Zootaxa 4457 (3): 444–454
http://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4457.3.6
http://zoobank.org/urn:lsid:zoobank.org:pub:0DED6B72-F735-48AD-B686-7A858AD7BA14

Notes on the biology and distribution of the tribe Agallissini in North America (Coleoptera: Cerambycidae: Cerambycinae)

THOMAS AUSTIN[1], DANIEL HEFFERN[2], ROBERT GEMMILL[3], BRIAN RABER[4] & MIKE QUINN[5]
[1]*111 Edward Ct, Summerville, SC 29486, USA. E-mail: tbausti@g.clemson.edu*
[2]*10531 Goldfield Ln, Houston, Texas 77064, USA. E-mail: titanusgiganteus@hotmail.com*
[3]*2944 Amberhill Way, Charleston, SC 29414, USA. E-mail: gemmill@musc.edu*
[4]*26206 Monarch Meadow Ct, Katy, Texas 77494, USA. E-mail: braberee@aol.com*
[5]*7739 Kiva Dr, Austin, TX 78749, USA. E-mail: entomike@gmail.com*

Abstract

New distributional records, new larval host records, various collecting notes, and observations are reported for the North American species of the tribe Agallissini LeConte, 1873 (Coleoptera: Cerambycidae: Cerambycinae): *Agallissus lepturoides* (Duponchel & Chevrolat, 1841), *Osmopleura chamaeropis* (Horn, 1893), and *Zagymnus clerinus* (LeConte, 1873). The species are illustrated and distribution maps are provided.

Key words: longhorned beetles, palmetto, palm borer, larval host, *Sabal*

Introduction

There are six known species in the tribe Agallissini LeConte, 1873 (Monné & Giesbert 1995). Three of these are found in the continental United States. This small tribe of beetles has long been associated with palmetto trees (family Arecaceae) (Riley 1880; Horn 1893), usually being collected on the foliage or blossoms. In this work, we report new host plants, distributional records, and some observations on the habits and biology of these beetles.

Materials and methods

The collection acronyms used in this study are as follows:

BTRC	Brian T. Raber Collection, Katy, Texas, USA
DJHC	Daniel J. Heffern Collection, Houston, Texas, USA
FSCA	Florida State Collection of Arthropods, Gainesville, Florida, USA
RFMC	Roy F. Morris, II Collection, Lakeland, Florida, USA
RMGC	Robert M. Gemmill Collection, Charleston, South Carolina, USA
TAMU	Texas A&M University Collection, College Station, Texas, USA
TBAC	Thomas B. Austin collection, Summerville, South Carolina, USA

Agallissus lepturoides (Duponchel & Chevrolat, 1841)

[Figs. 1 & 2]

History. This species was first reported from Texas, without further data, by LeConte (1873) as *Cryptopleura grata* Haldeman, 1854, and subsequently listed thereafter as occurring from Texas to Honduras in catalogs and

 Accepted by G. Nearns: 6 Jul. 2018; published: 9 Aug. 2018

other works (i.e. Linsley 1964; Hovore *et al*. 1987). The first collecting record from Texas known to us since LeConte's time was by R. M. Brattain, 2-IV-1999 and was taken by beating on *Sabal mexicana* Mart. along the edge of the Sabal Palm Sanctuary (SPS), Cameron County, Texas. (R. M. Brattain, pers. comm.). The next specimen was collected in the SPS by one of the authors (Raber), 18-X-2008, while beating on a leaf of a short *Sabal* palm tree. The subsequent search for additional specimens was centered in the SPS, which is a relatively small preserve containing a tiny fraction of the original sabal palm forest biotic community that was once dominant in the Lower Rio Grande Valley (LRGV) in Cameron and Hidalgo counties of Texas and adjacent parts of Mexico (Jahrsdoerfer & Leslie 1988). Hovore *et al.* (1987) speculated that this species would be associated with palms similarly to its close relatives, *Zagymnus* and *Osmopleura*.

Biological notes. Three of the authors (Heffern, Raber, and Quinn) and Edward Riley (TAMU), made concerted efforts in 2009 and 2010 to find larvae and adult specimens and to record observations as part of a larger study to document rare Coleoptera in the LRGV. During February, March, and April of those years, numerous dead petioles of *Sabal mexicana* were found that contained larvae, pupae, and teneral adults (**first host record**). Sites discovered within Cameron County with *Agallissus* included: the SPS, the Southmost Unit and the Boscaje de la Palma Unit of the LRGV National Wildlife Refuge, and along an irrigation ditch by Paloma Blanca Road about 2 km northwest of the SPS. The Boscaje de la Palma Unit, with re-vegetation in progress, is of comparable size to the SPS and borders it on the west side. Due to the healthy population of *Agallissus* encountered at the SPS, it is probable that it occurs widely around Brownsville where remnant *Sabal* palms naturally occur or where they have been re-introduced. Non-native palms in Cameron County were not examined for evidence of adult emergence.

