Until recently, nothing was documented of the reproductive mode of *Herpele* Peters, 1880. Kouete et al. (2012) reported finding a female *H. squalostoma* (Stutchbury, 1836) attending a litter of young in Cameroon, June 2012. The young had a multicuspid, non-adult-like dentition and their guts contained pieces of skin that were likely from the mother based on their size and from observations of maternal dermatophagy in other teresomatan (see Wilkinson & Nussbaum, 2006) caecilians (Kupfer et al., 2006a, 2008; Wilkinson et al. 2008, 2013). Kouete et al. (2012) additionally argued that it was “most plausible that *H. squalostoma* is oviparous” based on three lines of evidence: (i) oviductal eggs not smaller than those in other oviparous caecilians, (ii) no fetuses found during x-ray and dissection of many specimens, and (iii) presence of oviparity in *Herpele*’s closest relatives *Boulengerula* Tornier, 1896 and *Chikila* Kamei et al., 2012. Here, based on new fieldwork, we provide additional observations of extended parental care in *H. squalostoma*, including the first report of direct observations of oviparity.

Fieldwork was carried out by MTK, ESN and local assistants in agricultural habitats in Etam, in the Mungo Forest Reserve area, near (15 km NE of) Kumba, Southwest Region, Cameroon in May 2013. Fieldwork was directed at surveying caecilians and comprised digging of soil especially in shady and/or moist areas, using hoes to depths of approximately 20-30 cm. Adult *H. squalostoma* attending clutches of eggs or litters of young were found on two occasions. Some data on the size of the adults, eggs and young were recorded in the field (Table 1). Measures were taken using a tape measure to the nearest 1 mm, mass with a portable electronic balance to the nearest 0.1 g.

On 15 May, 2013 four person hours of digging were carried out at 04° 44.55’ N, 09° 34.26’ E (138 m altitude). Three adult *H. squalostoma* were found (separately from each other), one of which was attending a clutch of seven eggs (Figure 1). The egg clutch was found in a low-lying area (ca. 5 m²) bordered by cultivated cacao (and beyond this, maize) on one side and a small area of trees on the other (Figure 2). The low-lying area had a covering of herbaceous plants, including scattered banana, but no direct overhead tree canopy. A small and slow-flowing seepage meant that the sandy clay (to sandy clay loam) soil (temperature 26.9 °C) was moist to wet. The clutch

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**Figure 1.** Adult and egg clutch of *H. squalostoma* (C1 in Table 1).
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was found ca. 0.3 m from the spring water, 0.3 m above the lowest part of the low-lying area. The chamber was destroyed while digging but was less than 0.2 m below the surface and although the soil was moist it lay above the water table. The attending adult (presumably female) was more milky in colour than typical adult \textit{H. squalostoma}. Embryos were clearly visible within the eggs. One egg was loose (and was preserved) but the other six were attached to each other and this part of the clutch was attached to a small root (Figure 1), such as has been described for other caecilians (e.g., Kupfer et al., 2006b). An attempt was made to keep the mother

<table>
<thead>
<tr>
<th>Clutch/litter</th>
<th>Date</th>
<th>TL of mother</th>
<th>Mass of mother</th>
<th>Clutch/litter size</th>
<th>Egg diameter</th>
<th>Clutch/litter mass</th>
<th>Mass of single egg or young</th>
<th>TL of young</th>
</tr>
</thead>
<tbody>
<tr>
<td>L0</td>
<td>26/VI/2012</td>
<td>ca. 360</td>
<td>26.2</td>
<td>16</td>
<td>-</td>
<td>17.1</td>
<td>1.0-1.2 (4)</td>
<td>112-122 (4)</td>
</tr>
<tr>
<td>C1</td>
<td>15/V/2013</td>
<td>29.3</td>
<td>7</td>
<td>7-10 (7)</td>
<td>2.65*</td>
<td>0.44 (1)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C1</td>
<td>19/V/2013</td>
<td>30.0</td>
<td>7</td>
<td>7-10 (7)</td>
<td>0.44</td>
<td>0.27-0.32 (5)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>C1</td>
<td>21/V/2013</td>
<td>27.3</td>
<td>7</td>
<td>-</td>
<td>0.7</td>
<td>0.28-0.42 (2)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>L1</td>
<td>16/V/2013</td>
<td>11.4</td>
<td>2</td>
<td>-</td>
<td>0.7</td>
<td>0.28-0.42 (2)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>L2</td>
<td>16/V/2013</td>
<td>8.4</td>
<td>6</td>
<td>-</td>
<td>2.99</td>
<td>0.41-0.54 (6)</td>
<td>81 (1)</td>
<td>-</td>
</tr>
</tbody>
</table>

