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Article

First photographic inland records of bull shark *Carcharhinus leucas* (Carcharhiniformes: Carcharhinidae) in Sumatran waters, Indonesia

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Abstract
Two specimens (c.700 mm) of bull sharks *Carcharhinus leucas* (Müller & Henle, 1839) were caught and photographed by fishermen using trammel net on 29 September and 1 October 2017 in Musi River, South Sumatra province, Indonesia. These photos are considered as second record after 20 years (1997-2017), and first confirm inland record for Sumatra. Photographic records indicate specimens of *C. leucas* found in Musi River basin recorded about 75 km inland, and apparently very young juveniles. Further study and monitoring is needed to asses the possibility of the importance of Musi River basin as nursery area of *C. leucas.*

Key words: Present, Carcharhinidae, *Carcharhinus leucas*, Indonesia, Musi River, freshwater.

Introduction

The requiem sharkfamily (Carcharhinidae) is one of the largest, most important shark families, with many common and wide-ranging species in tropical and warm temperates waters (Campagno & Niem, 1998; Ebert et al., 2013). Although most species inhabitat continental coastal and offshore marine waters, but the family includes the only freshwater shark species (Compagno et al., 2005; Ebert et al., 2013). At least, seven species enter freshwater, with extended movements by bull shark *Carcharhinus leucas* and Ganges Shark *Glyphis gangeticus* (the latter, long thought to be conspecific to fresh and brackish water, may be conspecific with populations in Pakistan and Borneo on mtDNA evidence) (Nelson et al., 2016).

The bull shark *C. leucas* (Müller & Henle, 1839) is world-wide species of Carcharhinidae family that occur in tropical and subtropical waters (Compagno et al., 2005). This species is an euryhaline species and possibly the widest-ranging of all freshwater elasmobranchs, being found in numerous river systems as well as even in hypersaline lakes (Thorson et al., 1973). A Synopsis of global freshwater occurrences of the *C. leucas* was summarized by Gausmann (2018). Some examples of the presence of the *C. leucas* in rivers from other parts of the world are: a inland record of 120 km up the river in Zambesi River, Zimbabwe; reported up

to 420 km inland in Karun River, Iran; a record of approximately 130 km far inland in Lake Jamur, West Papua, Indonesia; a verified as far as 115 km from the sea at Wyrallah, Richmond River, Australia; a female *C. leucas* was caught by local fishermen in the Mearim River, 80 km far from the river's mouth, Maranhão State, Brazil; daily activity spaces of 67 juvenile *C. leucas* were monitored in Caloosahatchee River between 2003 and 2006 using an array of 25 acoustic receivers, ranged 0 to 14 km with most <5 km from from the river's mouth, southwest Gulf Coast of Florida, United States (Martin, 2005; Heupel et al., 2010, Feitosa et al., 2016; Gausmann 2018).

The *C. leucas* is one species of requiem shark families that occur in Indonesian waters (Kottelat et al., 1993; Fahmi, 2010; Ebert et al., 2013). However, Sumatra island of Indonesia is not include in the distribution map of *C. leucas* in many major shark references (Last & Stevens , 1994; Campagno & Niem, 1998; Compagno et al., 2005; Ebert et al., 2013). Record of two specimens of *C. leucas* from fish market in Jambi were reportedly caught from the Batang Hari basin during the dry season in July 1997 (Tan & Lim, 1998), is only known record of this species in Sumatra.

Recently recorded specimens of *C. leucas* based photographic evidences increase the knowledge and ranges of occurence of this species in western Indonesian waters. This paper presented second record of *C. leucas* after 20 years (1997-2017), and first confirm inland record for Sumatra.

Materials and Methods

Two specimens of *C. leucas* (c. 700 mm) were collected and photographed in 29 September and 1 October 2017 at two localities of the Musi River basin: One at Air Itam Timur village waters of Penukal subdistrict, Penukal Abab Lematang Ilir district **(**3°2'51.96"S,104°9'37.40"E), and second at Teluk Kijing village waters, Lais subdistrict, Musi Banyuasin district (2° 59' 7.33" S, 104° 7' 30.71"E) (Fig. 1). The distance of Air Itam Timur village and Teluk Kijing village waters were about 10 km, and these localities are about 75 km from the sea. Photos of these specimens were shown to us by fishermen through local angler facebook group. Both specimens were reported caught by trammel gill net. The specimens are unpreserved, due to the limitation of knowledge and lacking materials for preservations. First specimen caught at Air Itam Timur village waters has about 70 cm TL and 4 kg weigth (Figs. 2 and 3). No specific details of measurements for second species, but it was presumed having similar size and weight.