Leaf stalks of mature *S. mexicana* vary in length from approximately 1 to 3 meters, in width from 2 to 6 centimeters, and in thickness from about 1.5 to 3 centimeters. Larvae, pupae, and adults were found by carefully cutting a dry, dead leaf stalk lengthwise or cutting across it perpendicularly and looking for frass. Infested leaf stalks were usually found still attached to a palm immediately below healthy upper leaves. Occasionally they were found lying on the ground below tall healthy palms. Leaf stalks trimmed along walking trails through the SPS were piled up, and even within those, larvae were found.

Larval frass trails are rather straight (Fig. 10), as would be expected in the narrow petiole of a palm frond. Trails were moderately to very tightly packed with frass, typically about 0.3 to over 1 m in length after full larval development. Larvae appear to orient their feeding in a downwards direction with gravity. Whether the leaf stalk is still firmly attached horizontally, or broken and dangling vertically, affects which direction larvae feed and form pupal cells. Rarely, larvae would develop in or near the base (boot) of the stalk after the frond had been broken or cut off. This resulted in the larva being confined to a stub on the palm tree which would force it to feed in a restricted space. Thus, pupation may occur anywhere from the base to the extreme distal end of the leaf stalk. Infested leaf stalks may break due to weakness caused by larval feeding in conjunction with the weight of the dead frond or wind. Old emergence holes were observed on both the upper and lower surfaces of leaf stalks and were elliptical in shape, approximately 7 mm by 4.5 mm. A larva does not create an opening and plug it with frass, but simply positions its body so that it must only chew through a thin layer of stalk in order to emerge. There was no evidence to indicate that living fronds are used for larval development. Occasionally, one large and one small larvae were found in the same leaf stalk, which suggests that a female may be attracted to a leaf stalk that has been dead for a few months or perhaps as long as a year.

Dead leaf stalks found to contain larvae or pupae were cut into short sizes (<0.5 m) and stored in containers. They were occasionally sprayed with water to simulate rainfall and were allowed to dry before closing the container. *Agallissus* adults emerged from March to July when frond segments were stored in outside containers in the Houston area, suggesting that adults are active much of the year, excluding winter, and stayed alive in captivity for as long as 4–5 weeks. Adults rest with their antennae held straight forward, parallel to the body. *Agallissus* specimens ranged in size from 11.5 to 20 mm. In general, females tend to be slightly larger than males. Two small males had reduced yellow markings, (Fig. 2), otherwise there was little variation in the maculations of the elytra.

Other arthropods were found in abandoned larval tunnels in leaf stalks, including ants, caterpillars, and spiders. Other exit holes, smaller and nearly round, were observed on some stalks, generally in the distal half, and were apparently created by the emergence of an anthribid beetle, *Phoenicobiella schwarzii* (Schaeffer, 1906) (Coleoptera: Anthribidae), which was also reared on occasion. Numerous traps in the SPS, including Lindgren funnel traps, UV light traps, flight intercept traps, and ethanol-baited traps only produced a single specimen of *Agallissus*. Thus, nearly all specimens were collected as teneral adults, pupae, or larvae from the dead stalks of the palm fronds.

Distribution. A distribution map (Fig. 14) for *Agallissus lepturoides* was prepared based on records from DJHC, TAMU, FSCA, RMBC, Gutiérrez & Noguera (2015), Noguera & Chemsak (1996), Chemsak *et al.* (1980) and Haldeman (1854).

Osmopleura chamaeropis (Horn, 1893)

[Figs. 3 & 4]

History. Horn's original description states "Collected at Biscayne, Fla., by E. A. Schwarz on *Chamaerops palmetto*." Blatchley (1925) reported that specimens were collected from blossoms and foliage of palmetto. Turnbow & Hovore (1979) reported that individuals were most frequently found "in the deep interspaces between living stems in the basal rosettes of the palmettos." They also reported, "feeding larvae, pupae and teneral adults were collected from dead, dried inflorescences, and from dead leaf bases persisting on the trees." Linsley & Chemsak (1997) report the only host plant of *Osmopleura chamaeropis* as *Sabal palmetto*, and the known distribution of this species as Florida and Georgia (Linsley 1964).

