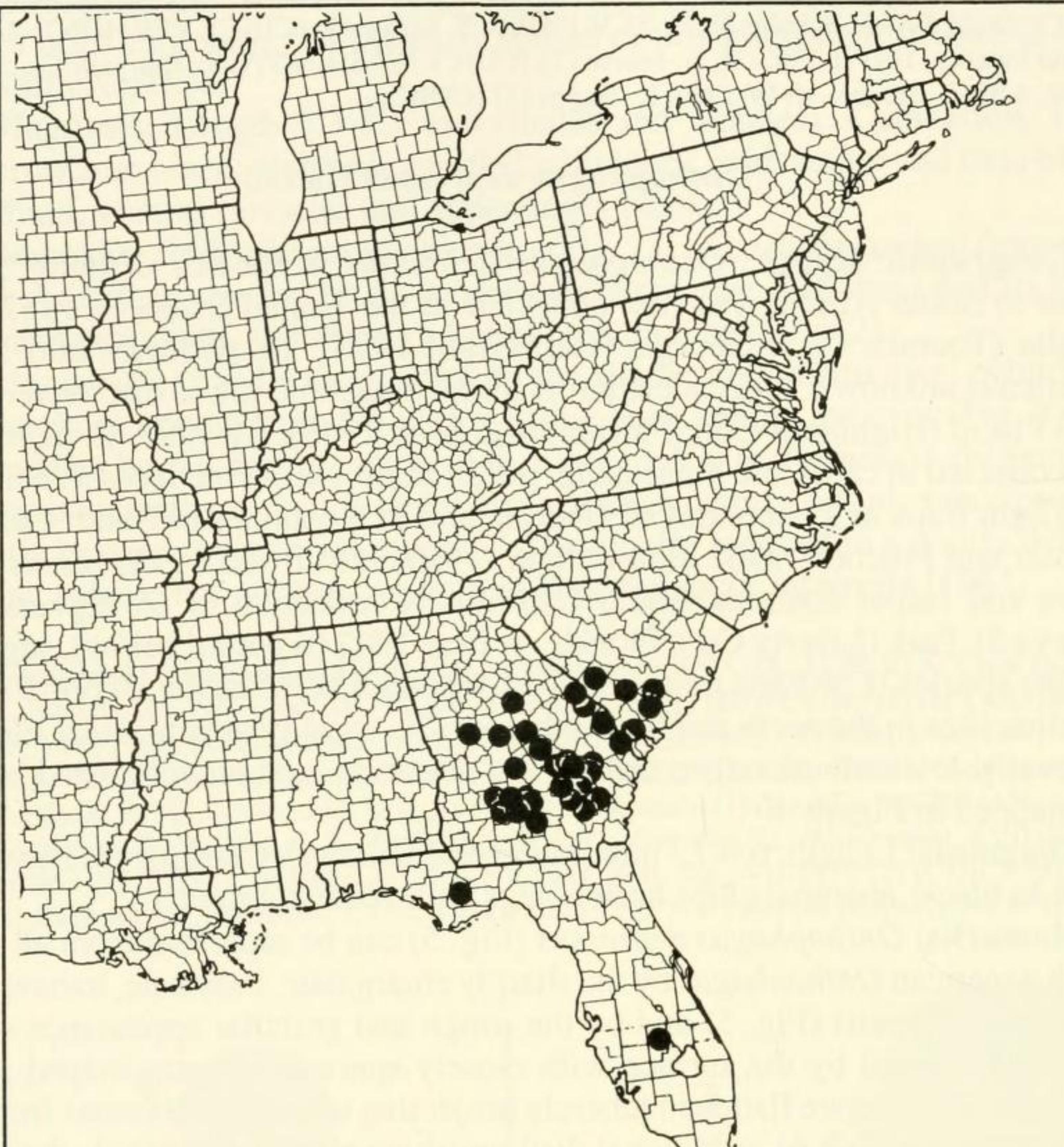
**Geographic Range:** *Onthophagus depressus*, a species of dung beetle native to South Africa, was first collected in the United States in 1937 near Vidalia (Toombs Co.), Georgia (Cartwright 1938). Its pathway into North America is unknown. A decade after its initial detection, it was discovered near Lake Placid (Highlands Co.), Florida (Robinson 1948). By 1995, *O. depressus* was collected in cattle and horse dung, pitfall traps with swine feces as bait, and blacklight traps in 27 counties of Georgia and in 5 counties of South Carolina (Hunter and Fincher 1996). Harpootlian (1995) also listed *O. depressus* from Aiken and Jasper counties, South Carolina. A collection of *O. depressus* in Torreya St. Park (Liberty Co.), Florida, in June 1982 (reported below), suggests that the species is perhaps more widely distributed between the Georgia/South Carolina sites in the north and the Highlands Co. locality in peninsular Florida. All available distributional records in the literature, and records listed below, are mapped in Figure 4.

**Diagnosis:** Length, 6.0-7.7 mm (males and females). **Coloration.** Brownish black to black; antennal clubs brown, legs dark reddish brown.

**Remarks:** *Onthophagus depressus* (Fig. 5) can be separated from all other North American *Onthophagus* by the sharply emarginate, bidentate, transversely tuberculate clypeus (Fig. 5) and by the rough and granular appearance of the pronotum created by the surface with closely-spaced, crescent-shaped punctures with an elongate flattened tubercle projecting toward their center from the anterior margin (Fig. 6). Additional distinguishing characters include the short, flattened, stubby yellow setae projecting from each puncture, and the heavily punctate tuberculate elytra.

