

Tomistoma *Tomistoma schlegelii*

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Common Names: Tomistoma, sunda gharial, false gharial, buaya sumpit, buaya senjulong/Julung or senjulong (Indonesia), buaya jenjulong (Malaysia), takong (Thailand)

Range: Indonesia (Kalimantan, Sumatra, Java), Malaysia (Peninsular Malaysia, Sarawak), Brunei, Thailand (extirpated?)



Figure 1. Distribution of *Tomistoma schlegelii*, based on recent (post-1950) sightings/records.

Conservation Overview

CITES: Appendix I

CSG Action Plan:

Availability of survey data: Poor (but sufficient to initiate conservation efforts in some areas)

Need for wild population recovery: High

Potential for sustainable management: Moderate

2018 IUCN Red List: Vulnerable (last assessed in 2011; Bezuijen *et al.* 2014). *Tomistoma schlegelii* qualifies as Vulnerable as global populations are considered to have been reduced by over 30% in the past 75 years (3 generations),

principally due to continuing loss and fragmentation of swamp forest over the past 3–4 decades. The species persists over a wide range (confirmed localities in Borneo, Sumatra and Peninsular Malaysia), but many documented populations are small, fragmented, and under threat from habitat loss. The largest remaining, and most secure, sub-populations may be in East and Central Kalimantan, which support thousands of square kilometres of degraded but largely undeveloped wetlands. Given this, it appears unlikely that <2500 mature individuals remain globally (the IUCN definition for Endangered), as a relatively low number of sites with small subpopulations (eg 50 sites each with 50 individuals or 100 sites each with 25 individuals) is required to meet this criterion. The re-assessment of the species as Vulnerable, from the previous “Endangered” listing, does not imply an increase in the global population/range or a reduction in threats, but a more accurate assessment than was previously possible. Nonetheless, it remains possible that *T. schlegelii* may qualify as Endangered in the future due to ongoing habitat loss and degradation, particularly Malaysia.

Principal threats: Habitat destruction



Figure 2. Hatchling *Tomistoma schlegelii*, Crocodiles of the World, UK. Photograph: Colin Stevenson.



Figure 3. Male *Tomistoma schlegelii*, Tankling, Kalimantan, Indonesia. Photograph: Boyd Simpson.

Ecology and Natural History

Tomistoma is a freshwater, mound-nesting crocodilian with a distinctively long, narrow snout. It is one of the largest of crocodilians, with males attaining lengths of up to 5 m. The current distribution of Tomistoma extends over lowland regions of eastern Sumatra, Kalimantan and western Java (Indonesia) and Sarawak and Peninsular Malaysia (Malaysia) (Fig. 1; Stuebing *et al.* 2006). Tomistoma apparently occurred in southern Thailand historically, but there have been no reports since at least the 1970s and it is probably extirpated there (Ratanakorn *et al.* 1994; Stuebing *et al.* 2006). There are unconfirmed reports from Sabah (Borneo), Sulawesi (Indonesia) and Vietnam, but these are not substantiated, and the lack of documented records suggests the species did not occur in these locations or that historic populations no longer remain there (Stuebing *et al.* 2006).

Tomistoma is restricted primarily to lowland swamps, lakes and rivers. Most documented records are from peat swamp and freshwater swamp forest (Stuebing *et al.* 2006), which historically encompassed most of the lowlands of Borneo, eastern Sumatra and Peninsular Malaysia.



Figure 4. Sekonyer Kanan River, Tanjung Puting National Park, Central Kalimantan. Photograph: Bruce Shwedick.



Figure 5. East Kalimantan Secgoy River, north of Mesangat wetlands. Photograph: Bruce Shwedick.

Few data are available on nesting ecology and less than 20 wild nests have been documented. Four nests in eastern Sumatra were located in mature peat swamp forest in remote upstream tributaries and were situated at the base of large trees (Bezuijen *et al.* 1998, 2001b, 2002a). A nest in Sarawak was in degraded forest at the edge of cultivated land (Lading and Stuebing 1997), and in Kalimantan, nests have been recorded on floating vegetation mats (Ross *et al.* 1998). Tomistoma lays small clutches (13-35 eggs per nest) and appears to produce the largest eggs of the extant crocodilians (Bezuijen *et al.* 1998, 2001b). Sexual maturity in females is attained at around 2.5-3.0 m TL, which is large compared to other crocodilians (Bezuijen *et al.* 1998).

