REPORT PROGRESS

Louisea yabassi

Conservation and monitoring strategies of the rare endemic and threatened freshwater crab *Louisea yabassi* from the Ebo Forest near Yabassi in Cameroon

***Application ID:* 35189-C (Completion Grant)**

By

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This is a report of a six months (Oct 2021- March 2022) field research at Eboforest on behalf of conservation action plan of *Louisea yabassi* (Fig. 1). Two new populations of *Louisea yabassi* were rediscovered during the 2nd Booster grant from Rufoord Foundation.

This Completion grant focused of conservation action plan of this threatened species with two important objectives were: (1) to provide crucial information on habitat, distributional range, reproductive biology, phylogeography, and evolutionary relationships of *Louisea yabassi* and (2) to assess the activities of local foresters, hunters, farmers and fishermen within Ebo Forest, specifically the locality where *L. yabassi* was rediscovered and their impact on the rich endemic freshwater crab fauna.

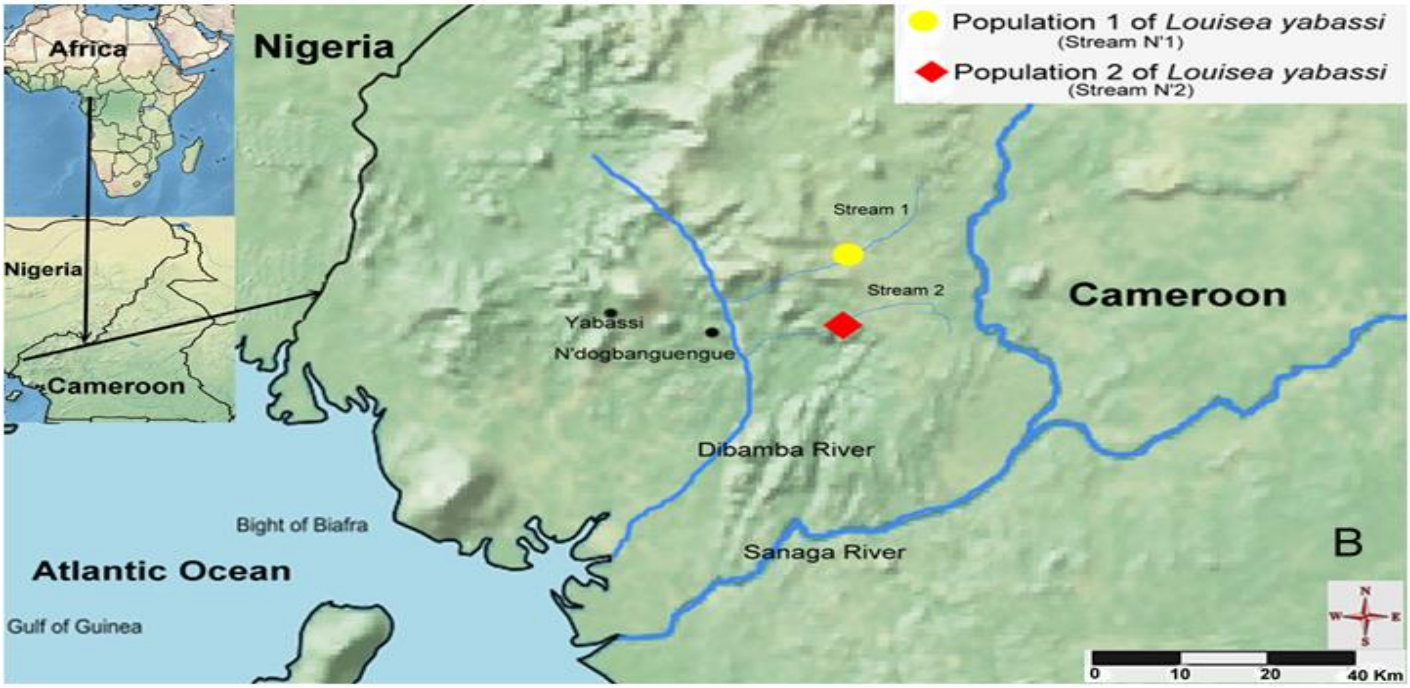

Figure 1. Collection localities of the populations of *Louisea yabassi* endemic to southwestern Cameroon. A–Population 1 (circle), population 2 (triangle) both found in the Ebo Forest, population 3 (asterisk) collected between 1900 and 1909 near Yabassi | B–Sampling sites of the newly discovered populations found in the Ebo Forest. (Mvogo Ndongo et al. 2021).

