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## Living Crocodylians of the World (2024)

The CSG currently recognises 26 species of world crocodilian (Tables 1 and 2), the most recent of which to be recognised being West/Central African species, *Mecistops leptorhynchus* (see Note 1 below), *Osteolaemus osborni* (see *Osteolaemus afzelii* later) and *Crocodylus suchus* (see Note 2 below).

<u>*Caiman crocodilus* Group</u>

The exact relationships and boundaries between subspecific units in the *Caiman crocodilus* group remain under study and in need of clarification (eg Amato 1994; Amavet *et al*. 2023; Balaguera *et al*. 2020, 2022; Escobedo-Galván *et al*. 2011, 2015a,b; Medem 1955; Muniz *et al*. 2021; Roberto *et al*. 2020; Venegas-Anaya *et al*. 2008).

Subspecies remain a debated topic within the crocodylian systematics community and at this time the CSG does not recognize valid subspecies. That said, recent molecular comparisons with *Caiman crocodilus apaporiensis* (Balaguera-Reina *et al*. 2020; Roberto *et al*. 2020) suggest that this caiman, despite having some distinct morphology, especially with regard to head shape, is not distinct from *C. c. crocodilus* based on mitochondrial markers. The following subspecies may be relevant species-level units for future consideration:

- Spectacled caiman (*C. c. crocodilus*): South America [Amazon River basin, Orinoco and upper Negro Rivers basins (Amazon lineage), Tapajós, Xingu, plus Araguaia-Tocantins, Parnaiba River basins, coastal drainages in northern South American and northeastern Brazil (Brazilian Shield lineage); Upper Branco River].

- Chiapas caiman (*C. c. chiapasius*): Mexico and northern Central America (southern Mexico and El Salvador drainages).

- Apaporis River caiman (*C. c. apaporiensis*): Colombia (Apaporis River between Jirijirimo and Puerto Yaviya falls).

- Brown caiman (*C. c. fuscus*): Central and South America (Atlantic coast of Costa Rica and probably in Nicaragua and Honduras, Pacific coast of Costa Rica and Panama to trans-Andean Colombia - the Magdalena and Atrato basins, Venezuela - Maracaibo basin and Ecuador).

<u>Species Yet to be Formally Recognised</u>

Two additional crocodylian "species" have yet to be formally recognised, and have not been included in the CSG's official list at this time. These are:

- *Crocodylus halli*: The nominate form of *Crocodylus novaeguineae* occupies the northern part of New Guinea and crocodiles in the southern part are reported to differ in morphology and reproduction (Cox 1984; Hall 1985, 1989; Hall and Johnson 197; Hall and Portier 1994; Oaks 2011). There is some preliminary genetic evidence for paraphyly in this species. This southern taxon has been named *Crocodylus halli* (Murray *et al*. 2019). The CSG Taxonomy and Identification Group has discussed at length as to whether there is enough support for this newly designated taxon to be included in this current species list. Consensus was that there is insufficient molecular data supporting its inclusion at this time. The group would like more extensive molecular analyses with samples of known provenance.

- *Osteolaemus afzelii* [Benin, Burkina Faso, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Nigeria(?), Senegal, Sierra Leone, Togo]: Dwarf crocodiles of the genus *Osteolaemus* have long been considered to include two recognized subspecies (*O. t. tetraspis* and *O. t. osborni*). Recent work shows that *Osteolaemus* has significant genetic and some morphological variation meriting species-level recognition of three distinct taxa: *Osteolaemus tetraspis*, *O. osborni*, and an as yet not fully described species (*O. afzelii*) from West Africa (Cope 1861; Eaton *et al*. 2008; Lilljeborg 1867; Schmidt 1919; Shirley *et al*. 2014, 2015).

<u>Validity in Question</u>

The putative *Crocodylus raninus* is a freshwater crocodile from Borneo (Das and Charles 2000), first proposed as a subspecies of *Crocodylus porosus* (referred to as *C. biporcatus* at the time) by Müller and Schlegel (1844). This taxon is generally synonymized with *C. porosus*, but publications by Ross (1990, 1992) raised renewed awareness of the taxon and stimulated new consideration of its taxonomic validity. Recent efforts to locate living specimens fitting the description of *C. raninus* have been in vain. Efforts are underway to collect DNA from museum specimens of *C. raninus* but are, as yet, unpublished. The CSG Taxonomy and Identification Group refrains from making a determination as to the validity of *C. raninus* at this time.

