



A Rapid Survey of the Critically Endangered Zapata Toad, *Peltophryne florentinoi* (Anura: Bufonidae), in Cuba: New Locality and Conservation Approaches

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Photographs by Marlon E. Cobos Cobos.

Abstract.—We provide new distributional data for the most geographically restricted and threatened Cuban toad, the Zapata Toad (*Peltophryne florentinoi*), and evaluate this information for its potential conservation implications. Prior to this survey, the species was known from only one locality. Although our records extend the geographic distribution about 20 km to the east from the previous locality, unsuitable habitats limited the species’ true extent of occurrence. Intermittent salt-water lagoons, local lithographic features, and anthropogenic disturbances impede the continuity of the toad’s distribution along the coastal forests. New surveys and long-term monitoring protocols could offer better clues about the distribution, biology, and conservation status of this species.

Key words: Caribbean toad; distribution; endangered species; suitable habitat

With eight endemic species, the Cuban Archipelago hosts the most species in the genus *Peltophryne*, a suite of endemic West Indian toads (Henderson and Powell 2009). Six of the Cuban species (*P. cataulaciceps*, *P. empusa*, *P. florentinoi*, *P. gundlachi*, *P. longinasus*, and *P. taladai*) are listed as Vulnerable, Endangered, or Critically Endangered in the IUCN Red List (Hedges and Díaz 2004a, b, c, d, e; Rivalta 2008), and only two (*P. fustiger* and *P. peltocephala*) are of Least Concern (Hedges and Díaz 2010; IUCN SSE Amphibian Specialist Group 2014). Several species have a wide distribution, others are regional endemics that inhabit lowlands and mountains in Western, Central, or Eastern Cuba, whereas a few, such as the Zapata Toad, *P. florentinoi* (Díaz and Cádiz 2008) have a very restricted range.

The Zapata Toad evolved during the most recent speciation event among Cuban toads (Alonso et al. 2012). It inhabits semideciduous sclerophyll forests or microphyllous evergreen forest (MEF) *sensu* Capote et al. (1989) on a limestone landscape near Playa Girón in the Zapata Swamp, Matanzas Province, Cuba (Moreno and Rivalta 2007; Rivalta et al. 2014). Reproduction occurs exclusively in rainwater-inundated small depressions characteristic of karstic substrates (Díaz and Cádiz 2008; Henderson and Powell 2009). Males

produce a species-specific, long, pulsating, and low-frequency advertisement call (Hernández et al. 2010) at night from exposed positions on limestone rocks (Alonso et al. 2007).

Citing rising-sea-level models of Hernández et al. (2005), Rodríguez-Schettino and Rivalta (2007) suggested that the entire range of *P. florentinoi* could be inundated in the not-too-distant future. That threat, combined with a reduced extent of occurrence (<100 km²), qualified the Zapata Toad for listing as Critically Endangered on the IUCN Red List (Rivalta 2008). Rivalta (2012), noting the lack of evidence of decreases in population size or habitat quality, but citing a reduced area of occupancy (<10 km²) and vulnerability to human activity and future threats, catalogued the species as Vulnerable (VU) in the Red Book of Cuban Vertebrates.

Herein we provide new distributional data for this geographically restricted and threatened Cuban toad. We also evaluate the suitability of the species’ habitat and discuss potential implications of this information for the toad’s conservation.

Methods

From 5–8 November 2015, we conducted a rapid survey with the goal of finding active individuals of *Peltophryne florentinoi*

at the type locality and nearby areas along roadsides east of Playa Girón (Fig. 1A-B). During the day we identified suitable habitats, and returned to those sites at night (2000–2300

h), using headlamps to search for *P. florentinoi* tadpoles, juveniles, and adults. We walked transects of 200–500 m (1–3 m on both sides of a trail) in four selected areas. We also