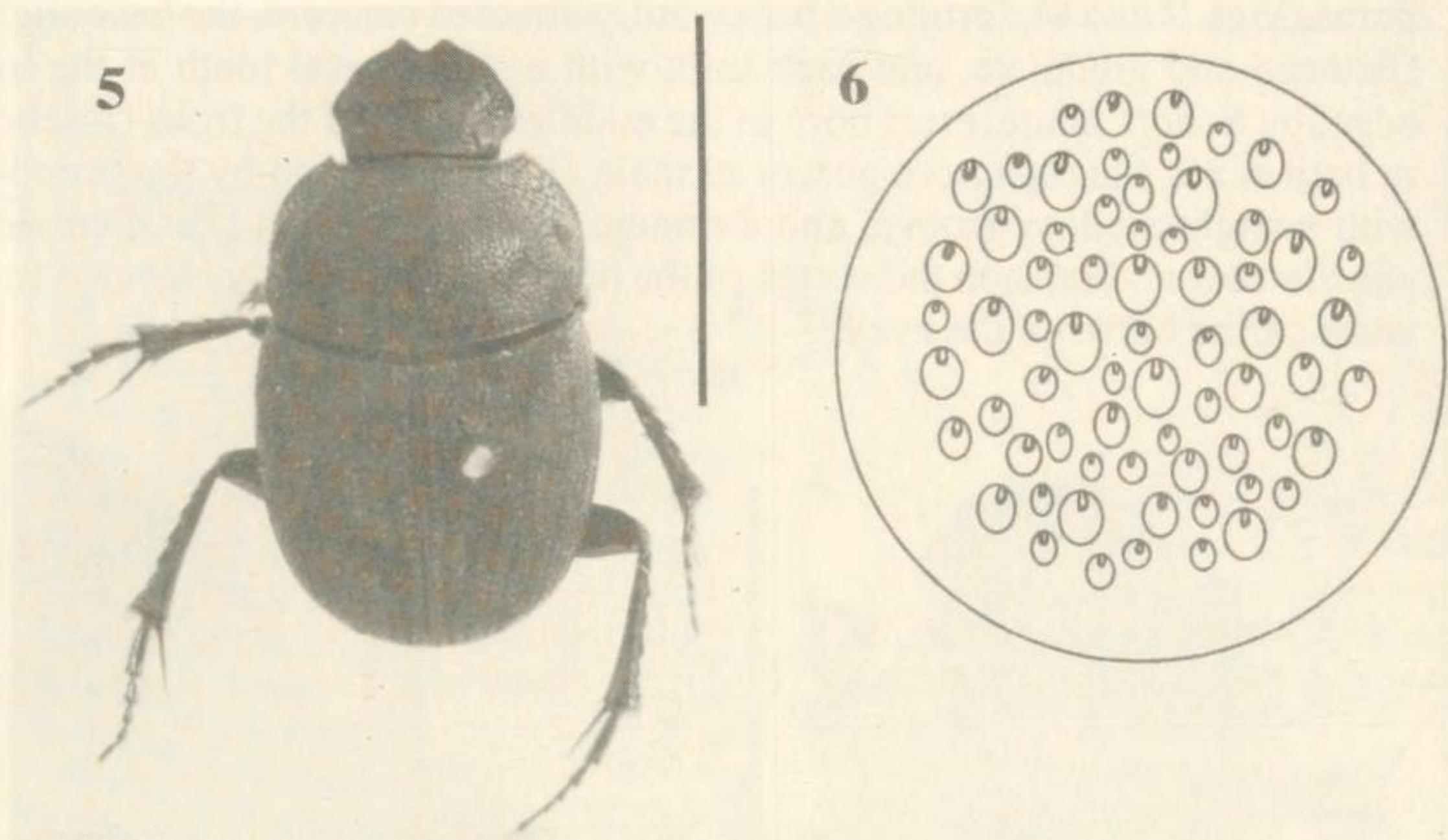
Males and females exhibit no obvious secondary sexual characteristics. In the female, the ventral abdominal segment before the pygidium is much longer along the midline as compared to that of the male. The species is keyed in Howden and Cartwright (1963).

**Additional United States Records:** UNITED STATES: FLORIDA: *Highlands Co.*, Archbold Biol. Sta., 18-IV-1969, L. L. Pechuman (1) (CUIC); Archbold Biol. Sta., 8 mi. S. of Lake Placid, 30-III-1979, G. Mullen (4) (CUIC); Archbold Biol. Sta., 24-27-III-1984, J. S. Miller (5) (CUIC); 9-VI-1990, 13,14-VI-1990, R. A. Androw, G. Keeney, and M. Archangelsky (4) (RAAC). *Liberty Co.*, Torreya St. Pk., 2-VI-1982, M. Brattain (2) (RAAC).



***Onthophagus depressus* Harold**

Fig. 4. Known distribution of *Onthophagus depressus* in North America.



Figs. 5-6. *Onthophagus depressus*. 5, dorsal habitus, male. 6, close-up of pronotal punctuation. Scale line for Fig. 5 = 5.0 mm.

