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Reply to Global high-altitude limits for amphibians by Tracie A. Seimon and Anton Seimon (2015)

Barkha Subba [1], G. Ravikanth [2] & N.A. Aravind [3]

[1,2,3] Ashoka Trust for Research in Ecology and the Environment (ATREE), Suri Sehgal Centre for Biodiversity and Conservation, Royal Enclave, Srirampura, Jakkur PO, Bengaluru, Karnataka 560064, India
[1] Manipal University, Manipal, Karnataka 576104, India
[1] barkhasubba@gmail.com (corresponding author),
[2] gravikanth@atree.org, [3] aravind@atree.org

High altitude records of amphibians in the age of Climate Change

With the problem of global warming looming large on our planet the existence of many species are under threat. Researchers are racing to bring in new information on the impact of climate change on global biodiversity (Walther et al. 2002; Parmesan & Yohe 2003; Campbell et al. 2009; Xu et al. 2009; Bellard et al. 2012; Gottfried et al. 2012; Shrestha et al. 2012). There have been a large number of studies that have documented range shifts of species due to climate change (Walther et al. 2005; Araujo & Rahbek 2006; Hickling et al. 2006; Chen et al. 2011). The new records on altitude of both flora and fauna as a result of range extension due to climate change have become quite frequent. In this context, we agree with Seimon et al. (2015) who have neatly summarized the three problems on new findings about altitude records in their Response to our paper (Subba et al. 2015). Furthermore, we agree with authors that often vital data may be hidden within other larger issues; as a result missing out on relevant data seems to be a reoccurring problem (Seimon et al. 2007a). In this age of easy access to information and an era where scientists and citizens are coming together to bridge the gap in information, there is a need to make the data easily available and visible. New records should also be followed by the exact location (latitude - longitude) where the species was observed or collected along with the stage of development.

In their comment Seimon et al. mention that we did not take into account the record of 5200m for *Scutiger alticola (boulengeri)* in Tibet recorded by Swan (1990). This was an intentional omission, the reason being the following—Swan (1990) writes *"The Himalayan and Tibetan frogs of the Family Pelobatidae include* Scutiger sikkimensis *that is found in scattered localities along the Himalaya between 2800 and 4000 m and* Scutiger alticola *which is primarily Tibetan and has been collected up to 5200m."*

Here he fails to mention who collected it, he may have been referring to Hocks record back in 1964, and we surely know that Swan did not make the collection from the following lines, where he writes, *"In 1980 I was privileged to accompany the first international tour across Tibet as a guest of the Chinese Academy of Sciences where I was able to see and collect in places where the fabled explorers of the last century made their remarkable observations. On a pass (Gyaco la, northeast of Tingri) I noticed some snow fed ponds and was drawn to them hoping for specimens of* Scutiger alticola *but the black mud I scooped up finally revealed two small scaleless loaches (Nemachilinae). This was at 5200 m and somewhat higher than similar fish obtained by G.E. Hutchinson in Ladakh back in 1932 and so they represented the highest fish in the world."*

We opine that not only new altitudinal records but old records as well require screening to some extent.

In our paper we did not write about other high altitude Himalayan frogs, as it was not within the scope of this short communication paper as the article is not exclusively about altitudinal distribution of amphibians.

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We have mainly focused on *S. boulengeri* and *S. sikimmensis*, the reason being, *S. boulengeri* is often misidentified as *S. sikimmensis*, and this information would be very useful for future researchers in this area.

We acknowledge that we missed the paper by Seimon et al. (2007b) on range extension of Andean anurans. The authors have recorded *Pleuroderma* sp. at a deglaciated seasonal pool at an altitude of 5400m. This is a very important and interesting paper on range extension by relatively lower altitude species to higher altitudes due to deglaciation. At the same time, we would like to point out how the well known and widely read book *Ecology and Behaviour of Amphibians* by Kentwood (Wells 2007) and reputable websites like AmphibiaWeb (http://amphibiaweb.org/. Accessed: 1.9.2015) also unfortunately fails to mention Seimon et al.'s altitude record of *Pleuroderma* sp. on their section on altitudinal distribution of amphibians in the world. They have mentioned *S. boulengeri* as probably the highest altitude amphibian in the world. We are writing this in hope that publication on altitude record gets more visibility as it has become a vital element in studying species response to the rapidly changing climate. Regarding the ephemeral pool where the authors photographed the tadpoles of *Pleuroderma* sp., the location would have been much more clear if the authors had given exact point location (latitude longitude) along with altitude (5400m), for the sake of "consistency and precision" of altitudinal records.

Lake Gurudongmar Complex 2, one of the lakes where we found *S. boulengeri* has increased in size from 0.249km^2 in 1965 to 1.076km^2 in 2010 (Kumar & Prabhu 2012) as a result of active deglaciation. In its home range in the eastern Himalaya, the highest authentic record of *Scutiger boulengeri*, with point location of the collection made, is at an altitude of 4324m (Chen et al. 2009; Li et al. 2009) and that of an anecdotal and unsubstantiated record is 5200m (Swan 1990). We collected an adult specimen from among a healthy population of *S. boulengeri* at an altitude of 5270m at Lake Gurudongmar Complex 2. This Lake Complex, including the seasonal pools in its vicinity has an altitudinal range of 5250–5490m. We reaffirm that *S.boulengeri* is undergoing upward range expansion and indeed "scaling new heights."

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