Biological notes. Along with *Zagymnus clerinus*, numerous specimens of *O. chamaeropis* were collected on fire-damaged *S. palmetto* in Pinellas County, Florida (R. F. Morris, II, R. M. Brattain, J. A. Green, pers. comm.). Their observations indicate that these two species will congregate on damaged plants.

In Texas, a specimen was collected along the coast: Calhoun County, Port O'Connor, 7-VI-2007, by Mr. B. Freeman (TAMU) (**new state record**). Two additional specimens were observed, V-2009, by Freeman at the same location, but only one was collected (DJHC).

In South Carolina, one living specimen of *O. chamaeropis* was photographed by Dr. P. Hendley on 8-VII-2016, along the Stono River, Charleston, Charleston County (**new state record**), (Bugguide 2018a). The beetle was resting on Dr. Hendley's upper-level porch but was not collected. The presence of numerous transplanted *S. palmetto* in the neighborhood, with occasional emergence holes, is consistent with dispersal by commercial landscapers. This observation constitutes the only record of this species from the state.

Distribution. A distribution map (Fig. 15) for *Osmopleura chamaeropis* was prepared based on records from DJHC, FSCA, TAMU, RFMC, Fattig (1947), and Bugguide (2018a).

Zagymnus clerinus (LeConte, 1873)

[Figs. 5–9, 11]

History. *Zagymnus clerinus* was described from a specimen from Florida. It has only been collected once in Cuba (Devesa *et al.* 2015; Devesa pers. comm., 2018) and there are only two records published from Georgia (Fattig 1947). C. V. Riley (1880) stated about *Zagymnus clerinus*: "bores in the dry leaf stems of *Chamaerops palmetto*, in Florida, the beetles appearing in April and May."

Biological notes. This species is typically found with color patterns as in Figs. 5–7. The pronotum may be either reddish-orange or black. Elytral markings may occasionally be reduced in size or, rarely, completely absent as in Figs. 8 & 9. Individuals have scattered, whitish hairs on the body.

In Florida, adults can be found from April to July, usually on Cabbage Palmetto (*Sabal palmetto* (Walter) Lodd. ex Schult. & Schult.f.). Long series of *Zagymnus* were collected on *S. palmetto*, particularly those which had been fire-damaged, in Pinellas County, Florida (R. Morris, II, R. M. Brattain, J. A. Green pers. comm.), indicating they have a strong attraction to damaged plants, or their vascular secretions. *Sabal palmetto* naturally ranges throughout Florida and the coastal plains of Georgia, South Carolina, and southeastern North Carolina but has also been introduced throughout the gulf coast as an ornamental (BONAP 2014).

A single, freshly crushed specimen of *Z. clerinus* was discovered by one of the authors (Gemmill) in a campus building corridor at the Medical University of South Carolina on 3-VII-2007 (**new state record**). RG noted *S. palmetto* trees growing near Charleston, SC with exit holes in their leaf petioles similar to those of the *A. lepturoides* he observed during a joint trip to the SPS with the Texas authors. These *S. palmetto* trees were located within or near the maritime forest of the South Carolina coast. In June of 2016, adult *Z. clerinus* were discovered on the shoreline of Edisto Island, SC hiding behind leaf petioles on *S. palmetto* trees.

FIGURES 1–4. 1. *Agallissus lepturoides* (typical pattern), female. **2**. *Agallissus lepturoides* (melanistic form), male. **3**. *Osmopleura chamaeropis* (typical color), female. **4**. *Osmopleura chamaeropis* (atypical dark color), male.

FIGURES 5–8. 5. *Zagymnus clerinus* (typical pattern), male. **6**. *Zagymnus clerinus* (typical pattern), female. **7**. *Zagymnus clerinus* (typical pattern), male. **8**. *Zagymnus clerinus* (atypical form), male.

Two *Z. clerinus* were captured in Lindgren funnel traps in the SPS in Texas (VII-2009 and VII-2010) by Heffern and Raber (DJHC & BTRC) (**new state record**). A desiccated adult was found in a pupal chamber in a dead leaf stalk of *S. mexicana* (**new host record**) at the SPS, II-2017 by Heffern. That same leaf stalk was also populated by an active colony of ants. The dead *Zagymnus* was located in the leaf stalk about 0.75 m from the trunk. *Zagymnus clerinus* was recently recorded from Galveston Island, Texas, (iNaturalist 2018).