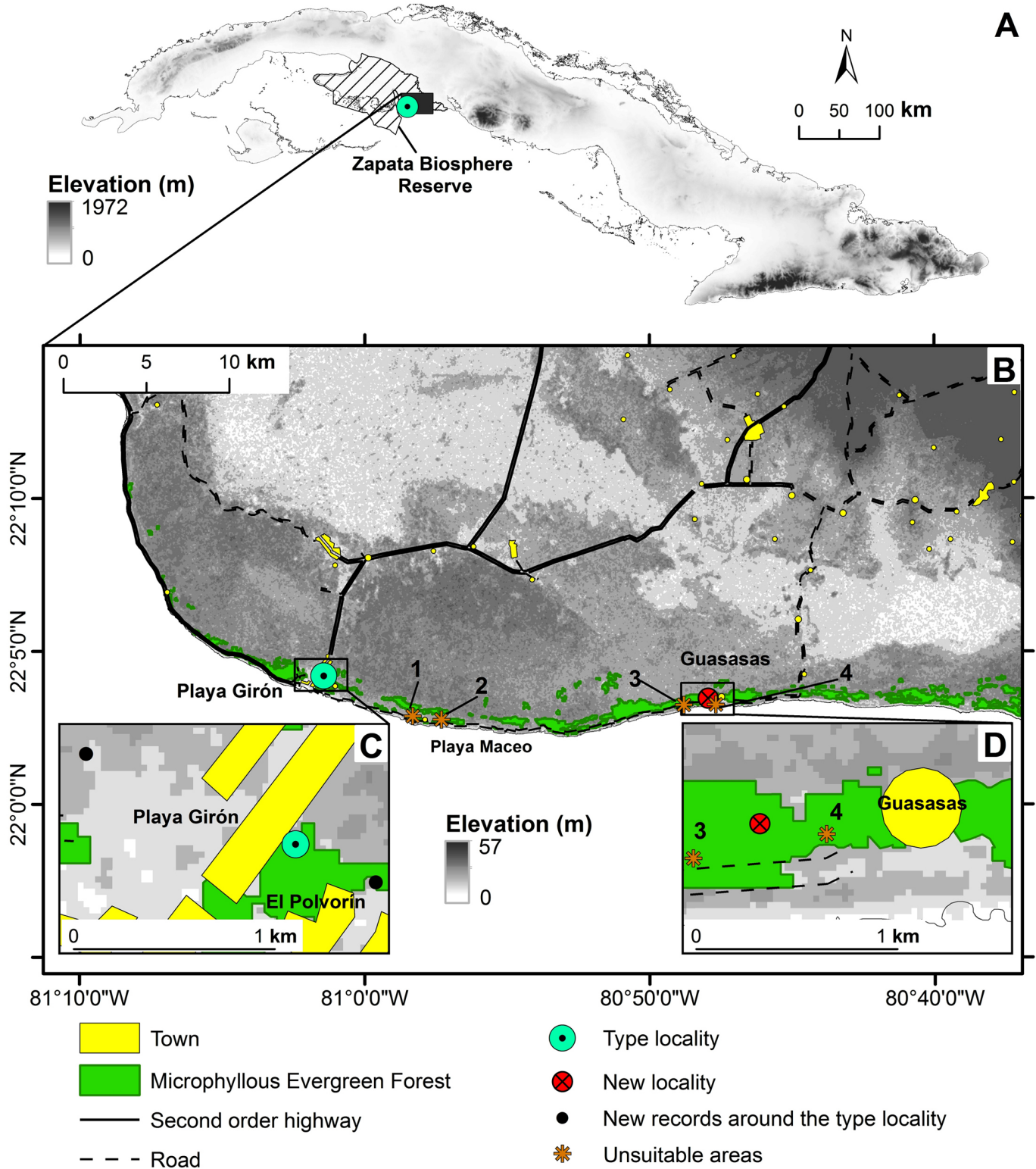


Fig. 1. Study area and distributional records of the Zapata Toad (*Peltophryne florentinoi*). (A) Location of the Zapata Biosphere reserve in the Cuban Archipelago. (B) Type locality (blue circle) and new record of *P. florentinoi* (red circle). Some unsuitable areas due to intermittent salt-water lagoons (1, 2) and anthropogenic disturbances (3, 4) are indicated by orange asterisks. (C, inset) Type locality and other records of new sightings around Girón (black dots). (D, inset) New locality record for this species.