Despite being generally regarded as harmless to humans, there have been a number of incidents of predation on humans by Tomistoma (Rachmawan and Brend 2009), and one confirmed case of a cow being attacked in a wetland habitat in East Kalimantan (R. Stuebing, pers. comm. 2010). Over the past decade (2008-2017) 28 incidents have been recorded in the Worldwide Crocodilian Attack Database (CrocBITE, 2013).

The evolutionary relationship of Tomistoma with other crocodilians has been debated for many years, and the species was usually aligned with the “True” crocodiles (Crocodylidae) based on morphological evidence (Norell 1989; Tarsitano *et al.* 1989; Brochu 1997). However, molecular studies since the 1980s suggest a closer relationship to *Gavialis* (Densmore 1983; Densmore and Dessauer 1984; Gatesy and Amato 1992; Harshman *et al.* 2003; McAliley *et al.* 2006). A 2007 molecular study found that Tomistoma shares gene sequences with *Gavialis* that are absent from *Crocodylus*, *Mecistops* (see Shirley 2010) and *Osteolaemus*, suggesting Tomistoma should be placed within the family Gavialidae (Willis *et al.* 2007). A recent study looking at morphological characteristics in early development also indicates alignment with *Gavialis* (Gold *et al.* 2014), although other studies underway seem to continue the controversy (A. Abzhanov, pers. comm. 2018). Nonetheless, the species is now recognized as being in the Family Gavialidae (CSG 2018).

Conservation and Status

Between the first (1992; Thorbjarnarson 1992) and second (1998; Ross 1998) CSG Species Action Plans, conservation efforts for Tomistoma focused on field surveys to document extant populations and identify conservation priorities. Rapid assessments were conducted in Sumatra (Bezuijen *et al.* 1998, 2001a), East and Central Kalimantan (Frazier 1994; Muin and Ramono 1994; Ross *et al.* 1998) and Peninsular Malaysia (Simpson *et al.* 1998), as well as a review of status in Sarawak (Stuebing *et al.* 2004). These surveys resulted in new information on the distribution, status, breeding biology and other aspects of ecology of Tomistoma, and reflected increasing awareness and interest among Range States in Tomistoma. Over the next decade, since 1998, further surveys, research, workshops and conservation initiatives were conducted across Range States (eg Auliya 2000; Bezuijen *et al.* 2004; Auliya *et al.* 2006; Bonke 2006; Simpson 2004).

The largest extant populations of *Tomistoma* are in Indonesia (Sumatra and Kalimantan). In Sumatra, the species was widely distributed prior to the 1950s in the lowlands of the eastern portion of the island, but intensive hunting from the 1950s to 1970s and habitat loss had reduced this range by around 30% by the late 1990s (Bezuijen *et al.* 1998). Scattered populations persist from North Sumatra to South Sumatran provinces, with an isolated population in Way Kambas National Park. *Tomistoma* is not reported west of the Barisan Mountain Ranges (Bezuijen *et al.* 1998). Spotlight surveys generally produce extremely low densities, however Shaney *et al.* (2016, 2019) recently recorded an unusually high density (1.38 ind/km in the Simpang T, a tributary of the Air Hitam Luar River in Jambi Province. Typically, maximum spotlight densities may reach 0.18 or 0.26 ind/km as recorded in South Sumatra and Jambi Provinces respectively (Bezuijen *et al.* 2002).

In Kalimantan, documented breeding populations persist in the Mesangat wetlands (Stuebing *et al.* 2015) and Mahakam River in East Kalimantan Province (Ross *et al.* 1998; Meijard and Sozer 1996), Tanjung Puting National Park in Central Kalimantan Province (Simpson 2004; Auliya *et al.* 2006), and Danau Sentarum and Gunung Palung National Parks, and the upper Kapuas River in West Kalimantan Province (Bezuijen *et al.* 2004; Simpson and Mediyansyah 2009). There are no confirmed wild populations in South Kalimantan Province. A small breeding population near the headquarters of Tanjung Puting National Park is the most secure *Tomistoma* population globally, and the park also supports the highest documented densities of this species (1.4 ind/km) (Simpson 2004). It is notable that in areas of the park further from the headquarters, habitats are more disturbed and *Tomistoma* densities are much lower (Auliya *et al.* 2006).