Since the second Booster grant and during the current research on conservation action plan, a total of 60 specimens in both populations of *L. yabassi* was collected from Eboforest near Yabassi. All specimens collected were identified, their gender and life stage (juvenile, sub adult, adult) recorded, their precise GIS location noted, and their habitat details recorded. Most collected specimens were returned alive and unharmed to the place where they were collected after recording all relevant mophological data. Few adult specimens (males and females) as well as legs of some specimens were kept in ethanol for further morphological descriptions and molecular analyses (for phylogeography, and evolutionary relationships).

The Museum Fur Natukunde was supported lab work in Germany that were included taxonomy and genetic. It sorted out that both populations have relatively low levels of morphological variations (Fig. 2-4).

Figure 2. Whole specimen of *Louisea yabassi* endemic to Eboforest. A: Dorsal view of largest adult male (CW 20.18 mm) of site n°1 (population n°1). B: Ventral view of largest adult male (CW 20.18 mm) of site n°1 (population n°1). C: Dorsal view of largest adult male (CW 21.30 mm) of site n°2 (population n°2). D: Ventral view of largest adult male (CW 21.30 mm) of site n°2 (population n°2). Scale bars: A, B = 15 mm, C, D = 17 mm.

Figure 3. *Louisea yabassi* endemic to Eboforest. A: Dorsal view of largest adult male (CW 20.18 mm) of site n°1 (population n°1). B: Frontal view of largest adult male (CW 20.18 mm) of site n°1 (population n°1). C: Dorsal view of largest adult male (CW 21.30 mm) of site n°2 (population n°2). D: Frontal view of largest adult male (CW 21.30 mm) of site n°2 (population n°2). Scale bars: A, B = 8 mm, C, D = 9 mm.

Figure 4. *Louisea yabassi* endemic to Eboforest, thoracic sternites (s1−s8) and pleonal segments (a4−a7). A: largest adult male (CW 20.18 mm) of site n°1 (population n°1). B: largest adult male (CW 21.30 mm) of site n°2 (population n°2). Scale bars: A = 8 mm, B = 9 mm.

Data from this Completion grant were pooled with data from previous projects supported by Rufford Small Grant Foundation (2nd Rufford Small Grant (*Louisea edeaensis*), 1st Booster Grant (*Louisea balssi*) and 2nd Booster Grant (*Louisea nkongsamba*)). The phylogenetic analysis indicate *Louisea* include four distinct species and that populations of *Louisea yabassi* are genetically identic and variations only occur in morphology (Fig. 5).