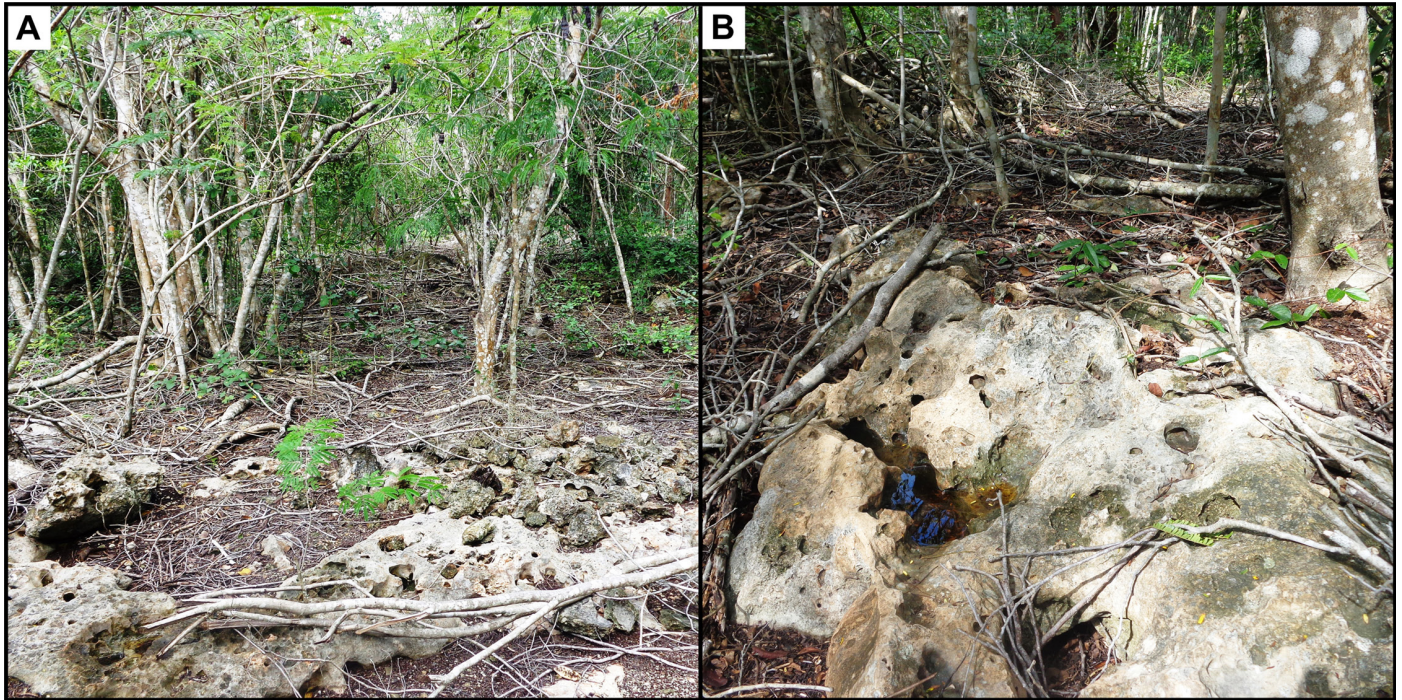


Fig. 2. Typical habitat of the Zapata Toad (*Peltophryne florentinoi*). A. Microphyllous evergreen forest (MEF). B. Karstic substrates with small reservoirs (“casimbas”) used during breeding.

played back recordings of the advertisement call in Alonso et al. (2007) for 3 min during every 100 m of each transect. We also measured air temperature (± 0.5 °C) and relative humidity ($\pm 5\%$) using a thermohygrometer (HANNAInstruments).

We defined suitable habitats (Moreno and Rivalta, 2007) by the presence of karstic substrates and MEF (Fig. 2). On day 1, we explored areas near Playa Girón (Fig.1C, inset); on day 2, we searched areas in and around Playa Maceo; and on day 3, we traveled to Guasasas (Fig.1D, inset), 22 km east of Playa Girón. We also characterized other roadside areas as unsuitable for the Zapata Toad (e.g., swampy areas and

extensively disturbed sites) to gain a better understanding of the state of the species’ habitat throughout its potential range.

Results

During the first night, we found five active individuals (three adult males, one adult female, and one juvenile) in somewhat degraded microphyllous evergreen forest (MEF) on karstic substrates, approximately 1 km west of the only previously known record for this species ($22^{\circ}4'27.91''N$, $81^{\circ}2'2.73''W$; elev. 7 m). We found another adult female (Fig. 3A) in better conserved MEF near a path in El Polvorín ($22^{\circ}4'7.17''N$,



Fig. 3. Species of bufonids detected during the rapid survey in Playa Giron and nearby localities in the Zapata Swamp, Matanzas Province, Cuba. A. Female Zapata Toad (*Peltophryne florentinoi*) at El Polvorín near Playa Girón. B. Male Eastern Giant Toad (*Peltophryne petiocephala*) from the same locality. C. Female Zapata Toad (*Peltophryne florentinoi*) from the vicinity of Guasasas, 20 km east of the type locality.

