



## Misconceptions about the taxonomy and distribution of *Caiman crocodilus chiapasius* and *C. crocodilus fuscus* (Reptilia: Crocodylia: Alligatoridae)

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Four subspecies are currently recognized for the Spectacled Caiman, *Caiman crocodilus* (Linnaeus 1758): *Caiman crocodilus fuscus* (Cope 1868: *Perosuchus fuscus*), described from a single specimen from the Magdalena River, Colombia; *C. c. chiapasius* (Bocourt 1876: *Alligator chiapasius*), described from the Tonalá Valley, Chiapas, México; *C. c. apaporiensis* (Medem 1955) from the upper Apaporis River, Colombia; and, *C. c. crocodilus* (Linnaeus 1758: *Lacerta crocodilus*), named for the species originally described (Smith & Smith 1977; Busack & Pandya 2001). *Caiman yacare* was previously considered to be a fifth subspecies (i.e., *C. c. yacare*), but it is now generally accepted that it is a full species (King & Burke 1989), and is no longer treated as a subspecies (Velasco & Ayarzagüena 2010). There is some confusion about the current distributions of *C. c. chiapasius* and *C. c. fuscus*, and although some works have attempted to clarify this situation (Busack & Pandya 2001), the confusion still remains (i.e., Rueda-Almonacid *et al.* 2007; Velasco & Ayarzagüena 2010). Here, we present a brief review of the taxonomic status of caiman subspecies, and its implications for their distributions.

When Bocourt (1876) described *C. c. chiapasius* he only made comparisons with material ascribed to *C. c. crocodilus* and *C. c. yacare* (now *C. yacare*), and suggested that *C. c. chiapasius* be recognized as a different species (Smith & Smith 1977). Apparently, Bocourt (1876) did not examine the only specimen ascribed to *C. c. fuscus* that was deposited in the Academy of Natural Sciences of Philadelphia (ANSP 9720). On the basis of Bocourt's (1876) superficial description of *C. c. chiapasius*, it has therefore been considered as a synonym of *C. c. fuscus* (Boulenger 1889; Schmidt 1928).

In the mid-twentieth century, Medem (1981) reviewed the paratypes of the two subspecies of *Caiman crocodilus*, using additional specimens from Colombia, Ecuador, Venezuela and Panama. He observed differences in cranial shape, coloration and scalation; suggesting that *C. c. chiapasius* could occur in Pacific lowlands of Colombia, specifically in the Chocó region (Medem 1962). Subsequently, Medem (1983) reviewed another specimen from Ecuador, which was determined to be *C. c. chiapasius*, and stated that *C. c. chiapasius* occurred from México, through Central America, in both versant Pacific and Caribbean Central America, to the Pacific lowlands of Colombia and Ecuador.

More recently, Busack & Pandya (2001) examined the morphological variation in *C. crocodilus* subspecies across the complete distributional range, and found insufficient morphological evidence to support the split of *C. crocodilus* into subspecies (*C. c. apaporiensis* was not included in the analysis). However, we suggest that their results could be skewed by three aspects: (i) first, Busack & Pandya (2001) used scalation characters (scalation, cranial measurements and coloration) to differentiate the subspecies, but these were do not exhibit in a regular pattern to distinguish among populations (i.e., Platt *et al.* 2008; García-Grajales *et al.* 2009); (ii) second, the low sample size of *C. c. fuscus* (n= 8); and, (iii) the original assignation of each specimen to the taxonomic categories (museum collections). The taxonomic assignation *a priori* based on distribution source (i.e., using locality data) has problems to correctly assigning specimens to any subspecies due to the difficulty of determining accurate distributional limits (Venegas-Anaya *et al.* 2008). Using a different analyses (covariance, principal component and discriminate function), Busack & Pandya (2001) observed that the percentage of specimens assigned to each subspecies varied considerably and suggested that some *C. crocodilus* subspecies were incorrectly recognized. The lack of morphological variation found in *C. crocodilus* through its distributional range does not allow the accurate recognition of subspecies. However, DNA analysis should help us to recognize subspecies and accurately delimit geographic distributions within *C. crocodilus* (Busack & Pandya 2001; Vasconcelos *et al.* 2006; Rueda-Almonacid *et al.* 2007).