New locality records of *Bipalium kewense* (Platyhelminthes: Tricladida: Geoplanidae) in Cuba

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**Abstract:** The land planarian *Bipalium kewense* Moseley, 1878 (Tricladida: Geoplanidae) is thought to be native from Southeast Asia, but it has been introduced into about 50 countries, including most part of the Insular Caribbean. It was reported from Cuba in 2016, based on some specimens collected in the Guamuhaya Massif, in the central region of the country. Herein we report *B. kewense* from western Cuba and other localities in the Guamuhaya Massif, besides we comment on the previous records of the species in the country.

**Keywords:** Exotic land planarian, Bipaliinae, distribution, Greater Antilles

**Resumen:** Nuevos registros de localidad de *Bipalium kewense* Moseley, 1878 (Platyhelminthes: Tricladida: Geoplanidae) en Cuba. La planaria terrestre *Bipalium kewense* Moseley, 1878 (Tricladida: Geoplanidae) se cree que es originaria del sudeste de Asia, pero ha sido introducida en alrededor de 50 países, incluyendo la mayor parte de los Antillas Mayores. Fue registrada para Cuba en el año 2016, a partir de recolectas realizadas en el Macizo de Guamuhaya, en la región central del país. En este trabajo se reporta *B. kewense* para la región occidental de Cuba y otras localidades en el Macizo de Guamuhaya, además, se comenta sobre los registros previos de esta especie en el país.

**Palabras Clave:** Planaria terrestre exótica, Bipaliinae, distribución, Antillas Mayores

Land planarians (Platyhelminthes: Tricladida: Geoplanidae: Bipaliinae) have received very little attention in Cuba, with a few records since 1996 as the only available information on this group in the country (Reinés, 1996; Suárez, 2012; Alegre and Barba, 2014; Morffe et al., 2016). The species *Bipalium kewense* Moseley, 1878 is believed to be native from Southeast Asia, but it currently has a cosmopolitan distribution: it has been introduced into about 50 countries, including most part of the Insular Caribbean (e.g., Winsor, 1983; Pérez-Gelbert, 2010; Justine et al., 2014; Sanchez-Garcia, 2014; Lago-Barcia et al., 2015; Morffe et al., 2016). It was reported from Cuba in 2016, based on some specimens collected at La Chispa and the path to Caburní River, near Topes de Collantes, Guamuhaya Massif, in the central region of the country (Fig. 1; Morffe et al., 2016). However, Reinés (1996) reports suggest that it has been also present in western and eastern Cuba since at least about 25 years earlier.

*Bipalium kewense* is a known predator of earthworms and terrestrial mollusks, therefore it is frequently found associated to earthworm cultures, gardens and plant nurseries (for reviews see Winsor, 1983; Winsor et al., 2004; Morffe et al., 2016). Its main non-natural dispersal mode has been by transport of exotic potted plants containing adults or cocoons in the soil (Winsor, 1983; Justine et al., 2014; Lago-Barcia et al., 2015; Morffe et al., 2016). This species can be readily distinguished from other geoplanids by a combination of large size, color pattern (dorsal ground color pale ochre with five black to gray longitudinal stripes: one median, two sub-lateral and two marginal; median and marginal stripes with more or less well-defined margins, sub-lateral stripes fade with diffuse margins; with paired sub-lateral and marginal stripes fused at “neck” level forming an
incomplete collar interrupted dorsally by a small median gap), and the anterior end of the body expanded forming a characteristic semilunate head plate (Winsor, 1983; Morffe et al., 2016). Following diagnosis by Winsor (1983), who stated that *B. kewense* can be distinguished from all other *Bipalium* species on the base of color and stripe pattern, besides other anatomical features, herein we report this species from several new localities in central and western Cuba based on visual and/or photographic records.