In South Carolina, sites in Charleston, Colleton, and Georgetown counties with *S. palmetto* trees were surveyed for evidence of *Z. clerinus* by Austin. Surveying was done between VI-2016 and X-2017 by visually inspecting all *S. palmetto* trees (Fig. 12) for *Z. clerinus* emergence holes and live adults. The age and abundance of the emergence holes, as well as the presence of any transplanted palmettos with emergence holes, was noted. All observations of live *Z. clerinus* in their natural habitat were made during daylight hours on Pockoy Island, a small barrier sandspit within the Botany Bay Wildlife Management Area, on Edisto Island, SC. Petioles displaying evidence of previous usage by *Z. clerinus* larvae, chiefly emergence holes, were collected from native Cabbage Palmettos on private land. Larval tunnels were examined by longitudinally splitting Palmetto petioles that exhibited *Z. clerinus* emergence holes. The dimensions of larval tunnels were measured and pupal chambers were examined. Several additional petioles that lacked emergence holes were placed into a mesh enclosure to capture any adults that might emerge the following summer.

Five adult *Z. clerinus* were observed and three specimens collected between 2007 and 2017 at three sites in Charleston County, SC. Additional indirect evidence at numerous other sites suggests that *Z. clerinus* populations in South Carolina are located throughout Charleston County within the saltwater tidal zone, from Edisto Beach to Isle of Palms.

The larvae utilize the petioles and forked bases (boots) of senesced, desiccated petioles that remain attached to the palm trunk. The larvae consume the longitudinal fibers of the petiole and move down the petiole towards the base at the trunk. The larval burrow is densely packed with frass. Each petiole can support two larvae, one on either side of the sagittal plane of the petiole. Larval burrows are found below the epidermis and oblique fibers of the petiole. They are typically 30cm long, 3cm wide, and 1cm deep, although dimensions vary with the shape of the host petiole. There is a clear preference for petioles that senesced over a year prior and show outward signs of degradation. This degree of degradation is visible as a dull, light gray color on the exterior. Occasional emergence holes in old inflorescence stalks indicates this tissue is also suitable for larval development. *Zagymnus clerinus* is not known to be harmful to the host tree as the larvae consume only dead plant material.

Pupation begins in late spring with adults emerging in early summer. After eclosing, adults exit the host petiole through an elliptical emergence hole averaging 5 to 9mm in length, and parallel to the grain of the wood (Fig. 12). Emergence holes are most often located 10 to 20 centimeters below the fork of the petiole in *S. palmetto* and most commonly on the underside of the petiole. Adults are diurnal and have been observed resting and ovipositing on *S. palmetto* throughout the day (Fig. 11). Adults have been found resting, or possibly hiding, between the petiole base and the trunk near the tops of some palmetto trees. Females oviposit rather indiscriminately on the edges and broken tips of petioles and have been observed to oviposit on both live fronds and desiccated petioles. However, larvae have not been found to utilize living or recently senesced fronds. Adults are short-lived and die within a few weeks of emergence.

The distinctly shaped emergence holes of this species has allowed for the tracking of its distribution within South Carolina. These holes can expand over time due to weathering or use by other insects. Pupal chambers of *Z. clerinus* are utilized by other arthropods after emergence of the beetle. *Parancistrocerus histrio* (Lepeletier, 1841), a species of Mason Wasp (Hymenoptera: Vesperidae: Eumeninae) native to Coastal SC, GA, and much of FL, has been observed to nest within these abandoned pupal chambers. Several species of small spiders (Araneae) have also been observed using the empty pupal chambers as a daytime refuge. The resultant wear and weathering of the exit holes provides an additional means to estimate the relative age of a given population.

Zagymnus clerinus has a marked preference for host palmettos that receive direct sunlight and grow in close proximity to saltwater tidal systems. The age and height of palmettos appears to be an unimportant factor in host selection, so long as the tree has sufficiently deteriorated boots attached to its trunk. Additionally, *Z. clerinus* appears to have a strong preference for stunted palmettos. These trees are typically found on the edges of salt marsh hammocks, or similar habitats with poor growing conditions. Such stunted palmettos have substantially reduced leaf size, shorter overall height, increased leaf senescence rates, and an overall unhealthy appearance. It is not uncommon for there to be two-dozen or more emergence holes on a stunted palmetto less than two meters in

height. The harsh growing conditions these trees reside in and their general poor health results in wood that decomposes relatively rapidly. This accelerated decomposition may create wood more easily digested by *Z. clerinus* larvae. This species is also present in shaded understory palmettos in South Carolina but at a substantially lower density than on host trees found in more exposed locations. In Texas, *Z. clerinus* was found at the SPS on palms in shaded understory, many miles from saltwater.