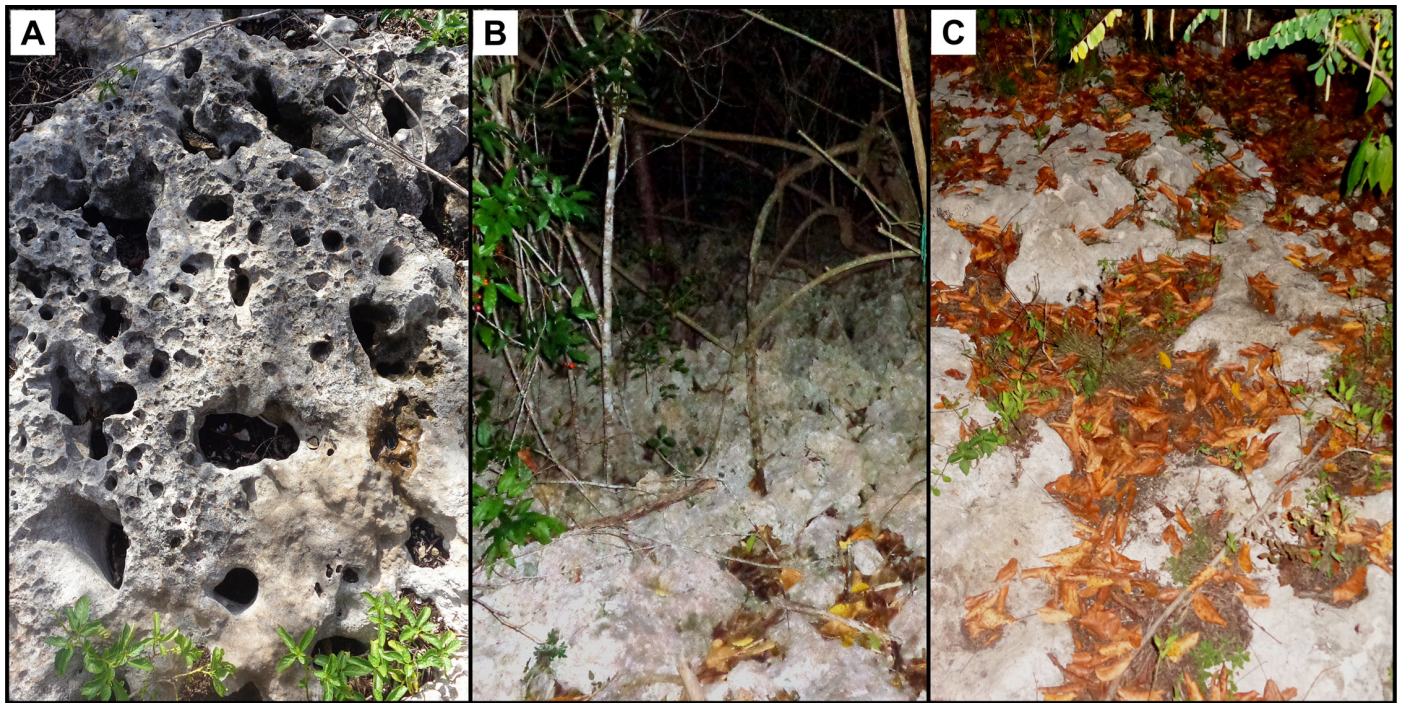


Fig. 4. Variation in the karstic substrates in microphyllous evergreen forest (MEF) at the three surveyed localities. (A) Playa Girón (soft limestone devoid of leaf litter). (B) Playa Maceo (sharped and deep limestone outcrops almost devoid of leaf litter) (C) Guasasas (soft limestone partially covered by leaf litter).

81°1'12.44"W; elev. 6 m). All were in proximity to Playa Girón (Fig. 1C, inset). We encountered another endemic Cuban bufonid, the Eastern Giant Toad (*Peltophryne peltocephala*), at all surveyed sites, but the latter occurred in more open areas, such as forest borders, roadsides, and roads (Fig. 3B).

Although habitats in similar karstic landscapes were apparently suitable, we were unable to find any toads during the second night in previously defined transects at Playa Maceo. The limestone substrates at Playa Maceo were sharper and with deeper depressions than those at the type locality (Fig. 4 A-B).