<u>Notes</u>

The following notes are provided for a number of species,

Table 1. The 26 species of crocodilian currently recognised by the CSG. *= IUCN Red List assessment not carried out yet or incomplete. Red List status: LC= Least Concern, VU= Vulnerable, EN= Endangered, CR= Critically Endangered. Other: E= considered extinct, E?= likely extinct, RR (recently rediscovered; Chaudhry *et al*. 2023).

| Common Name | Species | Red List | Range States |
|---|---|---|---|
| American Alligator | *Alligator mississippiensis* | LC | USA |
| Chinese Alligator | *Alligator sinensis* | CR | China |
| Spectacled Caiman | *Caiman crocodilus* | LC | Costa Rica, El Salvador, Guatemala, Honduras, Brazil, Mexico, Nicaragua, Panama, Colombia, Ecuador, French Guiana, Peru, Guyana, Suriname, Venezuela, Trinidad and Tobago, Bolivia (unconfirmed) |
| Broad-snouted Caiman | *Caiman latirostris* | LC | Argentina, Bolivia, Brazil, Paraguay, Uruguay |
| Yacare Caiman | *Caiman yacare* | LC | Argentina, Bolivia, Brazil, Paraguay |
| Black Caiman | *Melanosuchus niger* | LC | Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Peru, Venezuela (unconfirmed) |
| Cuvier's Dwarf Caiman | *Paleosuchus palpebrosus* | LC | Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Paraguay, Peru, Suriname, Trinidad and Tobago, Venezuela |
| Schneider's Smooth-fronted Caiman | *Paleosuchus trigonatus* | LC | Bolivia, Brazil, Colombia, Ecuador, French Guiana, Peru, Guyana, Suriname, Venezuela |
| American Crocodile | *Crocodylus acutus* | VU | Belize, Colombia, Costa Rica, Cuba, Ecuador, Guatemala, Peru, Honduras, Dominican Republic, El Salvador, Haiti, Jamaica, Mexico, Nicaragua, Panama, Venezuela, USA |
| Orinoco Crocodile | *Crocodylus intermedius* | CR | Colombia, Venezuela |
| Australian Freshwater Crocodile | *Crocodylus johnstoni* | LC | Australia |
| Philippine Crocodile | *Crocodylus mindorensis* | CR | Philippines |
| Morelet's Crocodile | *Crocodylus moreletii* | LC | Belize, Guatemala, Mexico |
| Nile Crocodile | *Crocodylus niloticus* | LC | Angola, Botswana, Burundi, Cameroon, DR Congo, Egypt, Congo, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Kenya, Madagascar, Malawi, Sudan, Mozambique, Namibia, Rwanda, Somalia, Tanzania, South Africa, Uganda, South Sudan, Zambia, Zimbabwe |
| New Guinea Freshwater Crocodile | *Crocodylus novaeguineae* | LC | Indonesia, Papua New Guinea |
| Mugger Crocodile | *Crocodylus palustris* | VU | India, Iran, Nepal, Pakistan, Sri Lanka |
| Saltwater Crocodile | *Crocodylus porosus* | LC | Australia, Bangladesh, Brunei, India, Indonesia, Malaysia, Sri Lanka, Myanmar, Papua New Guinea, Philippines, Singapore, Solomon Islands, Timor-Leste, Vanuatu, Palau, Cambodia(E?), Thailand(E?), Vietnam(E?) |
| Cuban Crocodile | *Crocodylus rhombifer* | CR | Cuba |
| Siamese Crocodile | *Crocodylus siamensis* | CR | Cambodia, Indonesia, Lao PDR, Thailand, Vietnam. **Uncertain**: Malaysia, Myanmar |
| West African Crocodile | *Crocodylus suchus* | * | Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Guinea, Congo, DR Congo, Côte d'Ivoire, Ethiopia, Gambia, Ghana, Niger, Mali, Guinea-Bissau, Liberia, Mauritania, Nigeria, Senegal, Sierra Leone, Togo, South Sudan, Uganda |
| West African Slender-snouted Croc. | *Mecistops cataphractus* | CR | **Known**: Côte d'Ivoire, Gambia, Ghana, Liberia, Sierra Leone **Unknown (possibly Extinct)**: Benin, Guinea, Burkina Faso, Mali, Togo, Guinea-Bissau, Nigeria, Senegal |
| Central African Slender-snouted Croc. | *Mecistops leptorhynchus* | * | **Known**: Cameroon, Central African Republic, DR Congo, Gabon **Unknown (possibly Extinct)**: Angola, Burundi, Chad, Zambia, Tanzania, Equatorial Guinea, South Sudan |
| African Dwarf Crocodile | *Osteolaemus tetraspis* | VU | **Known**: Angola, Benin, Cameroon, Congo, DR Congo, Gabon, Nigeria, Togo, Côte d'Ivoire, Gambia, Ghana, Guinea-Bissau, Guinea, Liberia, Mali, Sierra Leone. **Unknown (possibly Extinct)**: Burkina Faso, Senegal |
| Congo Dwarf Crocodile | *Osteolaemus osborni* | * | **Known**: Cameroon, Central African Republic, DR Congo, Congo **Unknown**: Angola |
| Indian Gharial | *Gavialis gangeticus* | CR | Bangladesh, India, Nepal, Pakistan (RR) |
| Tomistoma | *Tomistoma schlegelii* | EN | Indonesia, Malaysia, Brunei, Thailand (E), Vietnam (E) |

