Eggs and hatchlings of *Hemiphyllodactylus typus* Bleeker, 1860 (Gekkonidae) on a small islet in New Caledonia

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The Indo-Pacific slender gecko, *Hemiphyllodactylus typus* Bleeker, 1860, has a wide distribution ranging from the Mascarene Islands in Indian Ocean through the Asian continent (Indian subcontinent [Sri Lanka] and southeast Asia) and the entire tropical Pacific Ocean west from New Guinea to the Sunda Islands and east until the islands and atolls of eastern Polynesia reaching Pitcairn Island (Zug, 2010). Contrary to other geckos which have colonized Eastern Polynesia [*Hemidactylus garnotii*, *Lepidodactylus lugubris*, *Gehyra insulensis*], *H. typus* never reached the American continent, either naturally or by human-mediated introduction. Despite its large distribution this lizard is difficult to observe, although this in no way means that it is rare. Its apparent scarcity is certainly related to its small size, strictly nocturnal mode of life, and chiefly to its secretive behavior.

Populations of this gecko are unisexual (parthenogenetic) and thus are composed only of females which, however, possess precloacal and femoral pores. Populations in New Caledonia were originally described as a distinct species, *Platydactylus crepuscularis*, by Bavay in 1869 (see also Zug, 2010: 2). Very few data are available on its reproduction, its eggs and hatchlings (Zug, 2010), particularly for New Caledonia (Bauer and Sadlier, 2000) and the genus content is still imperfectly known with several new species recently described or suspected (see e.g. Grismer et al., 2013). We here report observation and collection of two eggs in the wild on a small islet off Ile des Pins in New Caledonia called Brosse. Those eggs were taken to Paris and incubated by one of us (FG) and both hatched. This is the first record for the species on Brosse but also for the whole area of Ile des Pins, despite recent large scale investigations in the area (Geneva et al., 2013).

On January 14, 2012 at 9:40 am, one of us (MH) found in the interior of Brosse two very small eggs attached together, but not attached to a substrate. The eggs were found under the bark of a dead tree trunk that was nearly in a horizontal position. They fell on the soil once the bark was detached from the trunk. A small gecko was observed around the eggs but could not be collected or observed for identification. The small size of both eggs allowed us to identify them as eggs of the gecko *Hemiphyllodactylus typus* but to verify this fact we decided to take them and to place them in a box for incubation in the field, especially since data about reproduction of the species are scarce (Bauer and Sadlier, 2000; Zug, 2010).

After having photographed and measured the eggs with an electronic caliper, we put them in a plastic box containing slightly moistened vermiculite. The eggs stayed in the box during our whole field trip on Brosse until our return to France on February 5, 2012. In France one of us (FG) placed them in an incubator. Both eggs hatched simultaneously on February 11, 2012. The hatchlings were subsequently deposited in the Muséum national d’Histoire naturelle collections (MNHN, Paris).

The eggs were rigid-shelled and measured 6.89 x 5.95 mm and 7.31 x 5.50 mm. They were bond together across a relatively large area (Figure 1) but they were not adherent to the substrate at their laying site. The hatchlings were nearly identical in size: 35 and 34 mm.
total length and SVL of 20 and 19 mm, respectively (alive). They thus had relatively short tails representing 42.85% and 44.12% of total length, respectively.

Hatchling colouration was typical for juveniles and we describe it below. Head and body greyish with scattered pinkish-orange spots distributed more or less regularly from snout and labials across dorsum and flanks and continuing onto the top of the feet. The two spots behind the eyes were larger than all other and were nearly circular (Figure 2). Dorsal side is almost uniform greyish and displays weakly discernible darker chevrons. The brownish colouration of the tail clearly differentiates it from back (Figure 3A). We also noted the presence of a larger dorsal orange spot at the middle of each finger and toe (Figure 3B). Tail dorsum light brown with fine irregular punctuations regularly placed on its whole length and darker segments giving the tail an annulated aspect. A yellow well defined line is distinct dorsally and abruptly separates the grey colour of the back from the brownish tail at the level of the cloaca. It may be a ‘W’-like lighter chevron shape or may consist of two enlarged lateral oblique bars more or less in contact at their base (Figure 3A). The ventral side of the body and head is uniform whitish to light grey whereas the tail shows a light reddish orange colouration on its whole length (Figure 4). Gular colouration is light yellowish and without marking.

