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Contemporary distribution records of the giant freshwater stingray *Urogymnus polylepis* in Borneo (Chondrichthyes: Dasyatidae)

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Stingrays (Dasyatidae) are found in marine (continental, insular shelves and uppermost slopes, one oceanic species), brackish and freshwater, and are distributed across tropical to warm temperate waters of the Atlantic, Indian and Pacific oceans (Nelson et al., 2016). Only a small proportion of dasyatid rays occur in freshwater, and include obligate freshwater species (those found only in freshwater) and euryhaline species (those that move between freshwater and saltwater) (Last et al., 2016a). Recently, a total of 89 species of Dasyatidae has been confirmed worldwide (Last et al., 2016a), including 14 species which are known to enter or live permanently in freshwater habitats of Southeast Asia [*Brevitrygon imbricata*, *Fluvitrygon kittipongi*, *F. oxyrhynchus*, *F. signifer*, *Hemitrygon laosensis*, *Himantura uarnak*, *Makararaja chindwinensis*, *Megatrygon microps*, *Pateobatis bleekeri*, *Urogymnus granulatus*, *U. polylepis*, *Pastinachus ater*, *P. solocirostris*, *P. stellurostris*] (Kottelat, 2013; Last et al., 2016a).

Although the taxonomy of Dasyatidae has recently been revised (Last et al., 2016b), information on the distribution of dasyatids is very limited for Southeast Asia, particularly for those species entering, or occurring in freshwater. For example, *Fluvitrygon oxyrhynchus* and *F. signifer* were only known from five or fewer major riverine systems (Compagno, 2016a–b; Last et al., 2016a), though recent surveys yielded a single record of *F. oxyrhynchus* and ten records of *F. signifier* in the Musi drainage, South Sumatra, indicating that both species are more widely distributed than previously expected (Iqbal et al., 2017, 2018).

Particularly, the dasyatid fauna of Borneo includes the giant freshwater stingray *Urogymnus polylepis*. The occurrence of *U. polylepis* in Borneo has been reported from Sabah and Sarawak in Malaysia and the Mahakam basin in Kalimantan of Indonesia (Monkolprasit & Roberts, 1990; Vidthayanon et al., 2016). While there are further reports of the species being collected by locals in the Kapuas River at Pontianak, Kalimantan (e.g. Vidthayanon et al., 2016), it has not been reported from other various regions of Borneo. For example, fish surveys in Danau Sentarum at Kapuas basin in West Kalimantan, as well as an extensive fish survey in the Rajang River in Sarawak did not record the species (Kottelat & Widjanarti, 2005; Parenti & Lim, 2005). This

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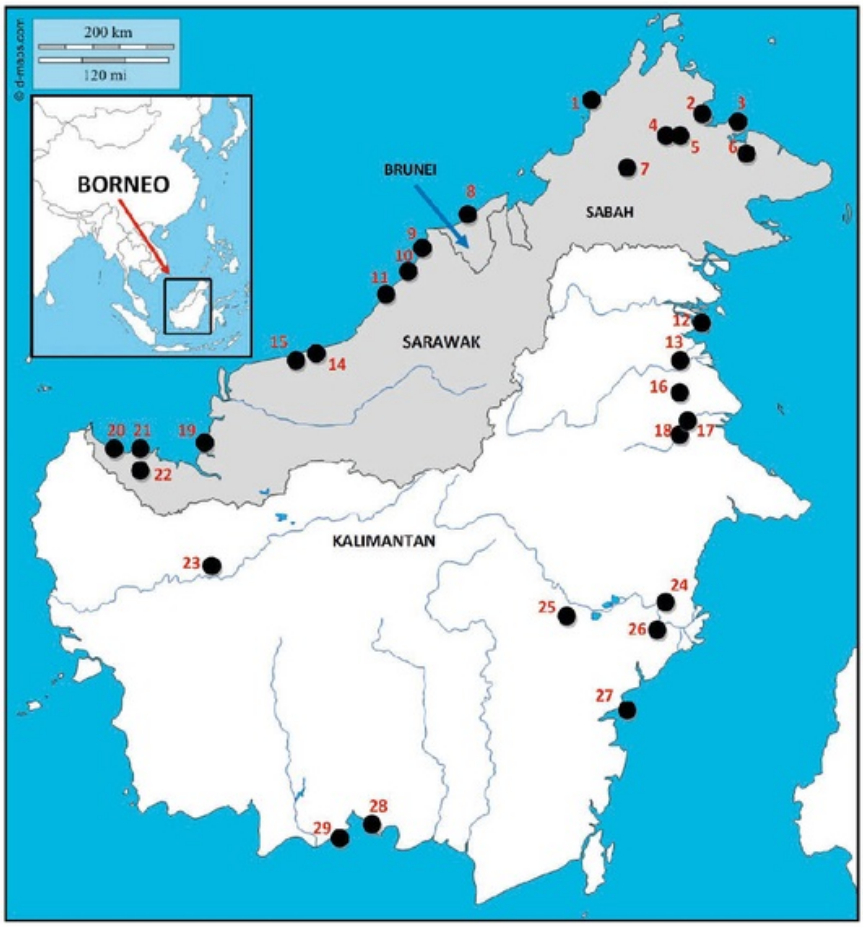