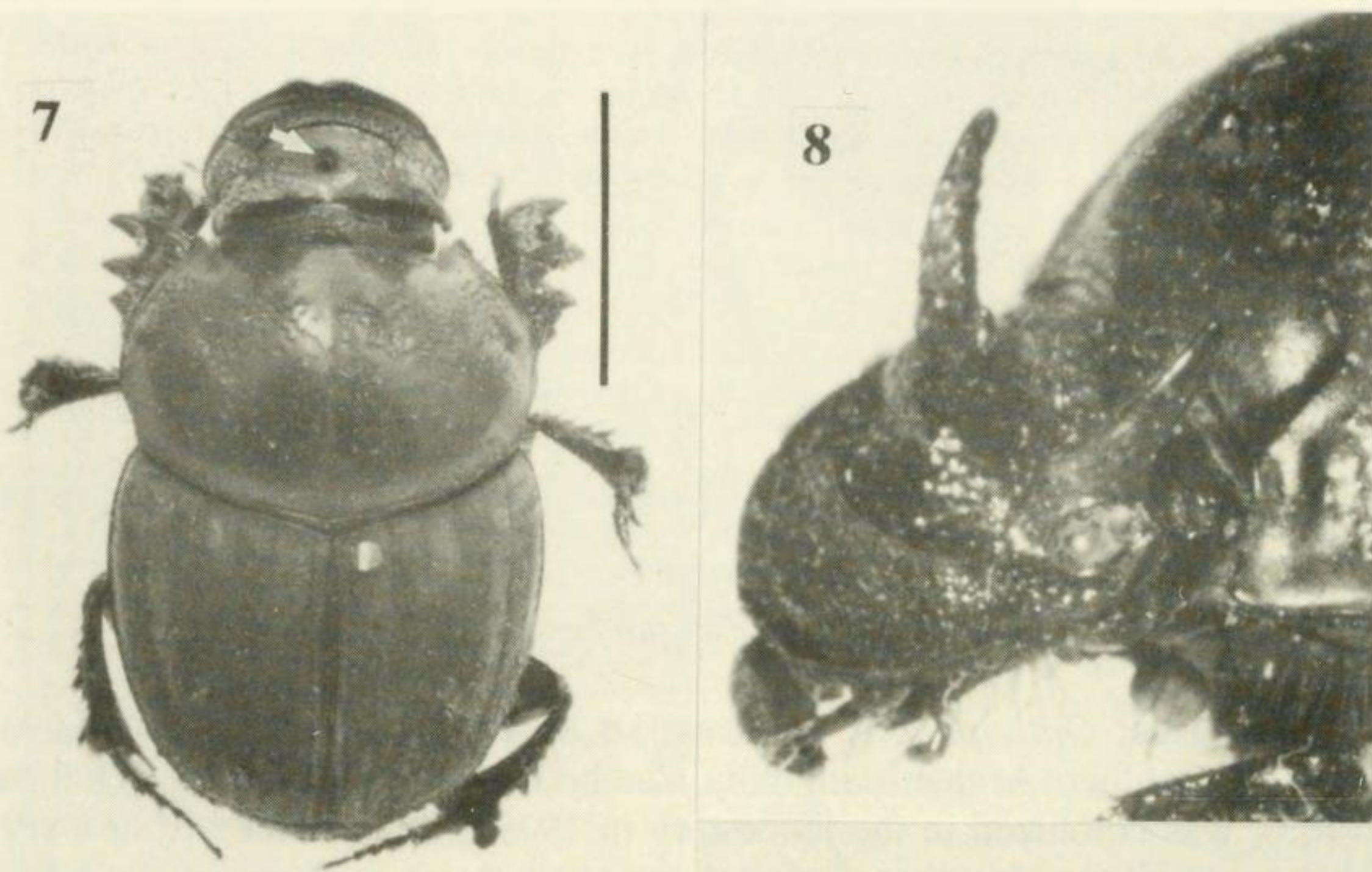
### *Onthophagus bonasus* (F.)

**Releases:** *Onthophagus bonasus*, an Indo-Asian dung beetle native to Pakistan, southern Afghanistan, India, Cambodia, Ceylon, and Burma (Balthasar 1963), was colonized in the laboratory in 1979 and first released at a site in east-central Texas (an owner-cooperator cattle ranch in Burleson Co.) during the winter of 1980-81 (Fincher 1986, Fincher and Hunter 1989). Additional releases of *O. bonasus* were made in other east-central Texas localities in the early 1980s: at one site in Brazos County, July to September, 1982 (Coulson 1992), and at one site in Grimes County, April to September, 1983 (Coulson 1994). Releases at unspecified sites in Georgia took place in 1984 (Fincher 1986). Fincher and Hunter (1989) concluded that the establishment of *O. bonasus* in the United States is equivocal, and that it "has not been recovered more than one year after release in any area."

**Diagnosis:** Length, 12-17 mm (males and females). **Coloration.** Testaceus yellow, with the head, pronotum (except a narrow pale margin at the sides and base), the elytral suture, the median portion of the metasternum, the upper surface of the femora and tibiae, and a large patch on the lower side of each femur, greenish-black. The entire surface is suffused with a slight metallic luster.

**Remarks:** Adults of *O. bonasus* (Fig. 7) are very similar in shape and coloration to those of *O. gazella* (discussed below), but in general are larger in size (12-17 mm vs. 8-13 mm). *Onthophagus bonasus* can be further distin-

guished by the vertex of the head of major males and females bearing a pair of horns (Figs. 7 and 8), forming a backwardly directed crescent, the base slightly flattened and granulate, and each horn with a slight basal tooth at the inner edge; by a short, acute, erect horn in the middle (Fig. 7) of the frons (forehead) in both sexes (median horn absent in male *O. gazella*); and by the pronotum with a slight median groove, and a minute tubercle on each side. Female *O. gazella* bear no horns on the vertex of the head, only a strongly elevated transverse carina between the eyes.



Figs. 7-8. *Onthophagus bonasus*. 7, dorsal habitus, male. 8, head, male, fronto-lateral aspect. Scale line for Fig. 7 = 5.0 mm.

#### *Onthophagus gazella* (F.)

**Releases, Establishment, and Geographic Range.** *Onthophagus gazella*, an Afro-Asian dung beetle native to much of the hotter, drier parts of Africa south of the Sahara, and ranging into Madagascar, Asia Minor, India and Ceylon (Balthasar 1963, Tyndale-Biscoe 1990), was first introduced into North America in 1972 with releases in Victoria and Kleberg Counties, Texas (Blume and Aga 1978). This exotic dung beetle was also imported, mass-produced, and released at various sites in central and southern California (Anderson and Loomis 1978, Legner 1986, Kohlmann 1994). Since its initial introduction into Texas, *O. gazella* has successfully radiated from the release sites and now occurs throughout a vast portion of the southern two-thirds of Texas and the southern tier of