In Malaysia, small breeding populations were reported from Sarawak (local reports from Kuching, Bintulu and Miri Divisions in western, central and northwestern Sarawak) (Bezuijen *et al.* 2010), however, in the absence of recent fieldwork the status of populations in Sarawak remains unclear. In Peninsular Malaysia, a breeding population was documented from the Sitiung wetlands, Terengganu in 2008 (S. Anwar pers. comm. 2014), while *Tomistoma* were present in the Perak River in 2004. *Tomistoma* are occasionally reported from the North Selangor peat swamp forest, Pahang Rivers and Tesak Bera Ramsar site (Stuebing *et al.* 2004, 2006; Simpson 2014). Remnant populations still remain in Peninsular Malaysia yet are small, fragmented and severely threatened, especially given the extensive and continuing loss of natural wetland habitats and high human densities of this region.

In Brunei, the first documented evidence of *Tomistoma* was obtained in 2005 with an individual being photographed in the Sungai Tutong River (R. Stuebing, pers. comm. 2010).

Although these data suggest a wide current distribution, it is likely that most remnant breeding populations of *Tomistoma* are highly threatened and under continuing pressure. Severe loss of swamp forest has occurred in the past three decades

at most documented *Tomistoma* localities, due to forest fire, logging, plantations, development and/or drainage. Although the species no longer appears to be hunted, eggs and young are collected opportunistically by some local communities, and adults sometimes drown in fishing nets and traps.

Tomistoma is legally protected in all Range States, and occurs in several national parks, but the level of applied protection is insufficient to protect breeding habitats.

Captive *Tomistoma* are held in private facilities and zoos in Asia, Europe and North America and probably number a few thousand individuals in total. The largest captive population is at Utairatch Crocodile Farm in Thailand (over 700 individuals). Successful breeding has occurred at Jong's Crocodile Farm and Zoo (Sarawak), Samutprakan, Utairatch and Pattaya Crocodile Farms (Thailand) and in zoos in Malaysia, Europe and North America. *Tomistoma* has no commercial skin value, precluding conservation efforts based on ranching as conducted for some other crocodilian species.

In 2003 the CSG *Tomistoma* Task Force (CSG-TTF) was formed. Current conservation initiatives led by the CSG-TTF include fundraising for field research (eg the first detailed autecological study of *Tomistoma* by Rene Bonke in Central Kalimantan), providing voluntary technical support through its members to Range States, and raising international awareness of *Tomistoma*. A CSG-TTF website and web-based user group was created in 2003 to encourage public participation and since then several fund-raising events led by Bruce Shwedick, Ralf Sommerlad and other members have been held in North America and Europe. CSG-TTF reports have been prepared on *Tomistoma* conservation priorities (Bezuijen *et al.* 2003) and standards for captive breeding (Shwedick and Sommerlad 2000; Shwedick 2004). In 2004 the CSG-TTF, along with the People Resources and Conservation Foundation (PRCF) and National Geographic Television, provided funding for surveys of *T. schlegelii* in Danau Sentarum National Park (DSNP) and other areas in West Kalimantan. In 2005 a short-term assessment of *T. schlegelii* was conducted by Mark Auliya and Stephen Brend in Tanjung Puting National Park and this was followed by a 2008 population ecology study led by Rene Bonke. An international CSG-TTF workshop was held in 2008 and resulted in an updated list of global conservation priorities.

In East Kalimantan Province, a new conservation foundation, Yayasan Ulin, was founded in 2009 to promote local *Tomistoma* conservation in the Mesangat wetlands. Field studies of *T. schlegelii* at Mesangat were subsequently conducted in 2009-2012 (Staniewicz 2013; Stuebing *et al.* 2015). In 2010 PRCF began planning *Tomistoma* conservation activities in DSNP and surrounding areas. In 2013, the project "Focused Conservation of *Tomistoma schlegelii* in the Landscape of Danau Sentarum National Park, West Kalimantan, Indonesia" was established between DSNP and PRCF. The first phase of this project (Suriansyah *et al.* 2017) was funded by the CSG-TTF and PRCF.

Recent status assessment surveys in Peninsular Malaysia and

in Sumatra have also been supported by the CSG-TTF. In November 2017 a training workshop on crocodilian veterinary medicine and conservation was organized by BKSDA Aceh and the Center for Wildlife Studies at the Veterinary Faculty of the Syiah Kuala University Banda Aceh, a was held in Medan, Indonesia, with a program developed by the CSG's Veterinary Science Working Group and CSG-TTF. Representatives from five regional field offices of the Indonesian Ministry of Forests, as well as veterinarians and wildlife rescue workers participated in the workshop's intensive four-day program. (Stevenson 2017). Similar workshops are being planned along with initiatives to encourage Malaysian and Indonesian university students to undertake field research focusing on *Tomistoma* and its habitats.