The sharks were immediately identified as *C. leucas* by combination of morphological characters and behaviour.

Results and Discussions

Both specimens of *C. leucas* found in Musi River basin have snout broadly, rounded and shot, its length less than distance between nostrils, and much lesser than mouth width; nostrils with a low, broadly triangular anterior nasal flap; first dorsal fin high and broad with a pointed or slightly rounded apex, its origin a little in advance of a short posterior lobe, its inner margin less than the fin height and its origin slightly in front of that of anal fin; pectoral pins broad, with narrow pointed tips; the baby has greyish back, belly white, tips of fins dark; and small eyes. The characters above are fitted well to the features of *C. leucas* (Compagno & Niem Niem, 1998; Compagno et al., 2005; Ebert et al., 2013). Based on freshwater habitat localities, both specimens could be a species of freshwater shark from genus *Glyphis*, which also occur in western Indonesia waters (Last & Stevens, 1994; Fahmi & Adrim, 2009; Fahmi, 2010). However, It was shortly recognized that these specimens differ from *Glyphis* by its small second dorsal fin, while *Glyphis* has large relative size of the second dorsal-fin (Last & Stevens, 1994; Fahmi & Adrim, 2009).

The *C. leucas* is a very rare species in Sumatra, with only recorded once from fish market in Jambi province which reported caught from Batang Hari River basin during the dry season in July 1997 (Tan & Lim, 1998). Recent discovery of *C. leucas* in South Sumatran waters could be represent a second documentation after 20 years (1997-2017), and first confirm inland record for Sumatra. The present dicovery extends distribution of *C. leucas* for Musi River basin, Southern Sumatran waters, which had never been recorded for this basin (Utomo et al., 2007; Husnah et al., 2008). Record of *C. leucas* in Musi River represent second record and first inland record for Sumatran waters, including add about 200 km further south from it previous known localities (Batang Hari River). *C. leucas* is a species inhabiting shallow waters, especially in

bays, river estuarines, rivers, lakes and may thousand km upstream in warm rivers (often in very turbid water) (Compagno & Niem, 1998; Compagno et al., 2005; Ebert et al., 2013). Capable of covering great distance (up to 180 km in 24 hours) moving between fresh and brackish water at random (Allen et al., 2003), and it has been found nearly 4000 km from the sea in the Amazon system (Last & Stevens,1994).

