Tomistoma *Tomistoma schlegelii*

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Common Names: Tomistoma, sunda gharial, false gharial, buaya sumpit, buaya senjulung/Julung (Indonesia), 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 (see Steubing *et al.* 2006).

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: Highest
Potential for sustainable management: Moderate

2009 IUCN Red List: EN (Endangered. Criteria: C1: Population estimate is less than 2500 mature individuals, with continuing decline of at least 25% within 5 years or two generations. Widespread, but in low numbers; IUCN 2009). It is likely that criteria A1(c): "a decline in the area of occupancy, extent of occurrence and/or decline in habitat" also applies, as habitat loss is the key threat to the species. (Last assessed in 2000).

Principal threats: Habitat destruction

Ecology and Natural History

Tomistoma (*Tomistoma schlegelii*) 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), within 5 degrees north and south of the equator (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 any historic populations no longer remain (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. Little data is available on Tomistoma 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, possible Tomistoma nests have been recorded on floating vegetation mats (Ross *et al.* 1998). Tomistoma lays small clutches (13-35 eggs per nest

Bezuijen, M.R., Shwedick, B.M., Sommerlad, R., Stevenson, C. and Steubing, R.B. (2010). Tomistoma *Tomistoma schlegelii*. Pp. 133-138 *in* Crocodiles. Status Survey and Conservation Action Plan. Third Edition, ed. by S.C. Manolis and C. Stevenson. Crocodile Specialist Group: Darwin.

Figure 2. *Tomistoma schlegelii*. Photograph: Grahame Webb.

have been documented), and appears to produce the largest eggs of extant crocodilians (Bezuijen *et al*. 1998, 2001b). Sexual maturity in females appears to be attained at around 2.5-3.0 m, which is large compared to other crocodilians (Bezuijen *et al*. 1998).

Figure 3. Female Tomistoma at nest. Photograph: Rob Steubing.

The species is generally regarded as harmless to humans, although one case of predation on humans has been confirmed and others have been reported (Rachmawan and Brend 2009). A single incident in which a cow was attacked in a wetland habitat in East Kalimantan has been recorded (R. Stuebing, pers. comm.).

The evolutionary relationship of Tomistoma with other crocodilians was 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). 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 recent molecular study found that Tomistoma shares gene sequences with *Gavialis* which are absent from *Crocodylus*, *Mecistops* (see Shirley 2010) and *Osteolaemus*, suggesting Tomistoma should be placed within the family Gavialidae (Willis *et al*. 2007).

Conservation and Status

Between the first (1992) and second (1998) CSG 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.

Since 1998 new surveys have been conducted in West Kalimantan (Auliya 2000; Bezuijen *et al*. 2004) and Central Kalimantan (Auliya *et al*. 2006; Bonke 2006; Simpson 2004). In 2001 and 2002, through the voluntary efforts of Mark Bezuijen and Grahame Webb, repeat-surveys were conducted at two sites in Sumatra last surveyed in 1996, and the first

Indonesian workshop on Tomistoma was held (Bezuijen *et al*. 2001a, 2002a,b). Sumatran agencies and NGOs subsequently conducted additional surveys which resulted in the discovery of a new nesting site and protection of swamp forest (Bezuijen 2004).

The largest extant populations of Tomistoma are in Sumatra and Kalimantan (Indonesian Borneo). 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 have reduced this range by around 30% (Bezuijen *et al*. 1998). Scattered populations persist from North Sumatra to South Sumatra Provinces, with an isolated population in Way Kambas National Park. Tomistoma is not reported west of the Barisan Mountain Ranges (Bezuijen *et al*. 1998). The highest spotlight-survey densities recorded in Sumatra were 0.18 and 0.26 individuals/km in South Sumatra and Jambi Provinces respectively (Bezuijen *et al*. 2002).

In Kalimantan, documented breeding populations persist in the 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 in West Kalimantan Province (Bezuijen *et al*. 2004). 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 which also supports the highest documented densities of this species (1.4 individuals/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 persist in Sarawak (local reports from Kuching, Bintulu and Miri Divisions in western, central and northwestern Sarawak), and in Peninsular Malaysia, two sites in the Perak River were confirmed in 2004 and there are unconfirmed reports from Selangor swamp, Perak and Pahang Rivers and Tesak Bera National Park (Stuebing *et al*. 2004, 2006). Remnant populations in Peninsular Malaysia are probably small and severely threatened given the extensive loss of natural wetland habitats and high human densities of this region. The status of populations in Sarawak is unclear.