Sabal palmetto trees reduce their growth rate after they are transplanted, resulting in a distinct compression of the layers of boots encircling the trunk. Boot compression is visible as an alteration in the angle that the petioles make with the trunk, providing a convenient means to identify transplanted trees. The condensed boot ring is also useful in assessing the status of any associated population of *Z. clerinus,* since emergence holes above this band indicate persistence of *Z. clerinus* after transplantation. Transplantation of palmettos to locations above the saltwater tidal zone typically resulted in the loss of *Z. clerinus* larvae hosting on the tree. This conclusion is based on the presence of emergence holes in petioles older than the transplantation band but absent above this band. In contrast, palmettos transplanted to barrier islands or waterfront properties within the saltwater tidal zone often showed evidence of continuous use as a host, extending for years after transplantation (Fig. 13). This is consistent with a larval cold intolerance that can be mitigated in proximity to saline water bodies.

The density of *Z. clerinus* emergence holes was greatest in areas where palmettos exist undisturbed in their natural habitat. Protected areas of coastal maritime forest near barrier island communities exhibited the highest densities of emergence holes. Manicured trees used in landscapes exhibited much lower densities, perhaps because their petioles are trimmed to just above the fork, removing a significant portion of suitable host material.

Our findings extend the range of *Z. clerinus* to include the South Carolina coastal plain and coastal Texas. Evidence from emergence holes on recently transplanted landscape palmettos suggests that the species was introduced to South Carolina by anthropogenic means and that this is a major factor in its current distribution. However, *Z. clerinus* has demonstrated the ability to naturally disperse and establish itself in new habitats within the state. Self-sustaining populations have been discovered at several protected or isolated sites where no landscape palmettos have been imported. Nevertheless, its natural dispersal ability appears to be limited, as several uninhabited barrier islands near likely populations showed no evidence of its presence. *Zagymnus clerinus* is likely present in Beaufort and Jasper counties, due to their significant coastal development and milder winters, but these counties were not surveyed. No populations were discovered in Georgetown or Conway counties and the colder winters of these counties may severely reduce larval survival. *Zagymnus clerinus* may still exist in isolated sites in these areas but these counties were not surveyed comprehensively. Further work will be required to fully understand the distribution of *Z. clerinus* in coastal South Carolina.

Distribution. A distribution map (Fig. 16) for *Zagymnus clerinus* was prepared based on records from DJHC, FSCA, TAMU, RFMC, RMBC, RMGC, TBAC, Devesa (2015), Fattig (1947), and iNaturalist (2018).

Summary. With widespread planting of numerous palm species for landscaping, all three Agallissini species known from the United States can disperse to areas where they are not native. Increased awareness by collectors, naturalists, and photographers will likely result in additional observations for these species, especially now that their life histories are being documented. There are no observations to indicate that any of these species are a threat to healthy plants. Just the opposite, Agallissini appear to be important natural agents in the decomposition of fibrous, dead leaf stalks, facilitating the shedding of dead leaves by palmettos and returning the mineral nutrients trapped within to the soil below.

Acknowledgments

We thank Jimmy Paz, former Manager of the Sabal Palm Sanctuary, and Seth Patterson, current manager of the SPS, for permission to do research and collect specimens at the refuge. We thank the US Fish and Wildlife Service for permission to collect in refuges under their control. We are grateful to Roy F. Morris, II (Lakeland, FL), R. Michael Brattain (Lafayette, IN), Joseph A. Green (Findlay, OH) and Brush Freeman (Elgin, TX) for providing notes, and specimens to photograph; to Kyle Schnepp (FSCA) and Meiying Lin (Beijing, China) for providing data from specimens at FSCA, and to Paul Hendley (Phasera, Ltd.) for allowing us to incorporate his observations on *O. chamaeropis* in SC. We thank Meiying Lin for the images of *O. chamaeropis*. Special appreciation is extended to Edward G. Riley (TAMU) for accompaniment on numerous field trips to South Texas, providing data from specimens at TAMU, for preparing distribution maps and for reviewing a preliminary draft of this work.

FIGURES 9–11. 9. *Zagymnus clerinus* (rare black form), female. **10**. Larval workings of *Agallissus lepturoides* in petiole. **11**. *Zagymnus clerinus* ovipositing.