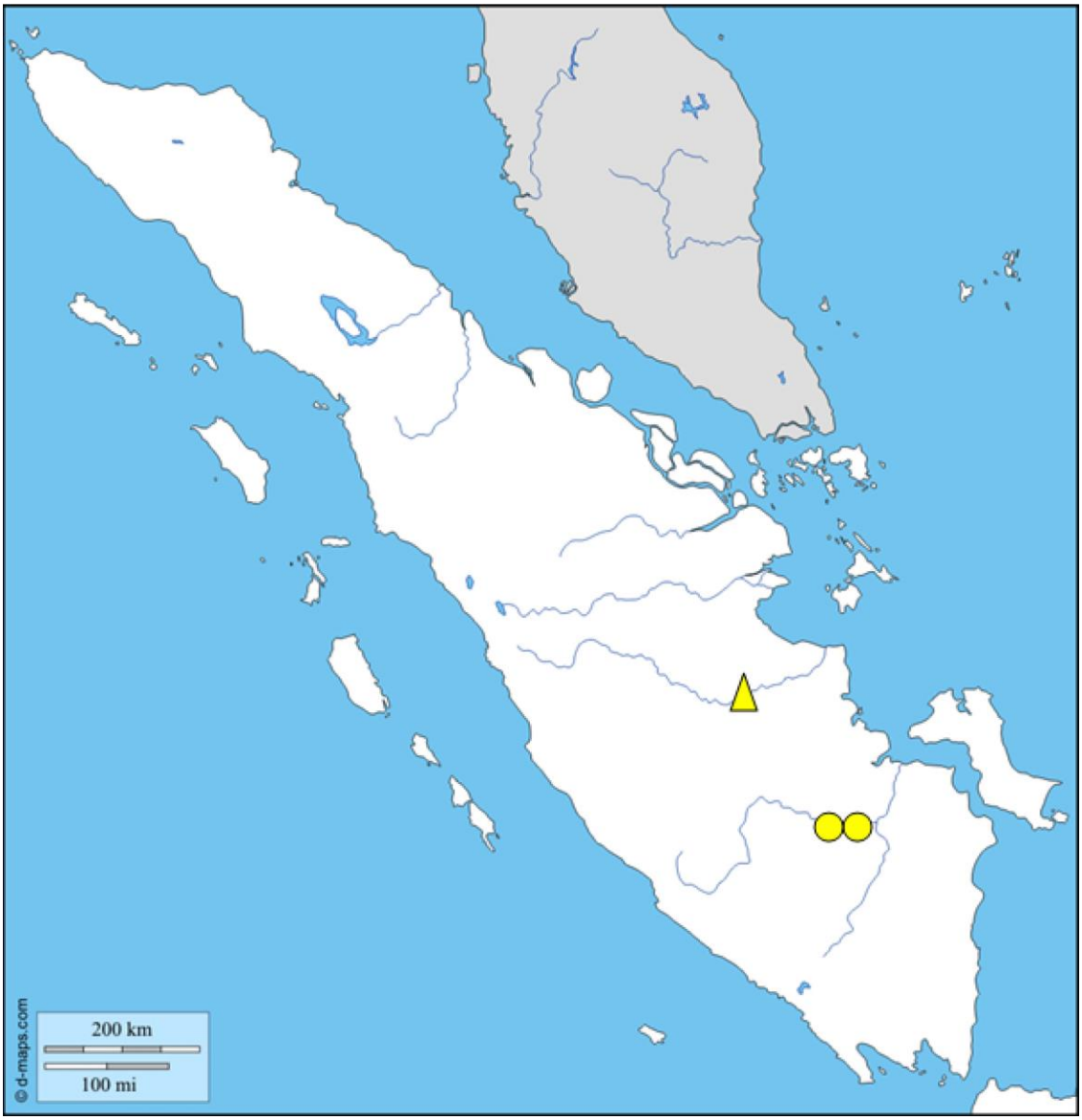

Figure 1. Location of known *C. leucas* caught in Sumatran waters. Triangle show previous record from Jambi market, Jambi province; and circle shows recent record from South Sumatran waters, Indonesia.

Specimens of *C. leucas* found in Musi River have black tip of fins and size around 70 cm of TL, show specific characters of very young individuals (Compagno & Niem, 1998). Pregnant female give birth to their pups in estuaries and rivers after estimated 10-11 month gestation (Compagno & Niem, 1998; Ebert et al., 2013). The finding of very young juveniles of *C. leucas* in Musi River basin indicate this river was nursery area for this species in Southern Sumatra. The young readily tolerate low salinities, and some are born in freshwater (Compagno & Niem, 1998). The size of two juveniles of *C. leucas* in Musi River are meet to other records of the juveniles of this species from around the world, including presence of very young *C. leucas* in Brisbane River, Australia, range from 65-83 cm TL, and the 14 small specimens of *C. leucas* in brackish Indian River lagoon system on the central east coast of Florida, USA, ranged from 73-85 cm TL (Snelson et al., 1984; Pillans, 2006). The captured adult female specimen from inland of Mearim River, Brazil, measured approximately 130 cm (Feitosa et al., 2016).

Figure 2. The ventral-lateral view of *C. leucas* caught on the Air Itam Timur village, Penukal Abab Lematang Timur district, South Sumatra province, Indonesia. Photo A. Kurniawan.

Figure 3. The dorsal view of *C. leucas* caught on the Teluk Kijing village, Musi Banyuasin district. Photo A. Kurniawan.