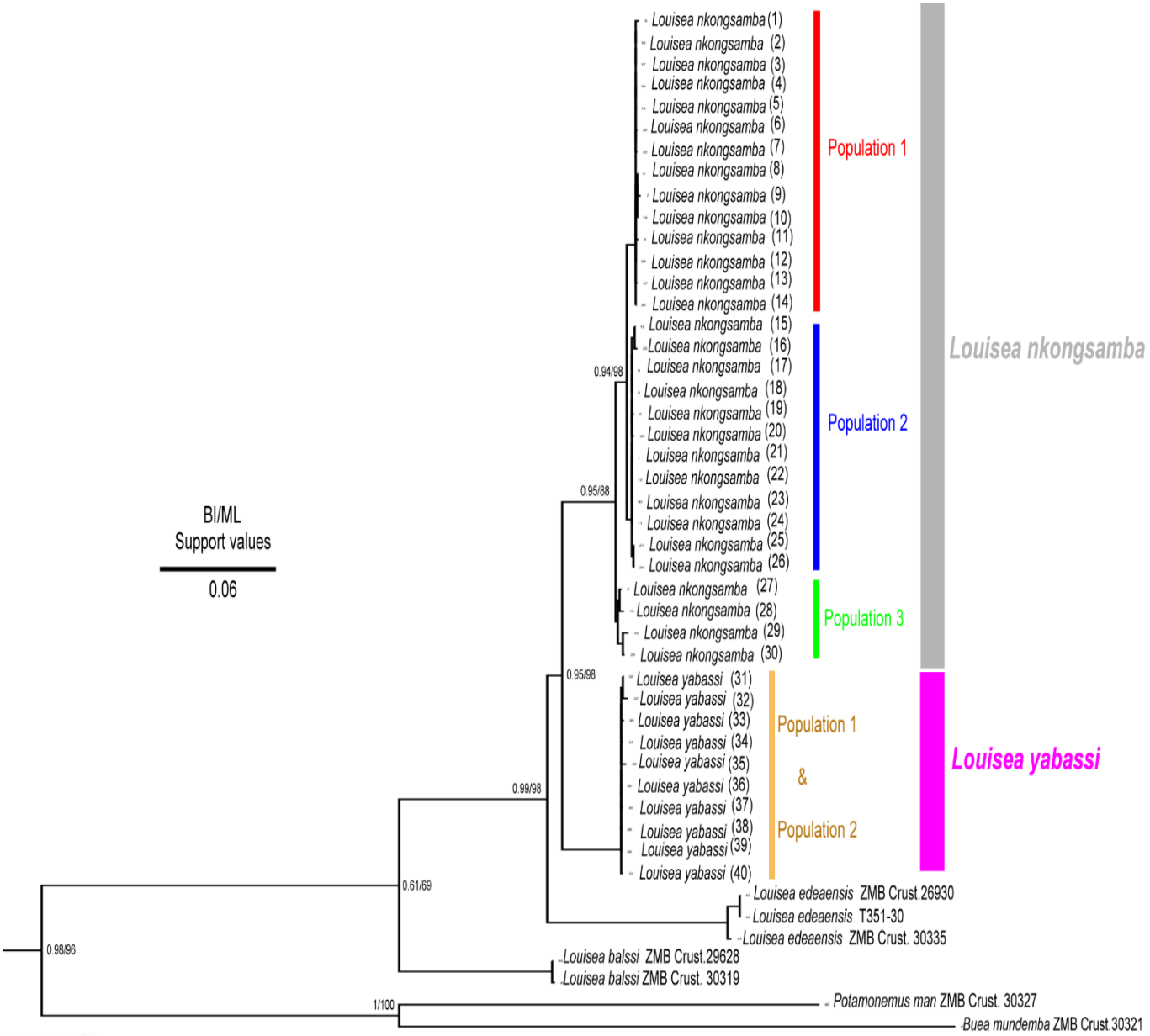

Figure 5. ML tree topology for the four freshwater crab *Louisea* species from Cameroon included in this study derived from mtDNA sequences corresponding to three loci (partial 16S rRNA, COI and 12S rRNA genes). BI and ML statistical values (%) on the nodes indicate posterior probabilities and bootstrap support, respectively.

All four species of *Louisea* form a single clade with *L. balssi* from Mt. Manengouba as the ancestral species, while *L. edeaensis* from Lake Ossa is the sister species of the clade that includes *L. yabassi* and *L. nkongsamba*. The divergence time estimates for *Louisea* species are provided in Fig. 6.