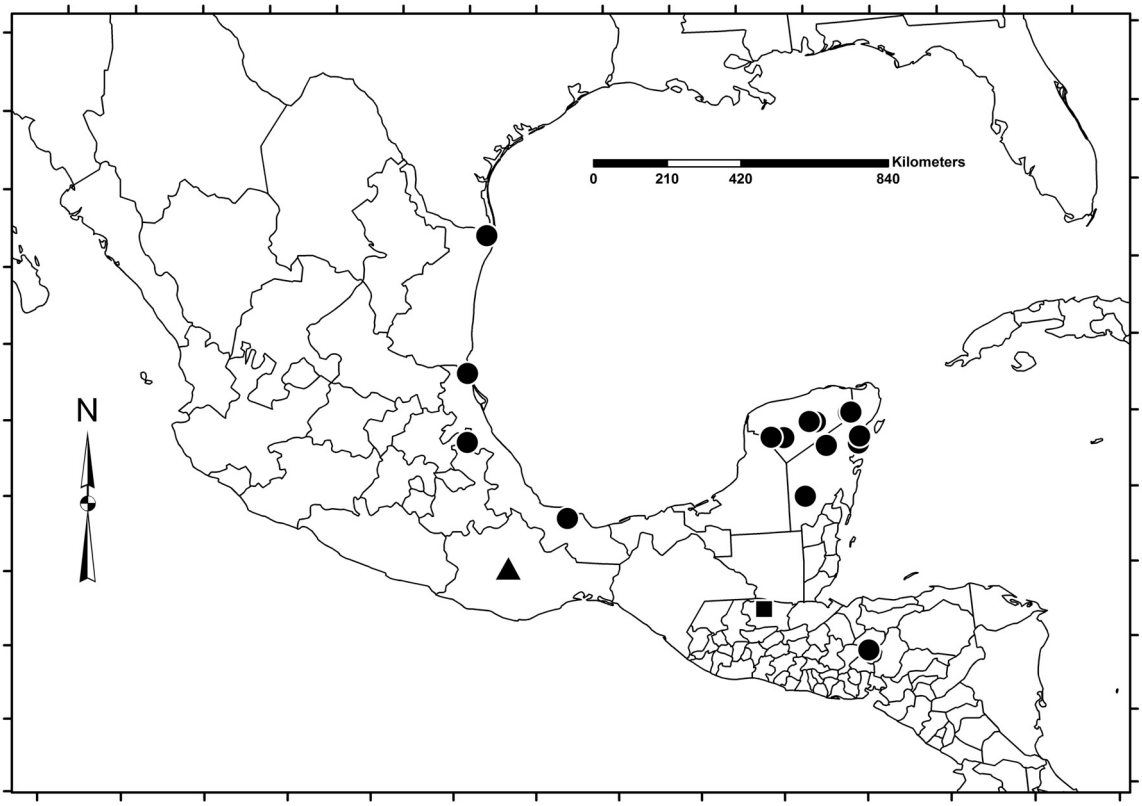
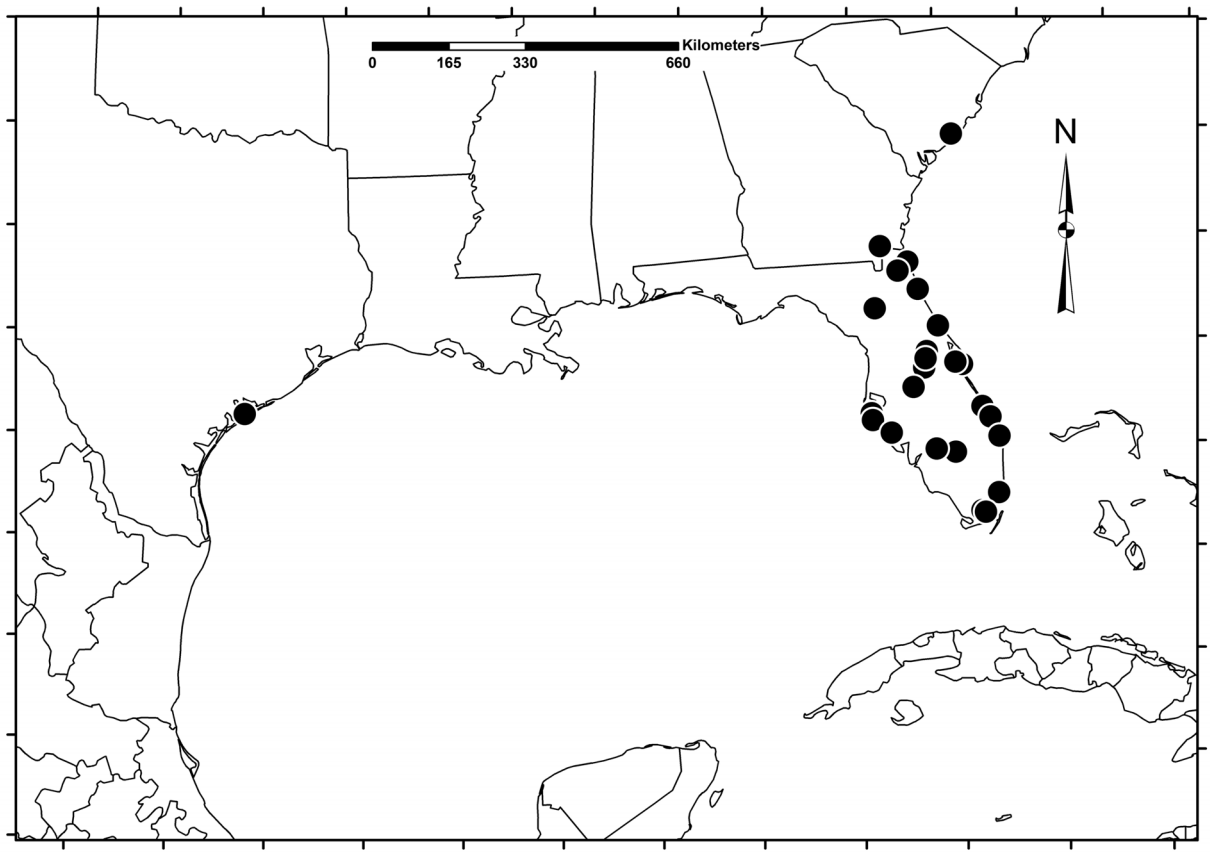