and have also been referenced in Table 2.

1. *Caiman latirostris* is part of a species complex based on previous published articles (eg Borges *et al*. 2018; Roberto *et al*. 2020), with three well delimited lineages.

2. Populations of *Paleosuchus palpebrosus* show three distinct haplotype clusters of 22 distinct haplotypes of cytb (Muniz *et al*. 2018, 2021). These authors also analyzed SNP-type nuDNA molecular and detected three distinct evolutionary significant units (Madeira-Bolivia, Amazon and Pantanal). The cytb data supports Madeira and Bolivia as distinct management units. A recent chapter (Muniz *et al*. 2021) updates the distribution of the ESU from Pantanal, that occurs throughout the upper Paraguay River basin, Paraná River, and much of the Brazilian Shield.

3. Analyses of *Paleosuchus trigonatus* populations across the range show clusters of four haplotype groups consisting of 36 unique haplotypes of cytb (Bittencourt *et al*. 2019). Two genetic lineages were recognized - one in the Guiana Shield region (Guyana, French Guiana, Amapá and Upper Branco River in Brazil), and another along the Amazon River and Araguaia-Tocantins basin.

4. Some regional structuring and cryptic species of *Crocodylus acutus* may be present, but this is not yet widely published or conclusive. The thought that Antillean populations might represent divergent species appears to no longer be the prevailing hypothesis, with an historic mitochondrial capture event much more likely (Bashyal *et al*. 2014; Milian-Garcia *et al*. 2011, 2018, 2020; Moncada-Jimenez *et al*. 2023).

5. Originally described as *Crocodylus johnsoni* but commonly referred to as *Crocodylus johnstoni*. The IUCN Red List and CITES use the name *Crocodylus johnstoni* and list *Crocodylus johnsoni* as a synonym. It is clear in Krefft's original 1873 description that the use of the name *johnsoni* was not a typographical error, as he used it repeatedly throughout the paper (Krefft 1873). As such, Article 32d of the International Code of Zoological Nomenclature (ICZN) does not apply in this case. King and Burke (1989), clearly state that the rules of the ICZN dictate that the specific epithet *johnsoni* must stand and could only be corrected by submitting an appeal to the ICZN. However, as pointed out by Tucker (2010), Article 33.2.3.1 of the 4th edition of the ICZN modified the rules relative to emendation of erroneous names of taxa. The new interpretation allows the spelling of *johnstoni* as a justified emendation in stating "when an unjustified emendation is in prevailing usage and is attributed to the original author and date it is deemed to be a justified emendation." Although the CSG Taxonomy and Identification Group consider either form of the specific epithet (*johnsoni* or *johnstoni*) to be of correct usage, *Crocodylus johnstoni* is the name most commonly applied in the scientific and general literature, and in Australian State/Territory and Federal legislation.

6. An extensive, stable and ancient hybrid zone with *Crocodylus moreletii* and *C. acutus* has been described. There is no evidence that this will alter the current specific validity of *C. moreletii* (Barão-Nóbrega *et al*. 2023; Cedeño *et al*. 2008; Hekkala *et al*. 2015; Ray *et al*. 2004).

7. Deraniyagala (1936) described the *Crocodylus palustris* of Sri Lanka (then Ceylon) as a separate subspecies from that of the Indian Mugger. This new subspecies he named *Crocodylus palustris kimbula*. The distinction was largely based on counts of dorsal scale rows, the shape and size of dorsal osteoderms, and the apparent lack of a ventral collar, among other differences. In recent decades, this taxon has been lacking in popular support and is rarely mentioned in the literature. No-one appears to be working on this from a molecular perspective.

8. Extensive hybridization in the wild between *Crocodylus rhombifer* and *C. acutus* has been reported (Milián-García *et al*. 2011, 2015; Pacheco-Sierra *et al*. 2016; see also Note 6). Recent evidence suggests that the formerly re-established population of *C. rhombifer* on Isla de la Juventud has again been wiped out by poaching.