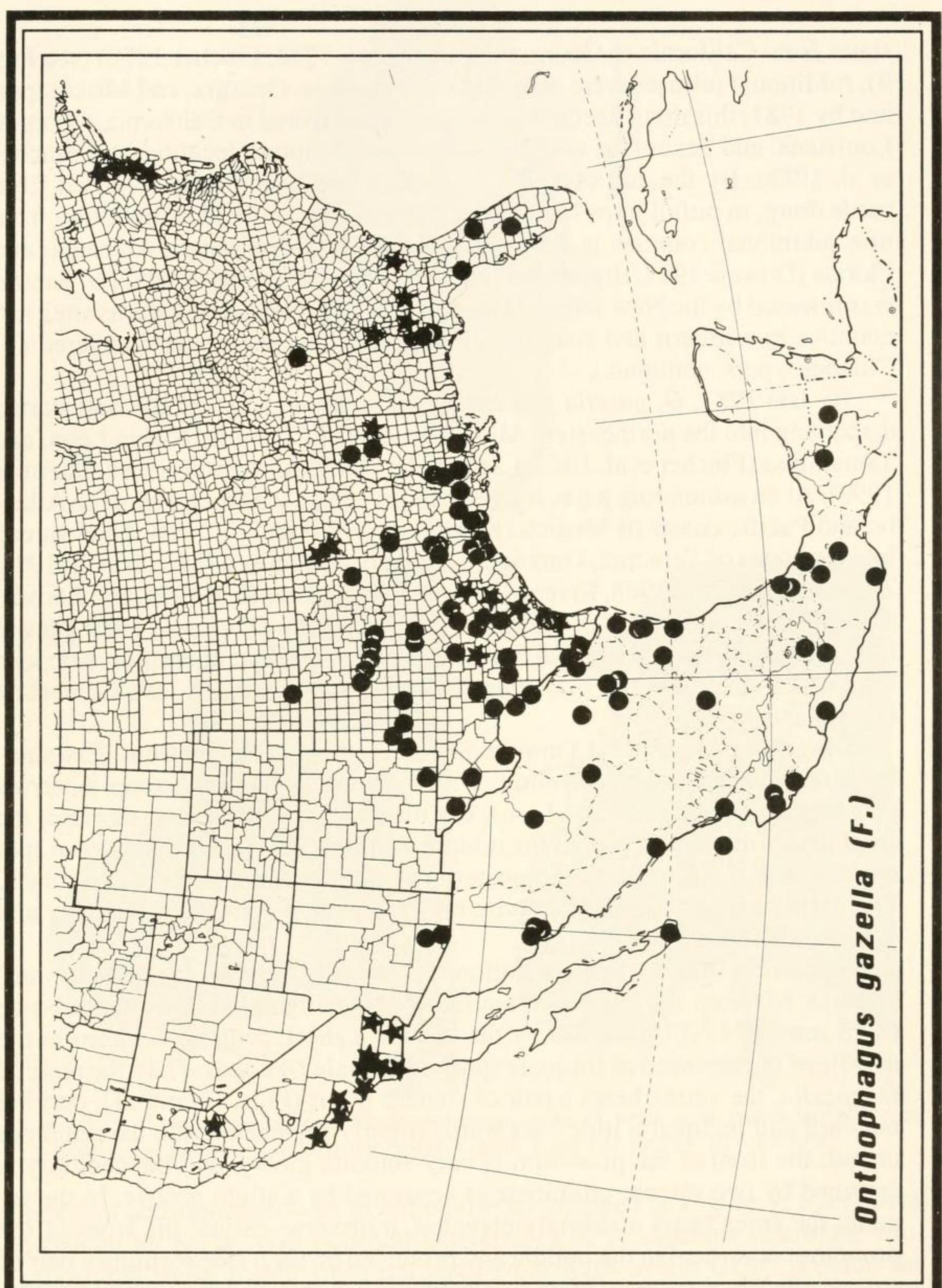


Fig. 9. Known distribution of *Onthophagus gazella* in the United States and Mexico. Stars denote release sites.

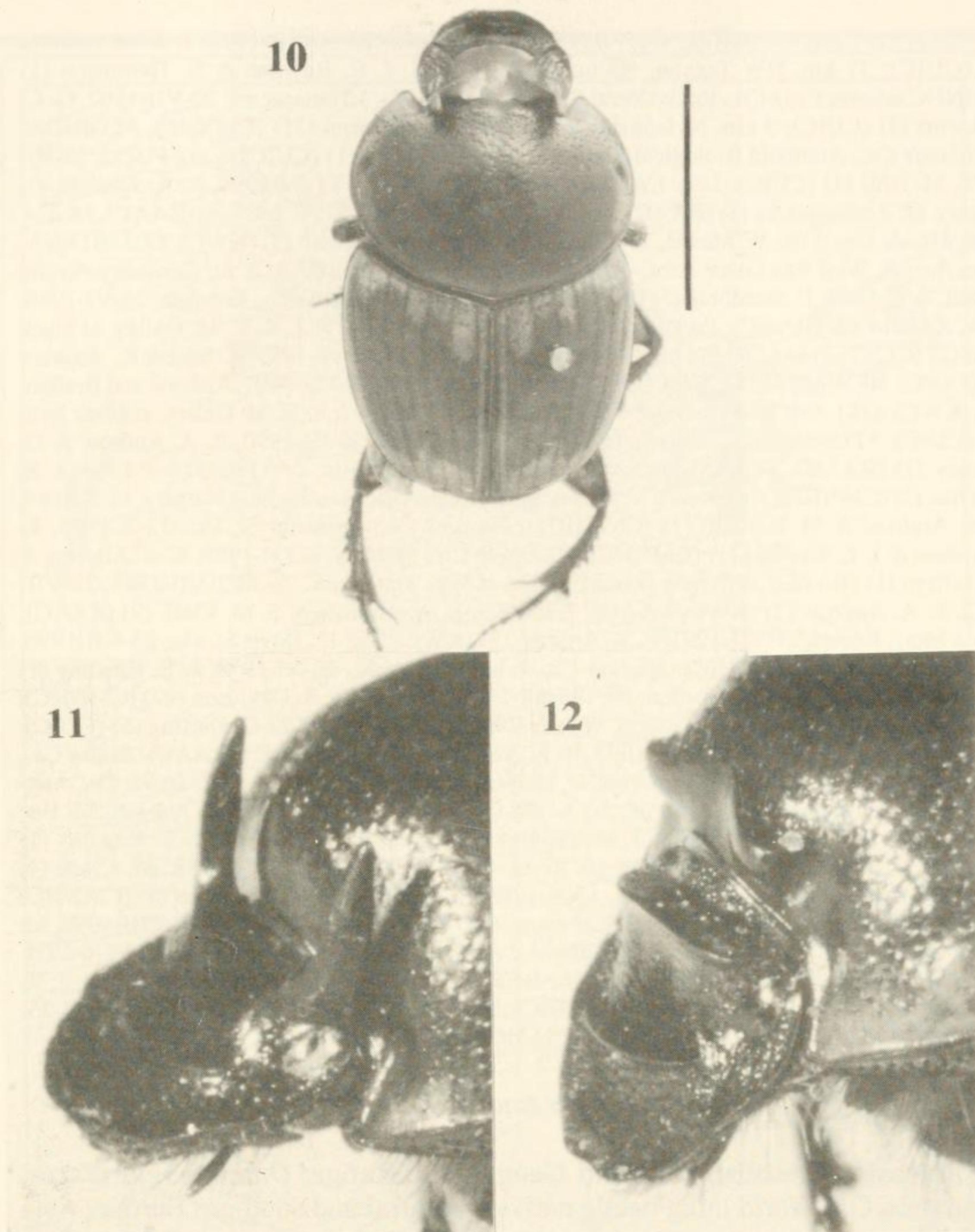
states from California to Georgia (Fincher et al. 1983, Fincher 1990) (see Fig. 9). Additional releases were also made in Arkansas, Georgia, and Mississippi, and by 1981, this dung beetle was securely established in California, Georgia, Louisiana, and Texas (for specific release and recapture localities see Fincher et al. 1983). By the end of 1983, *O. gazella* had been either collected from cattle dung, in pitfall traps baited with swine feces, or in a UV light trap from new additional counties in Oklahoma, Arkansas, Mississippi, Alabama, and Florida (Downie 1984, Hunter and Fincher 1985). Beginning in 1987, *O. gazella* was released by the New Jersey Department of Agriculture at various sites in 6 counties in northern and southern New Jersey, but was never recovered (R. Chianese, pers. commun.).