Fig. 1. Records of *Urogymnus* cf. *polylepis* in Borneo between 2011 and 2018. Numbers refer to all records of this species, and correspond with numbers given in Table 1 (see table for detailed localities and remarks).

species is also absent from the checklist of freshwater fishes of neighbouring Brunei Darussalam (Sulaiman et al., 2018). In the present paper, we compile recent records of *U. polylepis* in Borneo in an attempt to understand its contemporary occurrence. Records of *U. polylepis* in Borneo between 2011 and 2018 were compiled from the Internet and local social media (mainly a few Facebook groups of local anglers in Borneo) which were supported with photographs or other evidence (e. g. location, habitat type, morphology, and description from fishermen). We screened all records for authenticity and correct species identification, and unconfirmed or ambiguous records were rejected. However, given that specimens were not directly examined, and that Indonesia and Borneo are known for harbouring cryptic diversity in its biogeographically isolated valleys and basins, we chose to refer to the species as *Urogymnus* cf. *polylepis*.

Urogymnus cf. *polylepis* was recorded at 29 localities in Borneo, covering all three countries on the island: Malaysia, Brunei Darussalam, and Indonesia (Fig. 1). The identification of this species was based on the combination of its large size, freshwater habitat and the following morphological characters: snout very broad with enlarged narrow apical lobe; disc slightly longer than wide, length about 1.1 times width; coloration of dorsal surface of disc uniformly brownish or greyish brown (Fig. 2), and ventral surface with a broad black marginal band around the disk (Figs. 3–4) (Monkolprasit & Roberts, 1990; Kottelat et al., 1993; Vidthayanon et al., 2013; Iqbal & Yustian, 2016; Last et al., 2016a). Details of sites, coordinates, dates and other remarks are provided in Figure 1 and Table 1.

Urogymnus cf. *polylepis* is known in Borneo from Kampung Likas (Kota Kinabalu, Sabah, Malaysia) in the north to Ujung Pandaran (Mentaya

Fig. 2. *Urogymnus* cf. *polylepis* caught by local fishermen on 25 August 2013 in Beluran, Sandakan,Sabah, Malaysian Borneo (photograph by Razali Zalie).

Fig. 3. *Urogymnus* cf. *polylepis* caught by local fishermen on 7 January 2018 in Handil, Kutai Kartanegara, Kalimantan Timur, Indonesia (photograph by Ahmad Rustam).

Hilir Selatan, Kalimantan Tengah, Indonesia) in the southern part of the island (Table 1). Records of individual weights ranged from 82 to 400 kg. Unfortunately, information on total length and disc width are very limited, as in most instances measurements were not taken by fishermen, and fishermen frequently remove the tails of these rays to avoid the caudal sting. *Urogymnus* cf. *polylepis* 17 ches at least 2 m disc width and 5 m in total length, and can possibly grow larger according to reports from the Mekong and Chao Phraya Rivers of individuals weighing 500–600 kg (Monkolprasit & Roberts, 1990; Last et al., 2016a).

Recent records of *Urogymnus* cf. *polylepis* between 2011 and 2018 in Borneo are a noteworthy contribution, as they expand the known extent of occurrence of this species to encompass all rivers on the island. Although *Urogymnus* cf. *polylepis* has been previously re 14 ted from Sabah and Sarawak (Vidthayanon et al., 2016), the status of the species in Bor 28 is largely unknown due to insufficient data (Last et al., 2016a; Vidthayanon et al., 2016). Recent data in Borneo between 2011 and 2018 show that there are several records of *Urogymnus* cf. *polylepis* in Sabah, from at least six different localities, and nine records from Sarawak, representing nine different localities (Table 1).

A record of *Urogymnus* cf. *polylepis* from Danau, Kampung Penapar, Telisai coastal village, Tutong district, on 20 September 2011 represents the country's first confirmed record for Brunei Darussalam.

Fig. 4. *Urogymnus* cf. *polylepis* caught by local fishermen on 12 April 2018 in Tarakan, Pulau Tarakan, Kalimantan Utara, Indonesia (photograph by Rika Arif).