We found two adult female *P. florentinoi* in proximity to Guasasas (new locality), more than 20 km east of the type locality (Fig. 1D, inset). Karstic substrates in this site were similar to those at Playa Girón, but considerably more leaf-litter was present (Fig. 4A-C). The first toad was on an abandoned path that had been defined as a transect (22°3'28.74"N, 80°47'56.81"W; elev. 4 m). A second large female (Fig. 3C) was 15 m inside MEF close to the path and at least 100 m from the first toad. This animal was collected, euthanized, preserved in 70% ethanol, and deposited in the Herpetological Collection of the Museum of Natural History "Felipe Poey," University of Havana, Cuba (MFP 11.602). This specimen (SVL 134.8 mm, 0.01 mm error) was verified by Vilma Rivalta (Institute of Ecology and Systematics). We also found *P. peltocephala* at this site, again in more open areas.

We did not hear toads calling, even in response to our recording, during any night. Showers occurred during the

afternoons of the first and second days in Playa Girón, but were insufficient to fill the depressions used by *P. florentinoi* for breeding. According to data from the Meteorological Station at Girón, cumulative mean monthly precipitation in the period May–October was only 59.9 mm (M. García, pers. comm.). During the nocturnal surveys, air temperatures ranged from 26.4 °C at Playa Girón and 27.1 °C at Playa Maceo, to 28.5 °C in Guasasas. Maximum relative humidity each night was 79.6, 75.3 and 72.2, respectively.

Many areas between Playa Girón and the new locality are likely unsuitable for *P. florentinoi* (Fig. 1 and Fig. 5). Anthropogenic activities and natural features could be limiting the extent and connectivity of occupied habitats in the species' range. Deforested areas (Fig. 5A-B) and intermittent coastal lagoons and their swampy vegetation (Fig. 5 C-D) are unsuitable and presumably constitute barriers between the karstic habitats used by these toads.

Discussion

Moreno and Rivalta (2007) examined nine female Zapata Toads collected in Playa Girón. Maximum size was 133.0 mm (mean = 121.7 ± 2.1 mm). Consequently, the specimen (MFP 11.602) collected at the new site represents a new size record for *Peltophryne florentinoi*.

Previous reports suggested that suitable habitats for this toad consisted of MEF on limestone substrates in and near Playa Girón (Moreno and Rivalta 2007; Díaz and Cádiz 2008). Despite the fact that this combination is typical of the type locality, the combined conditions are not present

throughout the region. MEF occurs in a narrow and discontinuous band located almost immediately adjacent to the coast (Fig. 3B). Limestone substrates in this area (Fig. 5) vary in terms of structure (surface and subsurface) and cover. Some variations could provide essential resources such as diurnal refuges, access to prey, and suitable conditions for breeding and larval development. At this time, we cannot rule out the possibility that other forest formations in the region (e.g., semi-deciduous mesophyllous forest; Oviedo 2013) with suitable substrates could be occupied by *P. florentinoi*.

Loss, deterioration, and fragmentation of aquatic and terrestrial habitats have been implicated as causative agents of amphibian declines in several regions of the world, including many Caribbean islands and specifically the Cuban Archipelago (Stuart et al. 2004; Cushman 2006; Gallant et al. 2007; Hedges and Díaz 2011). Anthropogenic barriers could be isolating patches of habitat suitable for *P. florentinoi* (Fig. 6). Although human settlements in the region are few, small (i.e., Giron, <2,000 inhabitants; Guasasa, <300; and Cocodrilo, <100), and isolated, these communities depend on natural resources (sea, swamp, and forests). Tourism, fishing and hunting, small-scale agriculture, and exploitation of forests

for lumber and charcoal are some of the modes of subsistence. The latter two activities clearly are fragmenting the toad's habitat, but residents of these communities unfortunately are unaware of the presence of this specialized and geographically restricted species and the relevance of its conservation.

Our observations reveal that the range of *Peltophryne florentinoi* extends at least 20 km east of the type locality, increasing the area of occupancy and probably its extent of occurrence. For the moment, we prefer not to propose any changes in its IUCN Red List status, although criteria pertaining to geographic range might need to be reevaluated. We believe that this species could occur at other locations, but the range is clearly fragmented with few individuals in each isolated location. Consequently, more fieldwork in the coastal and subcoastal forests from Punta Perdiz, west of Giron in Matanzas Province to the vicinity of Juraguá in Cienfuegos Province could offer additional clues about the distribution and conservation status of this species.