Further study and monitoring is needed to looking at the importance of Musi River basin as nursery area of *C. leucas* in western Indonesian waters. The location of nursery areas in estuarine and freshwater systems makes the species vulnerable to pollution and habitat modification, but there has been only limited study of these impacts on *C. leucas* (Simpfendorfer & Burgess, 2009). It is more likely that *C. leucas* had not been reported because fish fauna of South Sumatran waters had not been explored enough than species recently colonized in this area. Recent works show that few species had been known occur locally but lacking for publication, such as *Fluvitrygon oxyrhynchus*, *Urogymnus polylepis* and *Lobocheilos ixocheilos* (Iqbal & Yustian, 2016; Iqbal et al., 2017a; Iqbal et al., 2017b). The reason why the *C. leucas* recently found in Musi basin is not specifically justified, but following Heupel et al. (2008), it is thought to be a physiological strategy of *C. leucas* to improve juvenile survival (possibly to adapt to new environment condition in Sumatran waters) and a way to increase overall fitness.

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References

Allen, G.R., Midgley, S.H. & Allen, M. (2003) Field guide to the freshwater fishes of Australia, 2nd Edit. Western Australian Museum, Perth, 394 p.

Compagno, L.J.V. & Niem, V.H. (1998) Carcharhinidae. Requiem sharks. *In*: Carpenter, K.E. & Niem, V.H. (Eds.), *FAO identification guide for fishery purposes. The living marine resources of the Western Central Pacific) Volume 2. Cephalopods, crustaceans, holothurians and sharks.* FAO, Rome, pp 1312-1360.

Compagno, L., Dando, M. & Fowler, S. (2005) A Field Guide to the sharks of the world. Princeton University Press, New Jersey, 368 p.

Ebert, D., Fowler, S. & Compagno, L. (2013) Sharks of the world, a fully illustrated guide. Wild Nature Press, Plymouth. 528 p.

Fahmi (2010) Sharks and rays in Indonesia. *Marine Research in Indonesia*, 35(1), 43-54.

Fahmi & Adrim, M. (2009) The first record of a shark of the genus *Glyphis* in Indonesia. *The Raffles Bulletin of Zoology*, 57(1), 113-118.

Feitosa, L.M., Martins, A.P.B. & Nunes, J.L. (2016) New record of *Carcharhinus leucas* (Valenciennes, 1839) in an equatorial river system. *Marine Biodiversity Records* 9, 1-4.

Gausmann, P. (2018). Synopsis of global freshwater occurrences of the bull shark (*Carcharhinus leucas* Valenciennes 1839, Carcharhinidae) with comments on the geographical range. Unpublished report.

Heupel, M.R., Yeiser, B.G., Collins, B,G., Ortega, C.L. & Simpfendorfer, C.A. (2010) Long-term presence and movement patterns of juvenile bull sharks, *Carcharhinus leucas*, in an estuarine river system. *Marine and Freshwater Research*, 61, 1-10.

Heupel, M.R. & Simpfendorfer, C.A. (2008). Movement and distribution of young bull sharks *Carcharhinus leucas* in a variable estuarine environment. *Aquatic Biology*, 1, 277-289.

Husnah., Nurhayati, E. & Suryati, N.K. (2008) Diversity, morphological characters and habitat of fish in Musi River drainage area, South Sumatra. Research Institute for Inland Fisheries, Palembang, 436 p.

Iqbal, M., Setiawan, A., Aprillia, I., Isa, M. & Yustian, I. (2017a) First record of *Lobocheilos ixocheilos* Kottelat & Tan, 2008 (Cypriniformes, Cyprinidae) in South Sumatra province, Indonesia. *Check List*, 13(6), 931-933.

Iqbal, M., Setiawan, D. & Ajiman (2017b) Presence of *Fluvitrygon oxyrhynchus* in Sumatra, Indonesia (Chondrichthyes: Dasyatidae). *Ichthyological Exploration of Freshwaters*, 28(1), 83-86.

