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Further Expansion of the Range of the Frog *Eleutherodactylus johnstonei* (Anura: Eleutherodactylidae) in Trinidad and Tobago, with a Note on Reproduction

The Lesser Antillean whistling frog *Eleutherodactylus johnstonei* (Fig. 1.) may have originated on Saint Lucia or one of the other Antillean islands (Hedges *et al.* 2010). It has expanded well beyond its original range, probably aided by human agency, to occupy most Caribbean islands, Bermuda and some of Central and South America. It is considered that the species' reproductive mode and habitat needs have helped its expansion. It is a direct developer, requiring no standing water, with eggs deposited in damp soil; females can produce clutches of up to 30 eggs as often as four times a year; the frogs are small (males up to 25mm long, females 35mm) and cryptically coloured (Bourne 1997); they thrive in human-disturbed habitats such as gardens and waste ground. All these factors would aid dispersal through trade in plants and plant produce.

Kenny (1979) was first to report *E. johnstonei* (as *E. martinicensis*) from Trinidad, around the docks of Port of Spain, the species not having been found for his 1969 account of Trinidad's amphibians (NB this report is mis-cited as Kenny 1980 in Kaiser 1997). Kaiser (1997) and Murphy (1997) both report *E. johnstonei*, still apparently restricted to the dockland area of Port of Spain (Kaiser's personal observations were made in 1992). However, one

of us (JRD, previously unpublished field notes) noted the presence of many *E. johnstonei* calling from a wasteland site close to the junction of the Priority Bus Route and the Lady Young Road on the outskirts of eastern Port of Spain in July 1996; this population was noted again in 1998 and 2000, and a further population recorded from gardens in Diego Martin in 1998. Since Kaiser does not state how extensively he searched for *E. johnstonei* around Port of Spain in 1992, we cannot determine how soon these frogs dispersed from the dockland area, but they had clearly expanded beyond it by 1996.

In 2011, Manickchan *et al.*, based on fieldwork from 2000 until 2002, and then October 2009 to February 2011, reported a considerable expansion of *E. johnstonei*: the frog could now be found along Trinidad's northern east-west corridor from Chaguaramas to La Horquetta. Manickchan *et al.* surveyed very extensively along Trinidad's roads at night, listening for *E. johnstonei*'s distinctive call, so we can be reasonably sure that their work defined the frog's dispersal up to 2011. In addition, White (2013) reported the occurrence of a small number of *E. johnstonei* from the grounds of the Magdalena Hotel in southern Tobago in November 2012.



Fig 1. *Eleutherodactylus johnstonei* photographed at Surrey Village, Lopinot Rd. February 2013.

While carrying out night-time audio monitoring in 2013-16 along the Trinidad road network for the Trinidad and Tobago endemic frog *Pristimantis urichi*, two of us (JRD, MSG) were able to listen out for *E. johnstonei*. We never found these two species in the same locations. *P. urichi* was restricted to relatively undisturbed forest areas (work in progress), while *E. johnstonei* occurred only in gardens and other disturbed areas in towns and villages. We found *E. johnstonei* well beyond the localities reported by Manickchan *et al.* (2011); see Table 1. *E. johnstonei* occurred east to Sangre Grande and south beyond the Mount Harris forest to Cushe; in central Trinidad, we heard the frog at Piarco Airport and south of Piarco at Carapo; in west Trinidad, along the Southern Main Road, there are extensive populations from Chaguanas south to California. In addition, White (pers.comm.) reported to us a 2013 record from Surrey Village. In Tobago, one of us (RJA) heard *E. johnstonei* near Parlatuvier in June 2016 and at Speyside in August 2016 (Table 1).

We cannot tell when these new localities were reached by *E. johnstonei*, nor how well established and numerous these populations are, though at some locations in Trinidad, we heard the frogs in more than one year. We also do not know how these frogs disperse. As small frogs, with preference for a particular and discontinuous habitat, their ability to disperse on their own may be limited. However, both Kenny (1979) and White (2013) suggest that dispersal may occur via the transportation of plants. This certainly appears the most likely explanation for *E. johnstonei* reaching Cushe, which is separated by an extensive forest from the next nearest population at

Table 1 New *Eleutherodactylus johnstonei* sites in Trinidad and Tobago

Location	GPS recording	Date ¹
Trinidad		
Cushe	10.384700, 61.178033	June 2016
California/Couva	10.419850, 61.471000	July 2013, 2016
Piarco carpark	10.602230, 61.337767	July 2013-16
UWI grounds	10.644295, 61.400205	July 2013-16
Sellier Street, St Augustine	10.649542, 61.407203	July 2014-16
Lady Young Road/EMR	10.648037, 61.469762	June-August 1996-2000
Carapo	10.589800, 61.322767	July 2016
Arouca (EMR east of Lopinot Rd.)	not recorded	June 2016
Surrey Village (Lopinot Rd.)	10.65657, 61.32881	February 2013
Sangre Grande bus station	10.585980, 61.131255	July 2014-16
Sangre Grande, Fishing Pond Rd.	10.584012, 61.123483	July 2016
St. Ann's valley	not recorded	July 2013
Tobago		
Speyside	11.297640, 60.649670	August 2016
Parlatuvier	11.302866, 60.533145	June 2016

¹ The dates given are when we heard calling; since we did not search systematically at all sites each year, we cannot tell when *E. johnstonei* first arrived at these sites.

Sangre Grande, and what appears to be a rapid expansion in Tobago.

Our observations show that *E. johnstonei* is continuing its colonization of Trinidad and Tobago, and accord with Manickchan and others' conclusion that, although this frog is an invasive species, it is unlikely to pose a threat to Trinidad's other amphibians. Although some of the native species, such as *Rhinella marina*, occur in the disturbed habitats preferred by *E. johnstonei*, their main distribution tends to be in the less disturbed habitats. One caveat is that alien species can sometimes adapt in unexpected ways to their new surroundings and then begin to threaten native species, a key amphibian example being the cane toad in Australia (Kosmala *et al.* 2017).

Bourne (1997, 1998) reported on reproduction of *E. johnstonei* in Guyana. He found that each male sired 3.3 +/-1.2 clutches and each female laid 4.3 +/-2.1 clutches per annum; clutches contained 14.6 +/-6 eggs and hatched directly into froglets after 13.2 +/-2.1 days. Bourne also found that either the male or the female provided parental care, but not both, and that care, which persisted several days beyond hatching, significantly reduced mortality of eggs and embryos.



Fig. 2 Photo of clutch/parents (Photo by P.A. Geerah)

Reproduction of *E. johnstonei* in Trinidad and Tobago has not previously been reported. On 2 March 2014, still during the dry season, a clutch of 15 eggs with two adults in attendance, presumably just laid, was discovered on the surface of damp soil under a flower pot in a garden in Diego Martin, Trinidad (Fig.2.). Two of us (RJA,PAG) followed the development of the clutch and the behaviour of the frogs. No adults were seen on 4, 6, 9 and 11 March; over this period, two eggs were lost to ants. On 13 March, one adult was seen attending the remaining 13 eggs. No adults were seen on 14 and 16 March and three more eggs were lost to ants. On 19 March, the remaining eggs were found to have hatched, with seven froglets visible, five remaining by the empty eggs capsules and two others at a short distance away; no adult was present. On 21 March, three froglets remained at the nest site, but they were gone by 23 March. Our patchy observations of parental attendance may have been caused by disturbance. In general, our observations accord with those of Bourne (1997, 1998) but with a slightly longer incubation time of 17 days.

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