Anecdotal records of *Urogymnus* cf. *polylepis* from the Kapuas River in West Kalimantan (Vidthayanon et al., 2016) were not confirmed and therefore not considered by Last et al. (2016a)

on their distribution map for this species. An inland record of a stingray caught in 2016 at about 200 km upstream in Seberang Kapuas (Sekadau, West Kalimantan) (Table 1) is the first confirmed record of *Urogymnus* cf. *polylepis* from the Kapuas River and West Kalimantan waters. *Urogymnus* cf. *polylepis* was recorded at various localities in Kalimantan: a single record from West Kalimantan; two from Central Kalimantan, three from North Kalimantan, and six from East Kalimantan (Table 1).

Records of *Urogymnus* cf. *polylepis* between 2011 and 2018 in Borneo show the occurrence of this species from estuarine waters to about 200 km inland (Table 1). To consider information on the habitat use of *Urogymnus* cf. *polylepis*, the distributional records were classified using the criteria of habitat and the months when individuals were caught (Table 2). Records of *Urogymnus* cf. *polylepis* from estuaries (between ca. 0–25 km) were reported in nearly every month except February and May; records from tidal reaches of rivers (between ca. 25–50 km) were reported only from February to November, with absence in April and September; and records from freshwater non-tidal reaches (between ca. 50–100 km) were reported from May to October, with absence in July and September. However, available data (Table 1), suggest that habitat use by *Urogymnus* cf. *polylepis* was not influenced by tidal factors. Within the ray groups, the ability to move location or migrate varies greatly; egg-case laying rays, the skates, need to move to find suitable localized feeding or spawning habitat, whereas large live-bearing species carry their embryonic young and 5n disperse more freely (Last et al., 2016a). The extensive lowlands of Borneo contain a large number of estuaries such as the Kapuas

Table 1. Records of *Urogymnus* cf. *polylepis* between 2011 and 2018 in Bornean waters. Records are listed form north to south. Numbers refer to localities in Figure 1.

No.	Site	Country	Coordinates	Date
1	Kampung Likas (Kota Kinabalu, Sabah)	Malaysia	06°00'01" N 116°06'27" E	6 Oct 2013
2	Kampung Kolapis (Sandakan, Sabah)	Malaysia	05°54'42" N 117°37'30" E	13 Aug 2015
3	Sandakan (Sandakan, Sabah)	Malaysia	05°50'21" N 118°08'43" E	25 Jul 2011
4	Beluran (Sandakan, Sabah)	Malaysia	05°54'06" N 117°33'17" E	10 Jul 2012
5	Beluran (Sandakan, Sabah)	Malaysia	05°54'06" N 117°33'17" E	25 Aug 2013
6	Orico estate (Kinabatangan, Sabah)	Malaysia	05°27'20" N 118°10'07" E	2 Aug 2014
7	Sungai Milian (Labau, Sabah)	Malaysia	05°08'11" N 116°35'39" E	21 Aug 2016
8	Danau (Kampong Penapar, Telisai)	Brunei Darusalam	04°45'15" N 114°35'06" E	20 Sep 2011
9	Pujut (Kuala Baram, Sarawak)	Malaysia	04°25'46" N 114°01'29" E	4 Jul 2013
10	Tanjung Bungai (Bekenu, Sarawak)	Malaysia	04°02'59" N 113°49'01" E	8 Dec 2016
11	Kuala Nyalau (Bintulu, Sarawak)	Malaysia	03°36'48" N 113°24'54" E	19 Apr 2016
12	Tarakan, (Tarakan island, North Kalimantan)	Indonesia	03°17'59" N 117°34'27" E	12 Apr 2018
13	Salimbatu (Nunukan, North Kalimantan)	Indonesia	02°57'08" N 117°21'14" E	19 Nov 2017
14	Kampung Litong (Mukah, Sarawak)	Malaysia	02°54'39" N 112°05'42" E	26 Nov 2012
15	Mukah fish market (Mukah, Sarawak)	Malaysia	02°54'35" N 112°05'43" E	10 Mar 2017
16	Tanjung Selor (Bulungan, North Kalimantan)	Indonesia	02°50'28" N 117°34'44" E	6 Jan 2018
17	Tanjung Redep (Berau, East Kalimantan)	Indonesia	02°09'51" N 117°29'42" E	12 May 2014
18	Tanjung Redep (Berau, East Kalimantan)	Indonesia	02°09'51" N 117°29'42" E	30 Jun 2017
19	Kabong (Saratok, Sarawak)	Malaysia	01°47'17" N 111°06'20" E	23 Aug 2016
20	Kampung Semunin (Lundu, Sarawak)	Malaysia	01°40'11" N 109°51'17" E	21 Jun 2016
21	Kucing (Kuching, Sarawak)	Malaysia	01°35'58" N 110°22'26" E	8 Sep 2017
22	Batu Kawa (Kuching, Sarawak)	Malaysia	01°32'47" N 110°17'50" E	24 Feb 2013
23	Seberang Kapuas (Sekadau, West Kalimantan)	Indonesia	00°01'43" N 110°53'28" E	19 Mar 2016
24	Tanah Merah (Samarinda, East Kalimantan)	Indonesia	00°30'18"S 117°08'24" E	19 Oct 2017
25	Mahakam river (Kutai Barat, East Kalimantan)	Indonesia	00°19'25"S 116°03'47" E	6 Mar 2015
26	Handil (Kutai Kartanegara, East Kalimantan)	Indonesia	00°44'41"S 117°17'14" E	7 Jan 2018
27	Muara Talake (Paser, East Kalimantan)	Indonesia	01°37'11"S 116°32'54" E	14 Nov 2017
28	Pagatan (Katingan, Central Kalimantan)	Indonesia	03°16'23"S 113°20'09" E	23 Oct 2017
29	Ujung Pandaran (Mentaya Hilir Selatan, Central Kalimantan)	Indonesia	03°10'10"S 113°01'45" E	14 Dec 2017