Elsewhere in Borneo, the first documented evidence of its occurrence in Brunei was obtained in 2005 (an individual was photographed at Sungai Tutong River by Rob Stuebing).

Although these data suggest a wide current distribution it is likely that most remnant breeding populations of Tomistoma are threatened. Severe loss of swamp forest has occurred in the past two decades at most documented Tomistoma localities in Sumatra and Kalimantan, due to forest fire, logging, plantation development and/or drainage. Although the species no longer appears to be hunted, eggs and young are collected opportunistically by local communities, and adults sometimes drown in fishing nets. 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 (Sarawak), Samutprakan, Utairatch and Pattaya Crocodile Farms (Thailand) and at zoos in Malaysia, Europe and North America. Tomistoma has no commercial skin value, precluding conservation efforts based on ranching as conducted for some other crocodilians.

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). 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 was founded in 2009 by CSG-TTF member Rob Stuebing to promote local Tomistoma conservation, and in West Kalimantan Province the People, Resources, and Conservation Foundation (PRCF) is planning Tomistoma conservation activities in Danau Sentarum National Park.

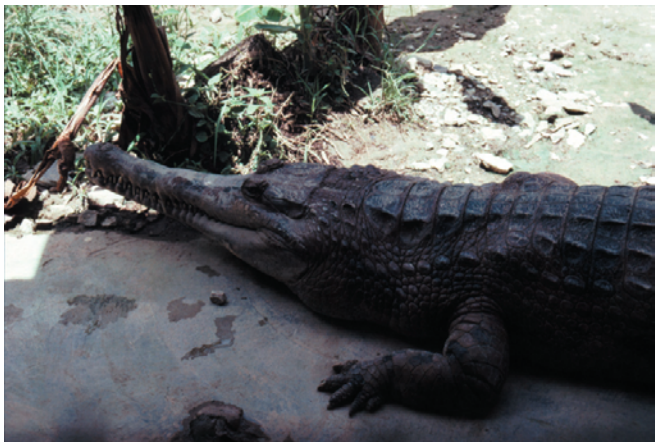

Figure 4. *Tomistoma schlegelii*. Photograph: Grahame Webb.

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.

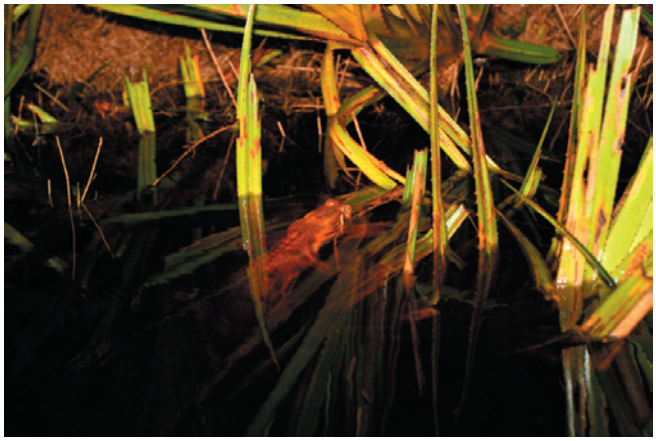

Figure 5. Juvenile *T. schlegelii* amongst *Thoracostachyum sumatranum* (sawgrass) in the Merang River, Sumatra, Indonesia. Photograph: Merlijn van Weerd.

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: (1) Danau Sentarum and Gunung Palung National Parks, West Kalimantan; (2) Tanjung Puting National Park, Central Kalimantan; (3) Danau Mesangat, East Kalimantan; and, (4) Merang River and Berbak 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 in the following sites: Aceh, Jambi, Riau and North Sumatra Provinces in Sumatra; and, Muara Kendawangan Nature Reserve in West Kalimantan.

3. **Strengthen national coordination for Tomistoma conservation in Sarawak**: Work with national agencies to identify and protect documented breeding sites and implement regular monitoring of all Sarawak crocodile populations.

4. **Quantify status of Tomistoma in Peninsular Malaysia**: 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, Ulu Perak, and Selangor peat swamp forest (Ulu Dusun).

Low priority

5. **Quantify the status of Tomistoma in Brunei, Sabah (Malaysia), Java, Sulawesi (Indonesia) and Vietnam**: The presence of Tomistoma in Java and Brunei has recently been reported (Steubing *et al*. 2006) - reports from the other locations are unsubstantiated. Examination of available records, including museum specimens, and visits to these locations to review the local status of Tomistoma could shed light on the status of the species at these locations.

Figure 6. Pair of courting *T. schlegelii* at Florida Cypress Gardens. Photograph: Bruce Shwedick.

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