By late 1981, *O. gazella* had expanded its range very rapidly and started dispersing into the northeastern Mexican states of Coahuila, Nuevo Leon, and Tamaulipas (Fincher et al. 1983, Lago et al. 1984, Barbero and Lopez-Guerrero 1992). At an astounding pace, it has since invaded a vast area along the Atlantic and Pacific coasts of Mexico (Kohlmann 1994) and by 1988 it had spread into the states of Veracruz, Durango, Guerrero, and Jalisco (Morón et al. 1988, Zunino and Halffter 1988, Rivera-Cervantes and Garcia-Real 1991, and Barbero and Lopez-Guerrero 1992). Thomas (1993) reported *O. gazella* from sites in lowland rain forest and tropical deciduous forest in the southernmost Mexican state of Chiapas. By 1987, *O. gazella* had even penetrated into Guatemala (Kohlmann 1994).

**Diagnosis:** Length. 8-13 mm (males and females). **Coloration.** Very similar to *O. bonasus*; testaceus yellow, with the head, pronotum (except a narrow pale margin at the sides and base), the median part of the metasternum, the front tibiae, the greater part of the middle and hind tibiae, and a large oval spot on the lower surface of the four posterior femora, greenish- or coppery-black. The extreme edges of the pronotum, elytra, and all segments of the body and legs are also dark.

**Remarks:** In shape and coloration, *O. gazella* (Fig. 10) is extremely similar to *O. bonasus*, but can be separated by being slightly smaller in body size (8-13 mm vs. 12-17 mm) and by the lack of a short, acute, erect horn in the middle of the forehead of the male (present in male *O. bonasus*). In the male of *O. gazella*, the vertex bears a pair of slender horns (Figs. 10 and 11), curving outward and inclined a little backward, slightly flattened at the base and not united; the front of the pronotum is very smooth, glossy, and the declivity is crowned by two minute prominences separated by a slight groove. In the female, the frons bears a strongly elevated, transverse carina; the front of the pronotum is vertical in the middle and produced on each side forming a pair of strong, slightly divergent, blunt processes (Fig. 12).

**Additional United States and Mexican Records:** All previously reported locality records for *O. gazella* (releases and recaptures) in the literature and



Figs. 10-12. *Onthophagus gazella*. 10, dorsal habitus, male. 11, head, male, fronto-lateral aspect. 12, head and pronotum, female, fronto-lateral aspect. Scale line for Fig. 10 = 5.0 mm.

new and additional records given below are mapped in Figure 9. Specimens provided by K. W. Will (Cornell University), R. A. Androw (Carnegie Museum) and those sorted from unidentified scarabs in the CUIC provide the basis for 2 new state records for the United States [marked with an asterisk (\*)]. These new distributional data, and other locality records, are as follows:

UNITED STATES: ARIZONA: *Pima Co.*, Continental, 23-30-VII-1992, J. & M. Huether (1) (CUIC); 31 km. NW Tucson, 600m., 29-VIII-1988, J. E. Rawlins & S. Thompson (1) (CMNHC). *Santa Cruz Co.*, Rock Corral Canyon, 2 mi. SW - 3 Tumacacori, 22-VII-1992, G. C. Eickwort (3) (CUIC); 3 km. N. Nogales, 6-IX 1992, L. Wismann (11) (CMNHC). FLORIDA: *Highlands Co.*, Archbold Biological Station, 25-III/5-IV-1984 (1) (CUIC); Lake Placid, 22-III-1988, M. Ishli (1) (CUIC). *Levy Co.*, Manatee Springs St. Pk., 15-VI-1990, R. A. Androw, G. Keeney, M. Archangelsky (1) (RAAC). *Seminole Co.*, Longwood, 5-VII-1987 (3) (RAAC). \*KANSAS: *Meade Co.*, 3 mi. W. Meade, 23-IX-1990, Androw and Brattain (1) (KWC). LOUISIANA: *Allen Parish*, West Bay Game Area, 4-VI-1985, D. Sundberg (2) (RAAC). *St. Tammany Parish*, Slidell, 4-VI-1983, D. Sundberg (5) (RAAC). MISSISSIPPI: *Grenada Co.*, Grenada, 26-VI-1986, R. A. Androw (1) (RAAC). *Panola Co.*, no locality, 12-13-VII-1987, K. E. M. Galley, at black light (2) (CUIC). *Stone Co.*, 8.4 mi. E. of Wiggins, on Rte. 26, 24-V-1995, K. Will & R. Androw (2) (CUIC). NEW MEXICO: *Eddy Co.*, 10-15 mi. S. Carlsbad, 16-VII-1991, Androw and Brattain (1) (KWC). OKLAHOMA: *Latimer Co.*, no locality, 5-VII-1987, K. E. M. Galley, at black light (2) (CUIC). \*TENNESSEE: *Cumberland Co.*, Grassy Cove, 26-III-1990, R. A. Androw & G. Keeney (1) (RAAC). TEXAS: *Bastrop Co.*, 5 km. N. Smithville, 1-V-1983, 16-V-1983, J. E. Rawlins (2) (CMNHC). *Cameron Co.*, 10 km. SSE Brownsville, Southpointe Nursery, 11-X 1994, R. A. Androw & M. Brattain (1) (CMNHC). *Gonzales Co.*, Palmetto St. Pk., 13-X-1985, R. Davidson & J. E. Rawlins (1) (CMNHC). *Hudspeth Co.*, McNary, 8-VII-1986, R. A. Androw & D. Heffern (1) (RAAC). *Jefferson Davis Co.*, Davis Mtn. State Park, 28-VI/2-VII-1986, 22-VII-1992, R. A. Androw (2) (KWC, RAAC); 7-X-1993, R. A. Androw & S. M. Clark (2) (RAAC); Davis Mtns. Resort, 21-VII-1991, R. A. Androw (3) (KWC); vic. Ft. Davis St. Pk., 24-VII-1996, Wappes & Huether (2) (CUIC). *Medina Co.*, 8 km. S. Hondo, 26-XI-1978, J. E. Rawlins (1) (CMNHC). *Palo Pinto Co.*, Gordon, Rt. 193 at I-20, 12-VIII-1981, R. Davidson (27) (CMNHC). *San Patricio Co.*, 12.4 km. NE Sinton, Welder Refuge, 20-VII-1979, D. C. Darling (5) (CUIC). *Starr Co.*, 14 mi. E. El Sauz, 10-X-1993, R. A. Androw & S. M. Clark (2) (RAAC). *Sutton Co.*, near Sonora, 27-VI-1986, R. A. Androw, D. Heffern & J. Huether (3) (RAAC). *Travis Co.*, Austin, Brackenridge Field Lab., 140 in., 13-X-1984, J. E. Rawlins (2) (CMNHC); 1 km. SE Bee Cave, 17-X-1985, R. Davidson & J. E. Rawlins (6) (CMNHC); 7-X-1984, J. E. Rawlins (1) (CMNHC). *Val Verde Co.*, I-90 at Pecos River, 8-X-1993, R. A. Androw & S. M. Clark (4) (CMNHC). *Zapata Co.*, Falcon St. Pk., 15-X-1985, R. Davidson & J. E. Rawlins (6) (CMNHC) CHIAPAS: Palenque, approx. 20 km. S. of ruins, to UV & Mercury Vapor, 19-20-VIII-1990, M. H. Evans (1) (CUIC). NUEVO LEON: above Cola de Caballo, 2550 ft. alt., to UV, 5-6-VIII-1986, M. H. Evans (15) (CUIC). OAXACA: Betanias, 20-VII-1990, 200 m. el., UV light, J. K. Liebherr, CAS-CU-UCB Field Exp. (1) (CUIC). VERACRUZ: Est. Biol. "Los Tuxtlas", 24-25-VII-1990, 250 m. el., J. K. Liebherr, CAS-CU-UCB Field Exp. (4) (CUIC).

### *Onthophagus taurus* (Schreber)

**Releases, Establishment and Geographic Range:** *Onthophagus taurus*, a common Old World dung beetle native to central and southern Europe, Asia Minor, and ranging from Spain to Morocco, Turkey, Iran and Afghanistan (Balthasar 1963, Tyndale-Biscoe 1990), was recorded for the first time from the United States by Fincher and Woodruff (1975), based on a specimen taken in August 1971 in Santa Rosa County, Florida. Fincher and Woodruff (1975) suggested that it most likely had been accidentally introduced into the Florida panhandle near Pensacola; they proposed the theory of a cattle farmer or rancher easily bringing adult beetles back from an overseas trip, or that the beetles