FIGURE 12–14. 12. *Zagymnus clerinus* exit hole in a *Sabal palmetto* boot. **13.** A transplanted *Sabal palmetto* showing several *Z. clerinus* exit holes. **14.** Known distribution of *Agallissus lepturoides* (circles: specific locations, triangle: state record, square: country record).



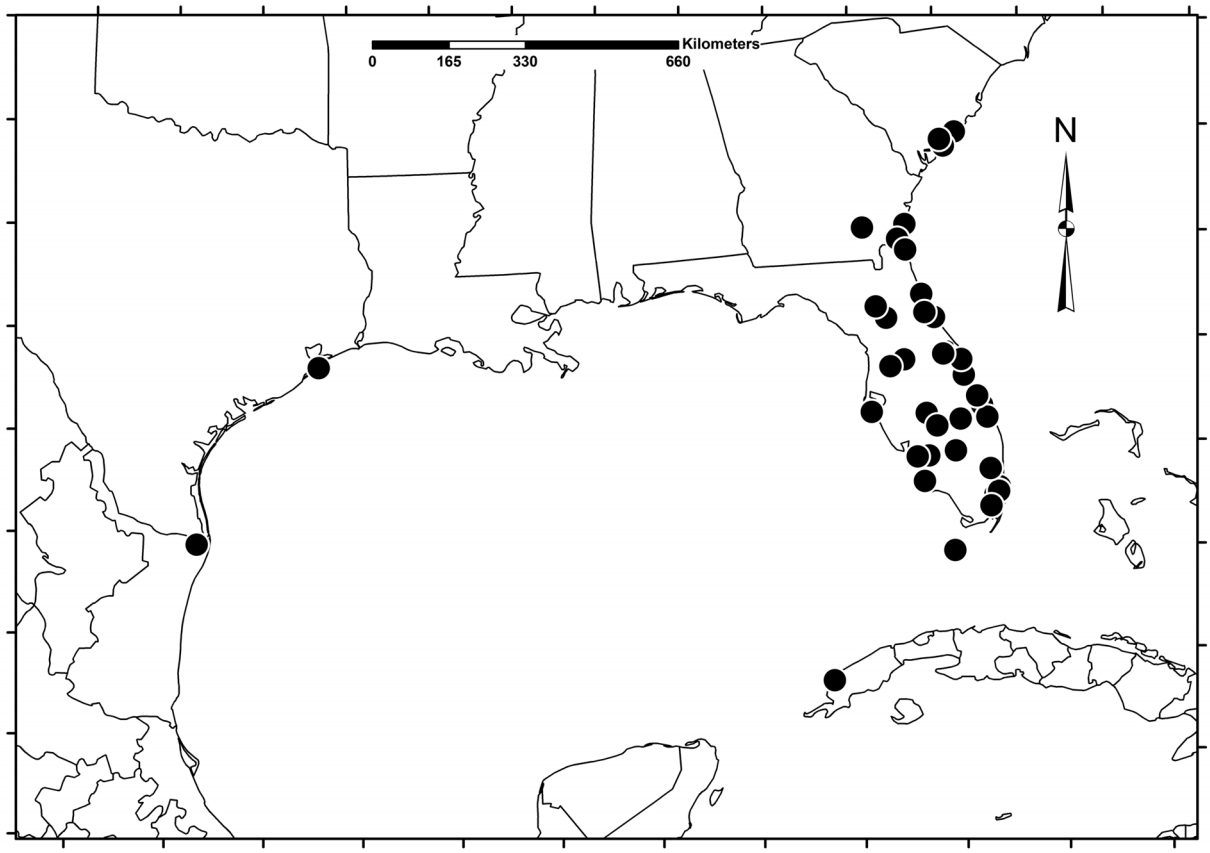


FIGURE 15–16. 15, Known distribution of *Osmopleura chamaeropis.* **16**, Known distribution of *Zagymnus clerinus.*