Iqbal, M. & Yustian, I. (2016) Occurrence of the giant freshwater stingray *Urogymnus polylepis* in Sumatra, Indonesia (Chondrichthyes: Dasyatidae). *Ichthyological Exploration of Freshwaters*, 27, 333 –336.

Kottelat, M., Whitten, A.J., Kartikasari, S.N. & Wirjoatmodjo, S. (1993) Freshwater fishes of Western Indonesia and Sulawesi. Periplus, Hong Kong, 259 p + 84 pls.

Last, P.R. & Stevens, J.D. (1994) Sharks and Rays of Australia. CSIRO, Australia. 513 p.

Martin, R.A. (2005) Conservation of freshwater and euryhaline elasmobranchs: a review. *Journal of the Marine Biological Association of the United Kingdom*, 85, 1049-1073.

Nelson, J.S., Terry, C., Grande, T.C. & Wilson, M.V.H. (2016) Fishes of the World, 5thEdit. John Wiley & Sons, Hoboken, 752 pp.

Pillans, R.D. (2006) The physiological ecology of the bull shark *Carcharhinus leucas* in the Brisbane River. PhD Thesis, School of Integrative Biology, University of Queensland.

Simpfendorfer, C. & Burgess, G.H. (2009) *Carcharhinus leucas*. *The IUCN Red List of Threatened Species* 2009: e.T39372A10187195. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T39372A10187195.en. [accessed 20/June/2018].

Snelson, F.F., Timothy J. Mulligan, T.J. & Williams, S.E. (1984) Food habits, occurrence, and population structure of the bull shark, *Carcharhinus leucas* in florida coastal lagoons. *Bulletin of Marine Science*, 34(1), 71-80.

Tan, H.H. & Lim, K.K.P. (1998) Freshwater elasmobranchs from the Batang Hari basin of Central Sumatra, Indonesia. *Raffles Bulletin of Zoology*, 46, 425-429.

Thorson, T.B., Cowan, C.M. & Watson, D.E. (1973) Body Fluid Solutes of Juveniles and Adults of the Euryhaline Bull Shark *Carcharhinus leucas* from Freshwater and Saline Environments. *Physiological Zoology*, 46, 29-42.

Utomo, A.D., Muflikah, N., Nurdawati, S., Raharjo, M.F. & Makmur, S. (2007) Ichtiofauna Sungai Musi, Sumatera Selatan. Balai Riset Perikanan Perairan Umum, Palembang, 250 p. [in Indonesian]

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7

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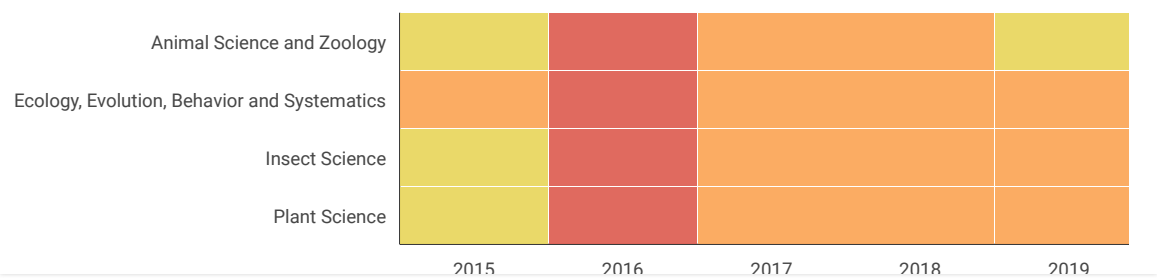