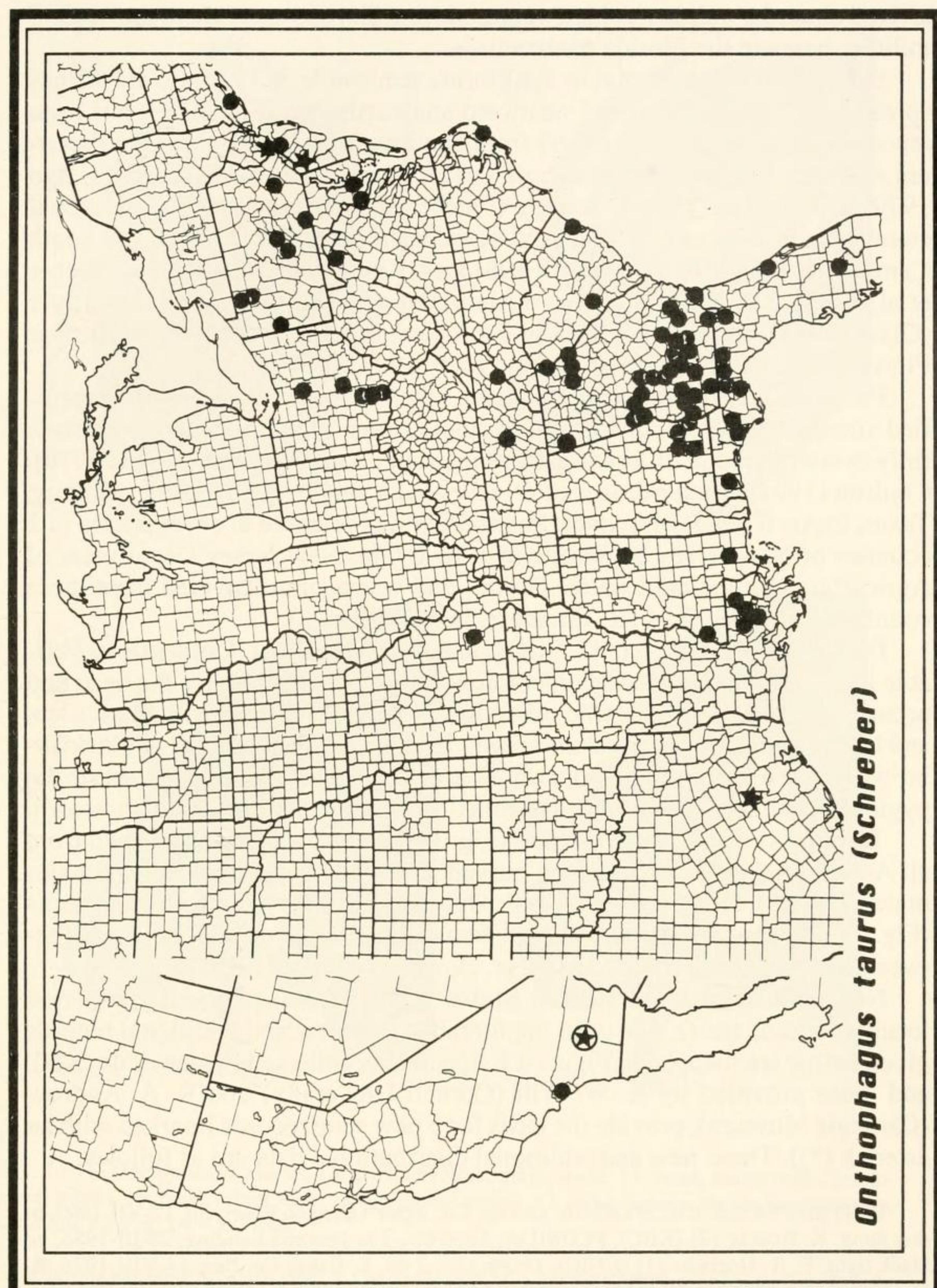


Fig. 13. Known distribution of *Onthophagus taurus* in North America. Stars denote release sites; star/circle denotes a number of unspecified release sites in southern California.

arrived aboard a military vehicle returned from Europe since there are several military bases in the Florida panhandle.

Since its initial detection in the Florida panhandle in 1971, *O. taurus* has spread with remarkable speed westward and northward (Fig. 13). It has been recorded (in chronological order) from southwestern Georgia and southeastern Alabama (Fincher and Woodruff 1975), Stone County, Mississippi (Lago 1979), Cumberland Island, Georgia (Fincher and Woodruff 1979), additional counties in Florida and Georgia, and new coastal localities in North and South Carolina (Steiner 1980, Bernhardt 1981), sites in southern Louisiana (Fincher et al. 1983), a locality in southern Maryland adjacent to the Potomac River (Glaser 1986), and at the Archbold Biological Station in southern peninsular Florida (Highlands Co.) (Vulinec and Eady 1993).

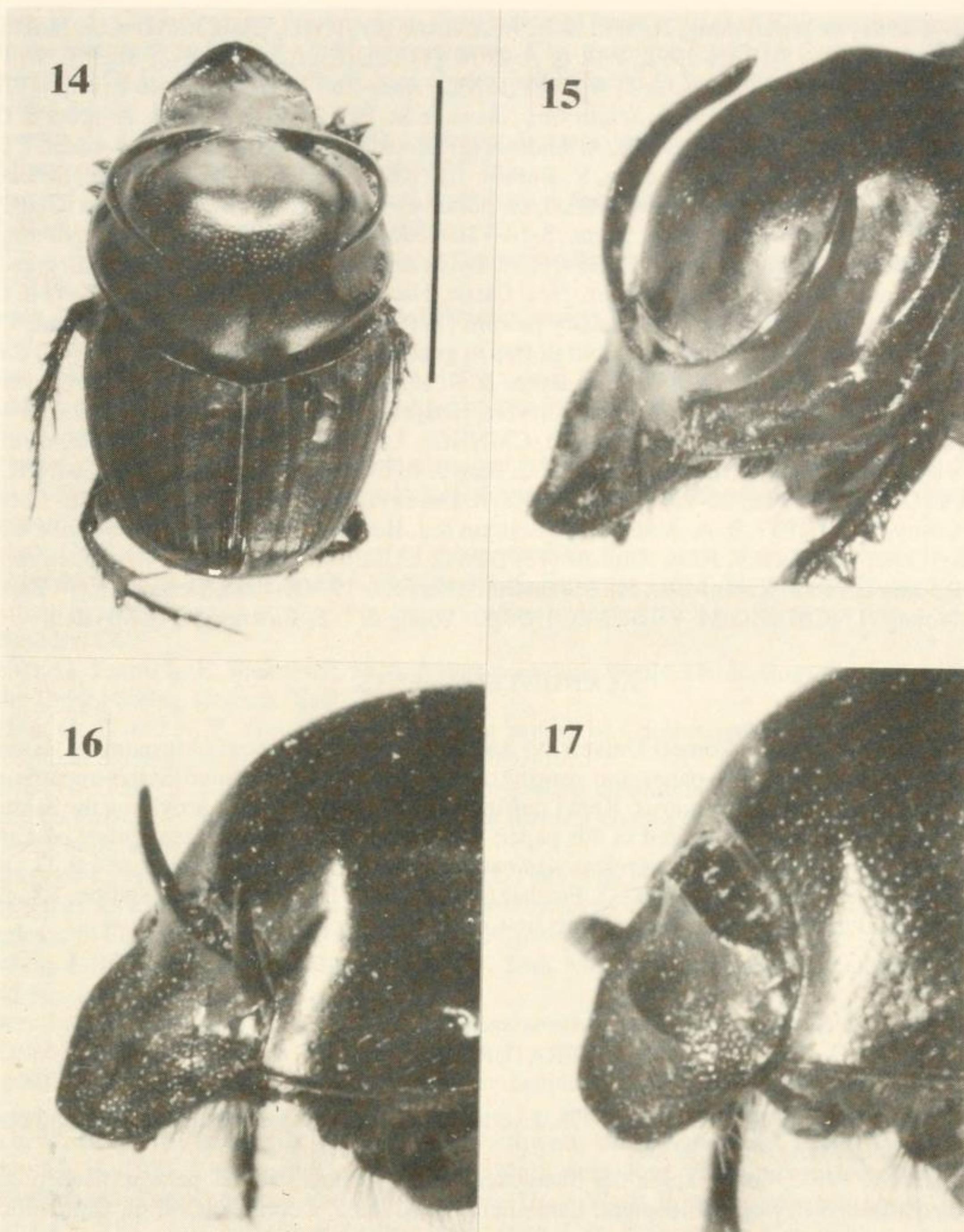
Field releases of *O. taurus* also have taken place at a number of unspecified sites in California and recapture studies have shown that it has successfully overwintered in different parts of the state (Anderson and Loomis 1978). Coulson (1994) noted releases of *O. taurus* at a single site in Grimes County, Texas, in April 1983. Moreover, this species was released at several sites in 2 counties of New Jersey beginning in 1987 by the New Jersey Department of Agriculture (Biological Control Group) and was again recovered from these counties during 1990-91 (R. Chianese, pers. commun.).