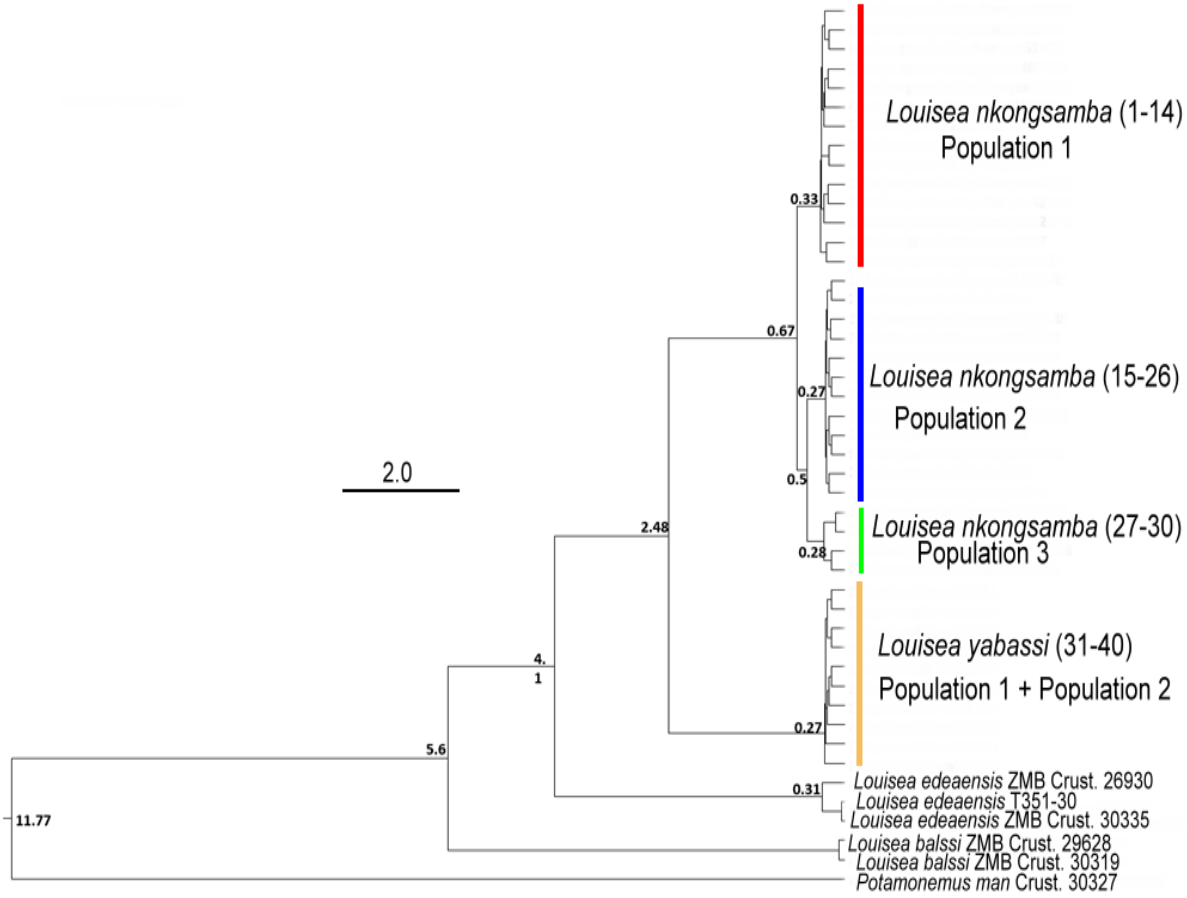

Figure 6. BI tree topology for the four freshwater crab *Louisea* species from Cameroon included in this study derived from COI mtDNA sequences constructed with BEAST 2.6.2. Statistical values on the nodes indicate age in million year.

Habitat, threats, and conservation

The EboForest is the largest remaining tract of primary lowland and submontane rainforest in this part of Africa, and is drained by the Wouri and Dibamba Rivers that flow into the Atlantic Ocean. This area represents a key biodiversity hotspot in southwestern Cameroon for a number of freshwater taxa including crabs. The freshwater catchments of the Ebo-Forest are also important spawning grounds for fish and other invertebrates, and these forests are also a refuge for charismatic wildlife including monkeys (including

chimpanzees and gorillas), manatees, elephants, birds, turtles, snakes, and amphibians (e.g. Cumberlidge 1999; Morgan et al. 2013).

Like *Louisea yabassi,* all other species of *Louisea* species are semi-terrestrial and prefer temporary water bodies such as puddles near small permanent streams as well as damp environments under small stones or fallen leaves on land adjacent to streams (Mvogo Ndongo et al. 2017, 2018, 2019, 2021). These freshwater crabs have limited dispersal abilities due to reproduction by direct development that restricts dispersal to the movements of adults, and to their relative isolation (dues the complicated topography and the fragmentary nature of their wetland habitats). These factors are probably responsible for much of the diversity and endemism of these freshwater crabs (Cumberlidge et al. 2009).

Ongoing threats exist to the rainforest habitat of *Louisea* yabassi, as already reported in previous projects, these threats are driven by human population increases, deforestation, rapid urbanization, infrastructure development and increased agriculture. Other anthropogenic threats include increased noise pollution and altered terrestrial and aquatic landscapes. Despite these threats, *Louisea yabassi* and other semi-terrestrial unique freshwater crab diversity is not yet fully appreciated by the relevant government agencies or indigenous communities. Therefore, capacity building through community outreach and collaboration with local communities and research institutes based in southwest Cameroon is recommended to raise awareness and facilitate monitoring of local endemic semi-terrestrial freshwater crab species. This initiative incudes training local field guides to aid with species identification, provision of resource guides for fisheries managers and park officials that highlight the role of threatened crabs in freshwater ecosystems, and the benefits that conservation development can bring in local areas (Brooks et al. 2008). These objectives will be done in the next steps at the Institut des Sciences Halieutiques University of Douala, Cameroon (upcoming congress) and *insitu* where local school will also be visited. Students need to be trained for long-term monitoring.

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