9. The taxon validity of *Crocodylus suchus* is supported by molecular and karyotypic evidence, and it is now widely accepted in the literature (Cunningham *et al*. 2016; Hekkala *et al*. 2011; Shirley *et al*. 2015).

10. Resurrection of the genus *Mecistops* was proposed based on its sister taxon status to *Osteolaemus*, and subsequent work has shown significant molecular and morphological evidence for cryptic species structure with two species, one in West (*M. cataphractus*) and one in Central Africa (*M. leptorhynchus*) (McAliley *et al*. 2006; Shirley *et al*. 2014, 2018). The taxonomy of *M. leptorhynchus* has been published and is gaining acceptance in the literature. We do not advocate the use of "sharp-nosed crocodile" as a common name in a context referring to live animals and recognize this English nomenclature exclusively due to its presence in the paleontological literature.

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Table 2. The 26 species of crocodilian currently recognised by the CSG, with biogeographic distribution.

| Common Name | Biogeographic Distribution |
|---|---|
| American Alligator<br>*Alligator mississippiensis* (Daudin, 1802) | Southeastern USA (Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, Oklahama, South Carolina, North Carolina, Texas) |
| Chinese Alligator<br>*Alligator sinensis* (Fauvel, 1879) | Lower Yangtze River (very limited and fragmented) |
| Spectacled Caiman<br>*Caiman crocodilus* (Linnaeus, 1758) | Very widespread from southern Mexico, lower elevations of Central America, northern South America, south to northern Argentina. Found on Trinidad and Tobago, occasional scattered records in the Lesser Antilles. Introduced in Puerto Rico, Cuba, and in extreme southern Florida (USA) |
| Broad-snouted Caiman<br>*Caiman latirostris* (Daudin, 1802)<br>See Note 1 | Drainages of the Paraná, Paraguay, Uruguay and São Francisco River systems, as well as numerous small Atlantic coast drainages from Natal (northeastern tip of Brazil) to northeast Uruguay |
| Yacare Caiman<br>*Caiman yacare* (Daudin, 1802) | Restricted to the river drainages/basins of the Madeira River, and its tributaries (Amazon system) and Parana-Paraguay River system south to Corrientes Province in northern Argentina, including the Pantanal |
| Black Caiman<br>*Melanosuchus niger* (Spix, 1825) | Widely distributed throughout the Amazon River basin. Populations also known from Rupununi and upper Essequibo River drainages (Guyana), Kaw and Approuague region (French Guiana), lower Oiapoque River (Amapá, Brazil/French Guiana border), Pointe Behague (French Guiana), and Cabo Orange (Brazil) |
| Cuvier's Dwarf Caiman<br>*Paleosuchus palpebrosus* (Cuvier, 1807)<br>See Note 2 | Amazon and Orinoco River drainages and Atlantic coast drainages between the Paraguay-Paraná River (except the Pantanal) and the São Francisco River. Small populations in the upper Paraguay River drainage (Paraguay). Also, populations along the Cerrado Domain in Brazil, in the Parnaiba, Tocantins-Araguaia River basins, and coastal drainages in northeastern Brazil. |
| Schneider's Smooth-fronted Caiman<br>*Paleosuchus trigonatus* (Schneider, 1801)<br>See Note 3 | Amazon and Orinoco basins and coastal drainages in northern South America |
| American Crocodile<br>*Crocodylus acutus* (Cuvier, 1807)<br>See Note 4 | Greater Antilles, Caribbean and Pacific Coast of Central and northern South America |
| Orinoco Crocodile<br>*Crocodylus intermedius* (Graves, 1819) | Restricted to the Orinoco River basin, and today only found in large rivers (eg Arauca, Bita, Cinaruco, Guaviare, Guayabero, Lozada, Meta, Vichada, Orinoco, Casanare, Cusiana, Ele, Lipa, Cravo Norte, Cravo Sur, Ariporo, Manacacias, Apure, Portuguesa, Tucupido, Cojedes, Manapire, Capanaparo, Ventuari, Caura, Zuata, and some of their tributaries). Occurring historically from the Lozada-Duda-Guayabero River system in central Colombia to the Orinoco delta in northeastern Venezuela. The Paragua and Jao Rivers (Orinoco River tributaries) between San Fernando de Atabapo and La Mision de La Esmeralda were the southernmost distribution. The eastern Andes, Merida Cordilleras in the west, Venezuelan coastal range in the north, and the Guiana shield in the southeast geologically constrained its distribution. |
| Australian Freshwater Crocodile<br>*Crocodylus johnstoni* (Krefft, 1873)<br>See Note 5. | Northern, northeast and northwest wet/dry tropical regions of Western Australia, Northern Territory and Queensland, Australia |
| Philippine Crocodile<br>*Crocodylus mindorensis* (Schmidt, 1935) | Contemporarily only on Dalupiri Island, Northern Luzon and Ligawasan marsh on Mindanao. Historically from Luzon, Mindoro, Masbate, Samar, Jolo, Negros, Busuanga and Mindanao. Recently introduced on Siargao Island |
| Morelet's Crocodile<br>*Crocodylus moreletii* (Duméril, Bibron & Duméril, 1851)<br>See Note 6 | Central American Bioregion. Central Tamaulipas area through the Yucatan Peninsula |
| Nile Crocodile<br>*Crocodylus niloticus* (Laurenti, 1768) | Sub-Saharan Africa. Bioregions of East Central Africa, West Central Africa (coastal), Southern Africa, and Madagascar. Southern and East Africa, coastal Central Africa. Historically extended into the Levant of the Eastern Mediterranean |