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|c|c|}
\hline
Clutch/litter & Date       & TL of mother | Mass of mother | Clutch/litter size | Egg diameter | Clutch/litter mass | Mass of single egg or young | TL of young |
\hline
L0            & 26/VI/2012 | ca. 360       | 26.2           | 16                | -            | 17.1                | 1.0-1.2 (4)                 | 112-122 (4) |
C1            & 15/V/2013  | 29.3          | 7              | 7-10 (7)          | 2.65*        | 0.44 (1)            | -                           | -           |
C1            & 19/V/2013  | 30.0          | 7              | 7-10 (7)          | 0.44         | 0.27-0.32 (5)       | -                           | -           |
C1            & 21/V/2013  | 27.3          | 7              | -                 | 0.7          | 0.28-0.42 (2)       | -                           | -           |
L1            & 16/V/2013  | 11.4          | 2              | -                 | 0.7          | 0.28-0.42 (2)       | -                           | -           |
L2            & 16/V/2013  | 8.4           | 6              | -                 | 2.99         | 0.41-0.54 (6)       | 81 (1)                      | -           |
\hline
\end{tabular}
\caption{Data for mothers and clutch of eggs (C) or litters of young (L) for \textit{Herpele squalostoma}. Data for Litter 0 from Kouete et al. (2012), all other data new. Among new records, partial time series data are available only for Clutch 1. All dimensions in mm; all masses in g. Numbers in parentheses are sample size. TL = total length; * = included a piece of vegetation entangled with clutch; - = measure not relevant. Cells blank where data not recorded.}
\end{table}

\textbf{Table 1.} Data for mothers and clutch of eggs (C) or litters of young (L) for \textit{Herpele squalostoma}. Data for Litter 0 from Kouete et al. (2012), all other data new. Among new records, partial time series data are available only for Clutch 1. All dimensions in mm; all masses in g. Numbers in parentheses are sample size. TL = total length; * = included a piece of vegetation entangled with clutch; - = measure not relevant. Cells blank where data not recorded.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{image.png}
\caption{Locality where egg clutch of \textit{H. squalostoma} was found. The eggs were found in the centre of the picture, slightly behind inundated area. Cacao trees visible back left.}
\end{figure}

\textbf{Figure 2.} Locality where egg clutch of \textit{H. squalostoma} was found. The eggs were found in the centre of the picture, slightly behind inundated area. Cacao trees visible back left.
Further observations of reproduction and confirmation of oviparity in *Herpele squalostoma*

and the six connected eggs alive together in a small box of soil for observations, but equipment and conditions available were suboptimal in that ambient captive temperature was higher (and probably less stable) than field soil temperature. Four days after collection one egg had disappeared and one more was removed and preserved. Six days after collection two more eggs had disappeared, and the remaining two eggs had also disappeared by nine days after collection. The box was secure and the soil contained no macroinvertebrates, so the disappeared eggs are likely to have been eaten by the mother. The mother slightly decreased in mass over the first six days (Table 1).

On 16 May, 2013 three person hours of digging were carried out at 4°42.83’ N, 9°32.52’ E (203 m) in fallow areas of a nearby low-intensity maize and cocoyam farm. Six adult *H. squalostoma* were found, two of which were attending litters approximately 2-3 m apart, one of two and one of six young (Table 1; Figure 3). The soil temperature was 27.9°C. The young were small and pinkish, with little pigment (Figure 3).

The four data points now available (Table 1) demonstrate large variation in clutch size in *H. squalostoma* and show that this variation is not all attributable to the size of the mother or to the ontogenetic stage (and thus approximate relative age) of the young. The discovery of eggs with embryos and of clutches with young in mid-May is consistent with seasonal breeding (young hatching in first of two main rainy periods), given that Kouete et al. (2012) reported a clutch of more mature young in late June. Kouete et al. (2012) predicted that, on the basis of comparison with *Boulengerula* and *Siphonops*, hatching *H. squalostoma* would be relatively altricial and much less pigmented than the young they reported, and this is borne out by the observations reported here of pinkish young at least as small as 81 mm and a mass of only one third of the 112-122 mm long, more pigmented young reported by Kouete et al. (2012).

*Herpele squalostoma* was first described 177 years ago. Despite being locally abundant, relatively well represented in collections, and appearing in the commercial pet trade, it has taken until the last two years to determine its reproductive and early life-history mode as an oviparous, direct-developing skin feeder. Much remains to be discovered about even the most basic facts of reproduction and other aspects of natural history of most species of caecilians, and we reiterate Kouete et al.’s (2012) point that fieldwork has a key part to play.

![Figure 3](image_url). Adult and litter of six young of *H. squalostoma* (L2 in Table 1).
This research was supported by grants from the Zoological Society of London’s EDGE Fellowship scheme and the US Fish & Wildlife’s Wildlife Without Borders – Amphibians in Decline scheme. For help with these funding schemes and for additional support we thank J. Dawson, C. Lawson, H. Meredith, and M. Muir. We thank local people for assistance in the field. The Cameroon Ministry of Forestry and Wildlife provided a research permit (1629/PRS/MINFOF/SG/DFAP/SDVEF/SC) to M. T. Kouete. Constructive criticism of an earlier draft was provided by H. Müller and M. Wilkinson.

References