When comparing our both hatchlings with both adults collected during a second field trip in the same place in December 2012 (Figures 5, 6), we observed that hatchling colouration is more vivid and obvious. Oliver and Shaw (1953) noted that the eggs of *H. typus* on the Hawaiian Islands were attached together but not always attached to any substrate, an observation confirmed by Schröder and Röll (2004). Clutch size is two but females laying single eggs were also reported (Anonymous, 2010). The size of both eggs (6.89 x 5.95 mm and 7.31 x 5.50 mm) that we sampled on Brosse is similar to other available data: 5.7 to 6.6 mm in Hawaii (Snyder, 1917), 7.29 x 6.02 mm and 7.30 x 5.81 mm for two eggs laid on Andaman Islands in Indian Ocean (Chandramouli *et al.*, 2012), 7.5 x 6.0, 7.9 x 6.0, 7.3 x 6.0, 8.2 x 6.0, 6.7 x 6.0 and 7.0 x 6.3 mm for six eggs sampled by one of us (II) on Upolu, Western Samoa in 1992 (see Fisher *et al.*, 2013). Egg laying and egg hatching certainly happened all year round (I. Ineich, pers. obs.; Lin, 1994; Deso *et al.*, 2008). Incubation time was estimated to be about 68 days in Taiwan (Lin, 1994).

Eggs can be laid in communal egg laying sites and even together with eggs of other species like e.g. *Phelsuma borbonica* on La Réunion (Deso *et al.*, 2008) or also *Lepidodactylus lugubris* at Upolu, Western Samoa (Ineich, pers. obs.). Myrmecophilous plants are also used as oviposition sites by *H. typus* (Janzen, 1974; Ineich, 2010). Deso *et al.* (2008) reported a communal egg laying place with 8 eggs inside a road signalization...
(four single eggs, two eggs only stuck together, and two eggs bond together to the substrate). Hatchling size of our two specimens (alive) from New Caledonia seems to be larger than of two hatchlings from Borneo (respectively 17.7 and 16.5 mm snout-vent length for a tail of 10.3 and 11.5 mm; Das, 1992) or from Hawaii (15.5 mm snout-vent length for a tail of 13.5 mm; Snyder, 1917).

Colouration of specimens from islands in the Indian Ocean is similar to that observed in our New Caledonian specimens. Those from Rodrigues Island are nearly identical in coloration, except that they seem to possess less orange-pinkish dorsal spots (Schröder and Röll, 2004) than our New Caledonian specimens or those from the Andaman Islands (Chandramouli et al., 2012). On the contrary, those from Borneo show less obvious dorsal chevrons which are mostly distinguished as two interrupted dorsolateral lines of larger black marks (Schröder and Röll, 2004). Note, however, that the hatchling of Upolu in Western Samoa (I. Ineich, pers. obs.) shows a light yellow ventral tail colouration whereas that colour is orange-reddish in New Caledonia.

The fine band going through the eyes is darker and larger, bordered dorsally by a lighter band in the specimens of Petite Île close to La Réunion in the Indian Ocean (Anonymous, 2010) whereas it is fine in our New Caledonian specimens. The former specimens also show large dark markings more or less continuous laterally on the tail, a pattern which was never seen on our New Caledonian specimens. All those geographic colour variations could be related to distinct unisexual clonal lineages originating from distinct hybridization events between parental sexual species, but also to

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**Figure 3.** General view (A) and right foot detail (B) of a hatchling showing most characteristic pattern and colouration features.

**Figure 4.** Orange ventral tail colouration is very pronounced by hatchlings. Note also the black caecum (yellow arrow) which is characteristic of unisexual species *H. typus* but also exists in some bisexual populations.
undescribed sexual species in other parts of the world (Grismer et al., 2013). Note however that hybrid origin of parthenogenesis has not been demonstrated for *H. typus* and potential parental species, if present, are not yet identified (Zug, 2010).

*H. typus* seems to be a relatively polymorphic species, at least as for its pattern and colouration; it would be interesting to determine if this variability is related to clonal diversity or to local adaptations. As in most geckos, individuals can change colouration physiologically, as for example with time of day or health. Intensity and colouration of cephalic and dorsal spots appear to vary with age (more intense in hatchlings) but also geographically (it is particularly vivid and orange-reddish in New Caledonia). Egg size and hatching colouration observed on Brosse in New Caledonia are in accordance with similar observations made elsewhere – size and shape of eggs seems relatively constant geographically. Note, however, that our hatchlings show a particularly vivid orange-reddish marked tail ventrally and a light brown dorsal tail colouration in juveniles, a colouration that is faded by adults yet still apparent. The Brosse population occurs in a very small area (less than several square meters) where all our observations were made (separated in time by nearby one year). Despite intensive collecting all over the islet and most other islets around Île des Pins by another team (Geneva et al., 2013), the species was previously never observed at any other place of that area.

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