Table 2 cont'd. The 26 species of crocodilian currently recognised by the CSG, with biogeographic distribution.

| Common Name | Biogeographic Distribution |
|---|---|
| New Guinea Freshwater Crocodile<br>*Crocodylus novaeguineae* (Schmidt, 1928) | Northern Papua New Guinea, southern Papua New Guinea, Papua Province and Pulau Kimaam off the southwestern coast of Papua |
| Mugger Crocodile<br>*Crocodylus palustris* (Lesson, 1831)<br>See Note 7 | In Tropical Wet, Tropical Wet and Dry, and Humid subtropical bioregions of South Asia. Freshwater, brackish and neritic marine habitats of the South Asian subcontinent, including artificial ponds and water storage structures. |
| Saltwater Crocodile<br>*Crocodylus porosus* (Schneider, 1801) | Indo-Pacific widespread. Coastal habitats and tidal rivers from northern Australia, Papua New Guinea, Solomon Islands, Micronesia, Philippine Islands, Indonesia, southeast Asia, Eastern India and Sri Lanka |
| Cuban Crocodile<br>*Crocodylus rhombifer* (Cuvier, 1807)<br>See Note 8 | Zapata Swamp. Appears to have been recently extirpated from Lanier Swamp (Isla de la Juventud) due to poaching |
| Siamese Crocodile<br>*Crocodylus siamensis* (Schneider, 1801) | Historically occurred over much of Southeast Asia lowland, possibly Malay Peninsula, and parts of Sundaland subregions. Current distribution is greatly diminished and fragmented. |
| West African Crocodile<br>*Crocodylus suchus* (Geoffroy Saint-Hilaire, 1807)<br>See Note 9 | West Africa, Eastern and Western Central Africa remnant populations scattered in North Africa and Sahara Desert. Guinean Forest and Congo Basin biogeographic regions, Sudano-Sahel and patchily throughout the Sahara, Kidepo Valley and Awash drainages in the east |
| West African Slender-snouted Crocodile<br>*Mecistops cataphractus* (Cuvier, 1824)<br>See Note 10 | Upper Guinea biogeographic zone from the Cross River west to the Gambia River |
| Central African Slender-snouted Crocodile<br>*Mecistops leptorhynchus* (Bennett, 1835)<br>See Note 10 | Lower Guinean Forest Biome and Congo Basin, from the Gabonese coast and the Sangha-Dja River drainage, north to the Uele River, east to Lake Tanganyika, including the Malagarasi River drainage on the eastern shore, and Lake Mweru and its drainages |
| African Dwarf Crocodile<br>*Osteolaemus tetraspis* (Cope, 1861) | Lower Guinea biogeographic zone. Upper Guinea biogeographic. |
| Congo Dwarf Crocodile<br>*Osteolaemus osborni* (Schmidt, 1919) | Congo Basin biogeographic zone |
| Indian Gharial<br>*Gavialis gangeticus* (Gmelin, 1789) | Now restricted largely to the Indo-Gangetic Plains. Main rivers and tributaries of the Indus, Gangetic and Brahmaputra drainages |
| Tomistoma<br>*Tomistoma schlegelii* (Müller, 1838) | Occupying portions of the Malayan Peninsula and Sundaland biogeographic subregions of Southeast Asia, extending over lowland regions of eastern Sumatra, Kalimantan and western Java (Indonesia), and Sarawak and Peninsular Malaysia (Malaysia), within 5° north and south of the equator |


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Kent Vliet, Matthew Shirley, Perran Ross and Igor Roberto, *CSG Taxonomy and Identification Group*.

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