SPECIMENS OBSERVED (Fig. 1): PINAR DEL RÍO Province (new locality record): La Palma Municipality: Cayo Hueso (22°40’21", -83°33’07’; 150 m a.s.l.); 13 August 2009; under a slab in a house’s backyard; one specimen observed and photographed by J. Torres and R. Marrero (Fig. 2A). ARTEMISA Province (new locality record): San Cristóbal Municipality: Santa Cruz River canyon (22°44’58", -83°08’59’; 180 m a.s.l.); 9 February 2018; under a rock in a house’s backyard; one specimen observed and photographed by R. López-Silvero (Fig. 2B). CIENFUEGOS Province (new locality record): Cumanayagua Municipality: Pico San Juan, around the meteorological radar station (21°59’21", -80°08’51’; 1,140 m a.s.l.); 22 February 2014; under a rock in secondary vegetation surrounded by mountain rainforest; one specimen observed and photographed by T. M. Rodríguez Cabrera, C. Martínez and R. Domínguez (Fig. 2C). SANCTI SPIRITUS Province: Trinidad Municipality: La Batata Cave (new locality record; 21°54’24", -80°02’15’; 750 m a.s.l.); 11 February 2011; on the cave’s wall; one specimen observed and photographed by R. López-Silvero and R. Montes (Fig. 2D). The color and stripe pattern of the specimens reported herein was slightly variable, but fall within the range reported for *B. kewense* (Winsor, 1983). The exception is the specimen from the Santa Cruz River canyon (Fig. 2B), which had broad marginal stripes, of similar width to sub-lateral stripes, fade and with diffuse margins over most of its body length. This pattern coincides to some degree with *B. dubium*, but the latter has the sub-lateral stripes fused before the "neck", with black head plate and "neck" (Winsor, 1983). Until additional material from this locality is available and other diagnostic characters can be examined (e.g., anatomy of copulatory organs), we refer this record to *B.*
_B. kewense_, assuming that such a color pattern might be a variation not described by Winsor (1983). Also, in the specimen from Cayo Hueso (Fig. 2A) the sub-lateral stripes were very fade, particularly on the anterior half of the body, but Winsor (1983) already noted that sub-lateral stripes in this species “sometimes exhibit considerable variation even on a single specimen.” The color pattern around the “neck” and head plate seems to be the most diagnostic external feature of _B. kewense_ (Winsor, 1983).

The records of _B. kewense_ in western Cuba, over 300 km from the previous ones (Morffe _et al._ 2016), suggest that the species either might have been more widely distributed than previously thought or it has been spreading rapidly. As a matter of fact, Reinés (1996) recorded land planarians referred to the genus _Bipalium_ in earthworm cultures from western and eastern Cuba, without giving a precise locality. Reinés (1996) also mentioned that the material examined by her was collected between 1981 and 1992, therefore the presence of _Bipalium_ in Cuba may be tracked back to the 1980’s at the most. The later would not be surprising since _B. kewense_ was reported from the Greater Antillean region, specifically from Jamaica, as early as the late 19th century (Cockerell, 1897).

The specimen of _B. kewense_ from La Batata Cave (Fig. 2D) was observed in February 2011, more than three years earlier than those reported by Morffe _et al._ (2016) from other two localities around Topes de Collantes in October 2014. Topes de Collantes is a touristic place with a great movement of people and goods year round, thus, it is not surprising that probably _B. kewense_ had arrived to this area with some cargo of potted plants or of humus from earthworm cultures as occurs in other parts of the world (Winsor, 1983; Justine _et al._, 2014; Lago-Barcia _et al._, 2015). Also, this species apparently is able to reproduce both sexually and asexually by fission (Winsor, 1983), therefore, the introduction of a single individual or a fragment may be sufficient to originate a new population.

Most of the _B. kewense_ specimens were found associated to disturbed areas (Fig. 3), which coincides with previous records in Cuba (Morffe _et al._ 2016) and other countries outside its native range (e.g., Winsor, 1983; Álvarez-Presas _et al._, 2014; Justine _et al._, 2014; Sánchez-García 2014). The exception might be Pico San Juan, which is an Ecological Reserve currently far from human settlements, but populated several decades ago, with a road that ends at the meteorological radar station and remaining patches of secondary vegetation (Fig. 3C). However, Winsor (1983) mentioned that in its native range _B. kewense_ inhabits highlands (1,300–2,000 m a.s.l.) with cold sub-tropical climate and rainforest, which coincides with the environmental conditions around Pico San Juan (i.e., predominant elevations above 1,000 m with mountain rainforest). This constitutes the highest elevation at which this species has been reported in Cuba.

Figure 3. Some habitats where the exotic land planarian _Bipalium kewense_ has been found in Cuba: A) near Cayo Hueso, B) Santa Cruz River canyon, C) Pico San Juan, and D) La Batata Cave. Photographs © R. Marrero (A) and T. M. Rodríguez-Cabrera (B, C, D).
The potential negative impact of *B. kewense* on the native biota of Cuba is unknown. In Cuba there are 46 different earthworm species reported, nearly 40% endemic (Rodríguez, 1993; Cabrera et al. 2017), and it is well known that earthworms play an important role in the physical properties of the soil and in the nutrients dynamic (e.g., Lavelle et al., 1992; Blanchart et al., 1991; Rodríguez, 2000; Jiménez et al., 2003). It is possible that large densities of this land planarian may affect native earthworm populations, breaking the equilibrium of natural ecosystems starting at the soil level. Moreover, Cuba harbors one the richest faunas of terrestrial mollusks of the world, with about 1,400 species, of which about 96% are endemic and some have very restricted geographical ranges (Espinosa and Ortea, 2009; Hidalgo-Gato et al., 2016; Hernández et al., 2017). Since *B. kewense* is known to prey also on terrestrial gastropods (Winsor et al., 2004), many of the most threatened Cuban endemic species may be vulnerable to this exotic predator. It is necessary to keep studying this land planarian in Cuba in order to detect in time any possible deleterious effect on natural ecosystems, so environmental authorities can provide the most appropriate management.

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**References**