and Mahakam in Kalimantan and the Lupar in Sarawak. They are characterized by high flood volumes, rapid tidal currents, high tidal ranges and extreme turbidities (Blaber, 1997).

Urogymnus cf. *polylepis* has previously been considered as either an obligate freshwater species or presumed to be a freshwater species found in large rivers with muddy or sandy bottom (Monkolprasit & Roberts, 1990; Martin 2005), despite records from coastal marine and brackish habitats in parts of Indonesia (Last et al., 2016a). Vidthayanon et al. (2016) reported that based on catch data and tagging work, the species does occur in both brackish and freshwater, but it is unlikely that the species needs to move between brackish and freshwater to complete its life cycle. However, large numbers of pregnant females are seen in brackish waters, so estuaries could be a pupping ground, at least for some populations (Vidthayanon et al., 2016). Recent data on *Urogymnus* cf. *polylepis* in Borneo between 2011 and 2018 suggest that records from estuarine waters

Table 2. Records of *Urogymnus* cf. *polylepis* between 2011 and 2018 in Borneo, based on the distance from the sea and months reported.

	Approximate distance from the sea	Months											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	0–25 km (estuarine)	+		+	+		+	+	+	+	+	+	+
2	25–50 km (tidal riverine)		+	+		+	+	+	+		+	+	
3	50–100 km (freshwater riverine)					+	+		+		+		

Approximate distance from sea	Remarks	Source
0 km	100 kg	Dede Kocung, his Facebook account
15 km	500 kg	Sabah Viral, Facebook page
0 km	206 kg	Sandakan Magic, Facebook page; youtube.com
20 km		Salmiah Badar, her Facebook account
[illegible]m	300 kg	Razali Zalie, posting to Sandakankini public group
50 km	2 ind	Kassim Sam, his Facebook account
70 km		Otong Ramli, his Facebook account
1 km	200 kg	Shahna Danish, his Facebook account
3 km	82 kg	Jang Rabing Mittz, his Facebook account
1 km	350 kg	Sarawak Aritok, Facebook page
4 km	2 ind (145 kg and 160 kg)	Kapok 2016
0 km	200 kg	Rika Arif, her Facebook account
30 km		Lencauyat Yat, his Facebook account
0 km	200 kg	Tinta Media Facebook page; Deli Sahari, his Facebook account
1 km	150 kg	Sarawak Aritok Facebook page
10 km		Zahida Qalbi Nahdhifa Difa, her Facebook account
50 km		Ari mbombo, posting to Mancing Kulonprogo Facebook group
50 km		Effendi Tanjung, his Facebook account
0 km	400 kg	Youtube.com
7 km	250–300 kg	Sarawak Edition, Facebook page
15 km		Nora Sikin, her Facebook account
20 km	150–200 kg	Ana Nesing Onak Dayung B'singai, her Facebook account
200 km		Gian Saputra, posting to Facebook group of Ikan air tawar Indonesia
50 km		Puma Trk, his Facebook account
200 km	100–200 kg	Yudha Ricki Rifaidi, his Facebook account
15 km		Ahmad Rustam, his Facebook account
0 km		Ahmad Amran, his Facebook account
0 km	300 kg	Anonymous 2017a
0 km	100 kg	Anonymous 2017b

or nearby predominated compared to inland records (Tables 1–2); and that large individuals are reported from both estuaries and inland freshwater habitats. Information on whether these individuals are pregnant females or not is unavailable, stressing the need for more data in Borneo (Vidthayanon et al., 2016). As suggested by Vidthayanon et al. (2016), habitat use by *Urogymnus* cf. *polylepis* within and between river systems (including estuarine waters) is largely unknown and requires further research.

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