In any case, we strongly recommend implementation of a long-term monitoring protocol at the Playa Girón and Guasasas localities, in order to collect baseline data (abundance, phenology, and ecological requirements) for

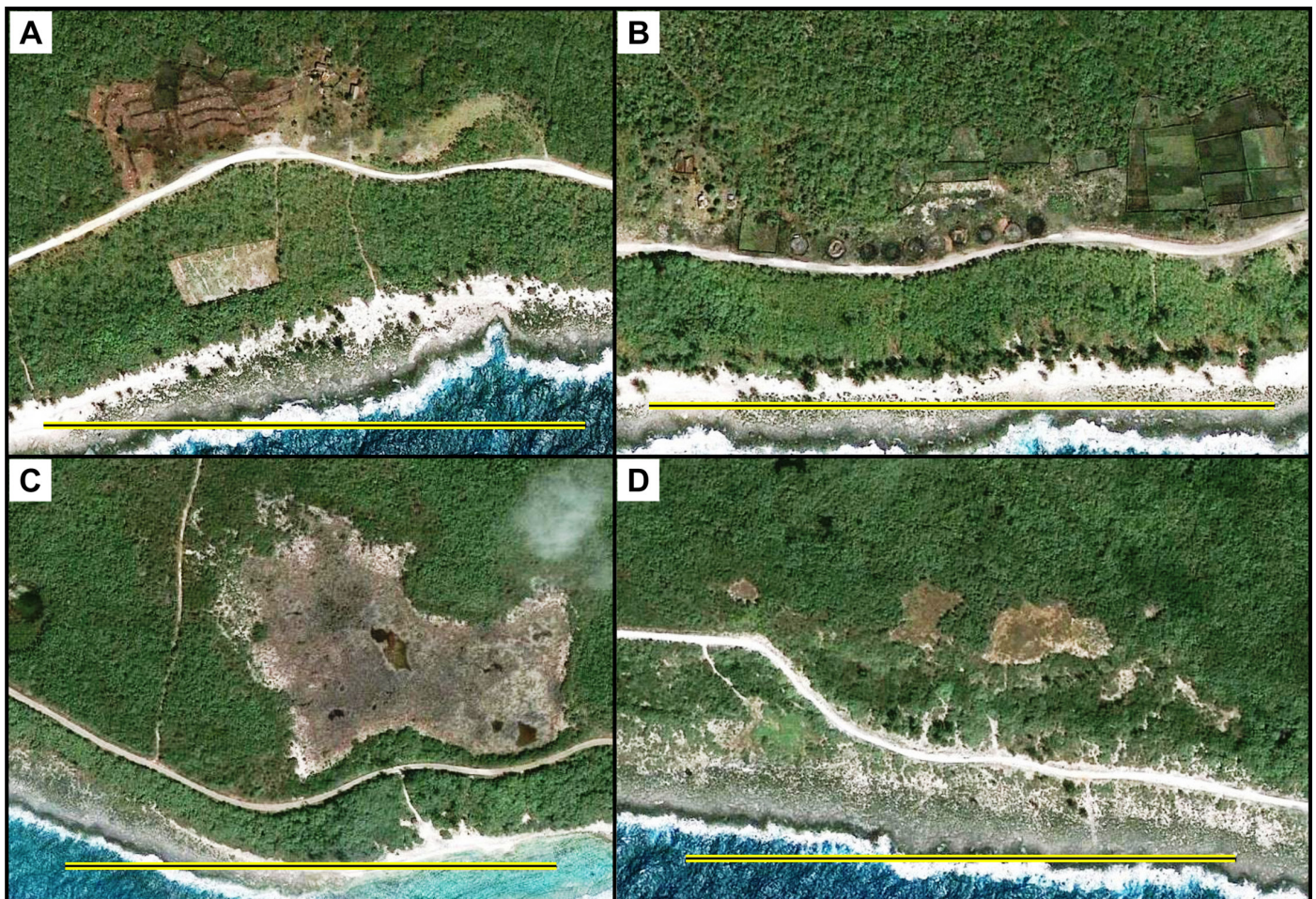


Fig. 5. Examples of unsuitable habitats for the Zapata Toad (*Peltophryne florentinoi*) between Playa Girón and the new locality near Guasasas. (A and B) Deforested areas used for agriculture and charcoal burning. (C and D) Intermittent coastal lagoons characterized by swampy vegetation. Lines = 0.5 km.

Peltophryne florentinoi and better understand and mitigate the effects of natural and anthropogenic habitat alterations on the survival and reproduction of this endemic toad. In addition, a public education program should be initiated in order to encourage local communities to know, enjoy, and value native amphibians in the wild.

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