Despite these positive efforts *Tomistoma* conservation is hindered by a lack of large and sustained funding. All projects have been conducted with minor funding and by virtue of their brief duration have been insufficient to develop expanded conservation programs. This is also due to the fact that most personnel working on the species have done so almost entirely on a voluntary basis. There is a realistic need to assign, and properly fund full-time persons who will coordinate *Tomistoma* conservation, prepare large funding proposals, and initiate projects with local agencies.



Figure 6. *Tomistoma schlegelii*, Batang Bunut River, West Kalimantan. Photograph: Mediyansyah (FFI).

Priority Projects

High priority

1. Initiate conservation programs at key sites in Sumatra and Kalimantan: Although large information gaps remain in our knowledge of the distribution and ecology of *Tomistoma*, there is now sufficient information to develop well-planned field conservation programs at some sites. Extended funding is required to develop and implement such programs to secure documented breeding populations of *Tomistoma* in Indonesia. The highest priority sites for conservation are:

- a. Danau Sentarum and Gunung Palung National Parks, West Kalimantan;

- b. Tanjung Puting National Park (TPNP), Central Kalimantan; Based on the information obtained during a CSG-TTF site visit to TPNP in 2014, an opportunity does exist to upgrade the use of *T. schlegelii* as an iconic species, and to implement various programs that provide ongoing monitoring indices of the population over time. This program should be developed and managed by TPNP, and include participation from the park's freelance guides and NGOs which operate within park borders. With relatively minor changes, increased reporting associated with current activities could provide useful data to assess population trends, document movements, gain further information on the absolute size and structure of the population, and add significantly to our knowledge of natural history and ecology;
- c. A project has been initiated in Danau Mesangat by the Wildlife Conservation Society (WCS Indonesia) in collaboration with the CSG-TTF. Further surveys will be necessary to determine the status of *Tomistoma* in other areas of East Kalimantan; and,
- d. Merang River, Berbak National Park and Way Kambas National Park, Sumatra.

Moderate priority

2. Clarify the status of *Tomistoma* in other locations in Sumatra and Kalimantan. The distribution and status of *Tomistoma* over much of Sumatra and Kalimantan remains poorly documented. Rapid assessments are required to identify new breeding populations where local reports suggest that *Tomistoma* may still occur, particularly at the following sites: Jambi, Riau and North Sumatra Provinces in Sumatra; Muara Kendawangan Nature Reserve in West Kalimantan; and, Lamandau Wildlife Reserve in Central Kalimantan.
3. Clarify the status of *Tomistoma* and strengthen national coordination for *Tomistoma* conservation in Sarawak. Work with national agencies to identify and assess the distribution and status of *Tomistoma* in Sarawak, including previously reported breeding sites. Implement and promote the conservation of *Tomistoma* populations.
4. Quantify status of *Tomistoma* in Peninsular Malaysia. Identifying and confirming *Tomistoma* sites are first required in Peninsular Malaysia, before further actions can be implemented. It is evident that if *Tomistoma* initiatives are to be successful in the North Selangor peat swamp forest, the Tengi River would provide the best site for population protection/recovery. This site is in relatively good condition and well protected, surrounded by the Raja Musa and Sungai Kerang Forestry Reserves, and the Sungai Dusun Wildlife Reserve. The remaining *Tomistoma* population there would also benefit from population augmentation, with the introduction of additional animals. The modification of the swamp forest may also be required to provide wetlands more suitable for *Tomistoma*. This

could include the blocking and expanding (width and depth) of existing drainage canals, and the provisions of small ponds (dry season refuges) within the peat swamp forest itself. Fishing regulations may also be warranted. Surveys are required to clarify status and identify conservation priorities at: Setiu wetlands and Sungai Tengi (Terangganu State), Jelud River and other wetlands near the Thai border, eastern Pahang, including the Pahang River and Lake Chini, and the upper Perak River.

Low priority

5. Quantify the status of *Tomistoma* in Brunei, Sabah (Malaysia) and western Java (Indonesia). The presence of *Tomistoma* in Java and Brunei has recently been reported (Stuebing *et al.* 2006). Examination of available records, including museum specimens, and site visits could shed light on the status of the species at these locations.

Acknowledgements

This revised species account is based on the previous CSG Action Plan (Bezuijen *et al.* 2010).

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