References

Blatchley, W.S. (1925) Notes on the distribution and habits of some Florida Coleoptera with descriptions of new species. *Canadian Entomologist*, 47, 160–168.
https://doi.org/10.4039/Ent57160-7

BONAP (2014) Biota of North America Program. [County range map for *Sabal palmetto*]. Available from http://bonap.net/MapGallery/County/Sabal%20palmetto.png (accessed 30 April 2018)

Bugguide (2018a) Identification, Images, & Information For Insects, Spiders & Their Kin For the United States & Canada. Available from https://bugguide.net/node/view/1255063 (accessed 30 April 2018)

Chemsak, J.A., Linsley, E.G. & Mankins, J.V. (1980) Records of some Cerambycidae from Honduras. *The Pan-Pacific Entomologist*, 56 (1), 26–37.

Devesa, S., Fonseca, E. & Barro, A. (2015) *Longicornios de Cuba (Coleoptera: Cerambycidae). Vol. 1. Parandrinae, Prioninae, Spondylidinae, Cerambycinae*. Greta Editores, Lleida, 353 pp.

Fattig, P.W. (1947) The Cerambycidae or long-horned beetles of Georgia. *Emory University Museum Bulletin*, 5, 1–48.

Gutiérrez, N. & Noguera, F.A. (2015) New distributional records of Cerambycidae (Coleoptera) from Mexico. *The Pan-Pacific Entomologist*, 91 (2), 135–147.
https://doi.org/10.3956/2015-91.2.135

Haldeman, S.S. (1854) Descriptions of some new species of insects, with observations on described species. *Proceedings of the Academy of Natural Sciences of Philadelphia*, 6 [1853], 361–365.

Horn, G.H. (1893) Miscellaneous Coleopterous Studies. *Transactions of the American Entomological Society*, 20, 136–144, pl. I.

Hovore, F.T., Penrose, R.L. & Neck, R.W. (1987) The Cerambycidae or longhorned beetles of Southern Texas: a faunal survey (Coleoptera). *Proceedings of the California Academy of Sciences*, 44 (13), 283–334, 20 figs.

iNaturalist (2018a) *Zagymnus clerinus*. Available from: https://www.inaturalist.org/observations/6379755 (accessed 30 April 2018)

Jahrsdoerfer, S.E. & Leslie, D.E. (1988) Tamaulipan brushland of the lower Rio Grande Valley of south Texas: Description, human impacts, and management options. *USDI Fish & Wildlife Service Biological Report*, 88 (36), 1–63.

LeConte, J.L. (1873) Classification of the Coleoptera of North America. Prepared for the Smithsonian Institution. Part II. *Smithsonian Miscellaneous Collections, Washington, D.C.*, 11 (265), 279–348.

Linsley, E.G. (1964) The Cerambycidae of North America. Pt. 5. Taxonomy and classification of the subfamily Cerambycinae, tribes Callichromini through Ancylocerini. *University of California Publications in Entomology*, 22, 1–197, 1 pl, 60 figs.

Linsley, E.G. & Chemsak, J.A. (1997) The Cerambycidae of North America, Part VIII: Bibliography, Index, and Host Plant Index. *University of California Publications in Entomology*, 117, i–ix + 1–534.

Monné, M.Á. & Giesbert, E.F. (1995) *Checklist of the Cerambycidae and Disteniidae (Coleoptera) of the Western Hemisphere*. Wolfsgarden Books, Burbank, California, xiv + 420 pp. [ISBN 1-885850-01-8]

Noguera, F.A. & Chemsak, J.A. (1996) Cerambycidae (Coleoptera). *In*: Biodiversidad, Taxonomía y Biogeografía de Artrópodos de México: Hacia una Síntesis de su conocimiento. *Universidad Nacional Autonoma de México*, 1996, pp. 381–409.

Riley, C.V. (1880) Food habits of the longicorn beetles or wood borers. *The American Entomologist*, 3 (10), 237–239.

Turnbow, R.H. Jr. & Hovore, F.T. (1979) Notes on Cerambycidae from the southeastern U. S. (Coleoptera). *Entomological News*, *Philadelphia*, 90 (5), 219–229.