**Diagnosis:** Length. 6.0-11.5 mm (males and females). **Coloration.** Variable in coloration, but mostly unicolorous dull black; sometimes the head and pronotum with a slight metallic reflection. Antennae reddish, with black club, and legs blackish or dark reddish-brown. Elytra usually dull black or blackish-brown, occasionally reddish-brown. The entire pygidium, or portions of the pygidium, and the sides of the abdominal sternites sometimes reddish-brown.

**Remarks:** *Onthophagus taurus* (Fig. 14) can be easily distinguished from all American species by two long curved, divergent cephalic horns on major males (Fig. 15). However, minor males have a pair of very short, straight horns (Fig. 16), or else they are absent. In females, the clypeus and the frons (between the eyes) each has a transverse, elevated carina or ridge (Fig. 17).

**New and Additional United States Records:** All previously reported locality records for *O. taurus* in the literature and new and additional records given below are mapped in Figure 13. Specimens collected by one of us (KB), and those provided by K. W. Will (Cornell University) and R. A. Androw (Carnegie Museum), provide the basis for 6 new state records [marked with an asterisk (\*)]. These new and additional distributional data are as follows:

UNITED STATES: CALIFORNIA: *Orange Co.*, Peter's Canyon Reservoir, 12-VII-1993, in dog dung, K. Beucke (2) (KBC). FLORIDA: *Leon Co.*, Lk. Iamonia Landing, 28-III-1986, ex black light, E. R. Hoebeke (1) (CUIC). *Union Co.*, 2 mi. S. Baker Co. line, 14-VIII-1976, R. Davidson (8) (CMNHC). *Volusia Co.*, Ormond Beach, 25-III-1982, R. A. Androw (3) (RAAC). GEORGIA: *Crisp Co.*, Cordele, 31-III-1982, R. A. Androw (7) (RAAC). MARYLAND: *Calvert*



Figs. 14-17. *Onthophagus taurus*. 14, dorsal habitus, major male. 15, head, major male, fronto-lateral aspect. 16, head, minor male, fronto-lateral aspect. 17, head, female, fronto-lateral aspect. Scale line for Fig. 14 = 5.0 mm.

*Co.*, Chesapeake Beach, 2-VII-1986, J. Green (4) (RAAC). MISSISSIPPI: *Oktibbeha Co.*, Osborn Prairie, 16-20-III-1997, C. J. Marshall & K. W. Will, ex baited pitfall traps (3) (CUIC). \*MISSOURI: *Reynolds Co.*, Ellington, 15-VI-1985, M. Brattain (5) (RAAC). NEW JERSEY: *Burlington Co.*, Mount Holly, 2-VII-1994, in cow dung, K. Beucke (2) (KBC). \*NEW YORK: *Suffolk Co.*, Stony Brook, 29-VIII-1993, K. Beucke (1) (KBC); Rocky Point, (burned pine barrens, site #2), 21-IX-1996, ex chicken pitfall trap, K. Beucke (1) (KBC). \*OHIO: *Fairfield Co.*, Barneby Ctn.,

12-19-X-1991, ex pitfall/dung, K. Will & R. A. Androw (6) (KWC, CUIC). *Pike Co.*, Jackson Twp., Jackson Lk., 5-12-IX-1992, Will & Androw (1) (CUIC). *Richland Co.*, Shelby, Will's Farm, 29-IV-1991, ex dung, K. & I. Will (1) (KWC). *Ross Co.*, Rt. 50 at Scioto River, 4-VII-1989, R. A. Androw (1) (RAAC). *Scioto Co.*, Shawnee St. Pk., 26-V-1990, R. A. Androw & G. Keeney (2) (RAAC); 20-VII 1990, R. A. Androw (2) (RAAC). \*PENNSYLVANIA: *Adams Co.*, Gettysburg, 10-VI-1995, in cow dung, K. Beucke (1) (KBC). *Berks Co.*, Wernersville, Stricker farm, V-1994, R. A. Byers & G. M. Barker, ex pitfall trap in grazed dairy pasture (1) (CUIC). *Forest Co.*, 8.7 km. N. Kellettsville, 500m., 8-14-VIII-1995, J. R. Deeds (1) (CMNHC). *Huntington Co.*, Tyrone, Hawthorne farm, V-1994, R. A. Byers & G. M. Barker, ex pitfall trap in grazed dairy pasture (1) (CUIC). *Lawrence Co.*, New Castle, Harmon farm, VI-1994, R. A. Byers & G. M. Barker, ex soil samples in grazed dairy pasture (1) (CUIC); New Castle, Gebhart farm, VI-1994, R. A. Byers & G. M. Barker, ex pitfall trap in grazed dairy pasture (1) (CUIC). *Mifflin Co.*, Belleville, Rodgers farm, V-1994, R. A. Byers & G. M. Barker, ex pitfall trap in grazed dairy pasture (1) (CUIC). *Warren Co.*, 8.6 km. S. Irvine, Hedgehog Run, 530 m., 19-27-V-1995, 28-V/2-VI-1995, 8-14-VIII-1995, J. R. Deeds (6) (CMNHC); 7.3 km. SSW Cherry Grove, 520m., 28-V/2-VI-1995 (1) (CMNHC); 3-10-VI-1995, C. Bier, J. R. Deeds & T. Schumann (1) (CMNHC); 6 km. E. Cobham, 565 m., 26-VII-1-VIII-1995, J. R. Deeds (1) (CMNHC). \*TENNESSEE: *Cocke Co.*, Cosby, 13-VI-1987, R. A. Androw, M. Brattain & J. Huether (1) (RAAC). *Cumberland Co.*, Grassy Cove, 27-III-1989, R. A. Androw (13) (KWC, CUIC). \*WEST VIRGINIA: *Hampshire Co.*, 0.5 km. E. North River Mills, Ice Mountain Preserve, 6-19-VII-1995, D. Koenig, W. Zanol & C. Young (1) (CMNHC); 1-VIII-20-IX-1995, C. Young & J. E. Rawlins (1) (CMNHC).

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