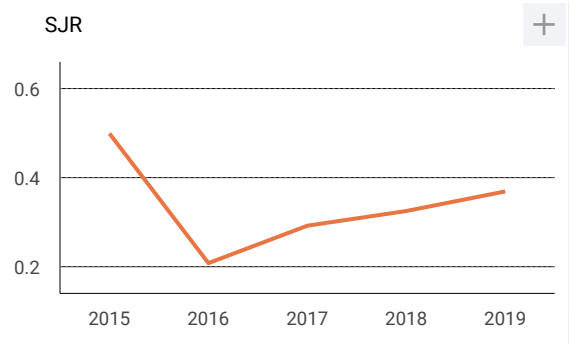

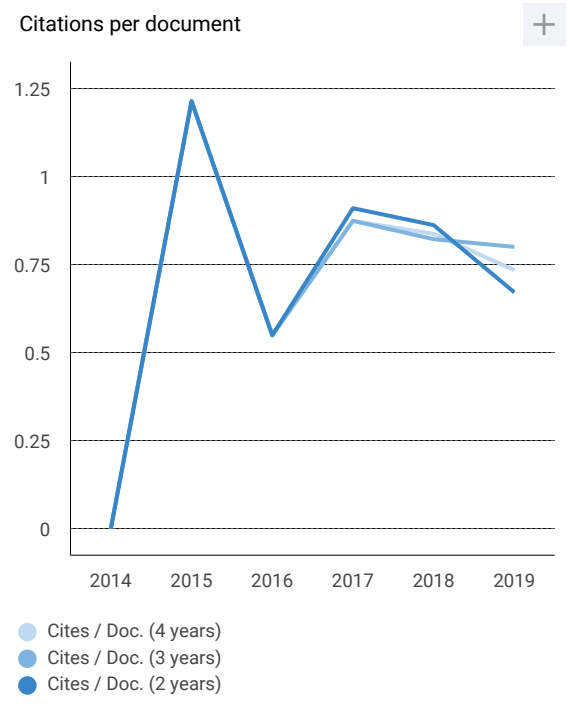

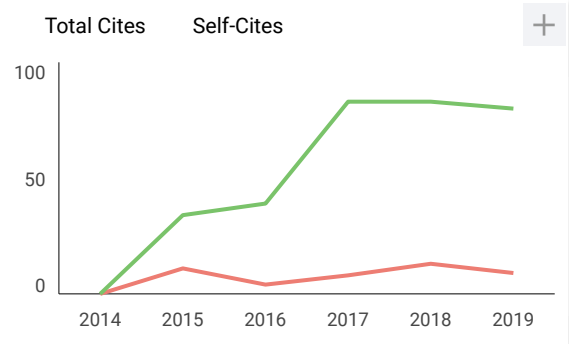

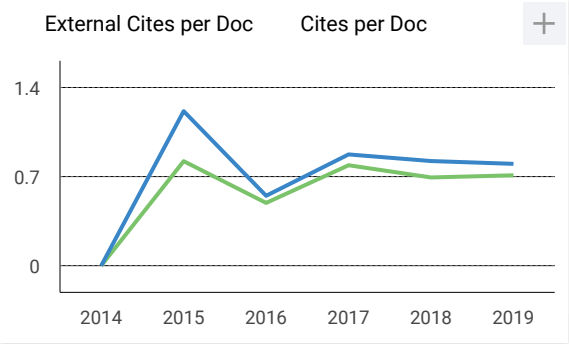

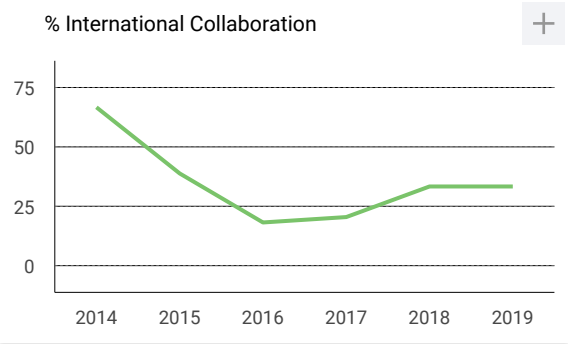

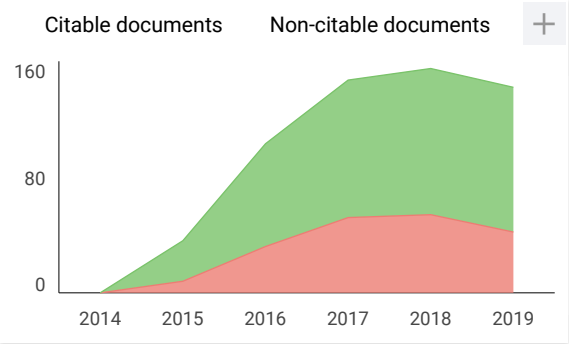

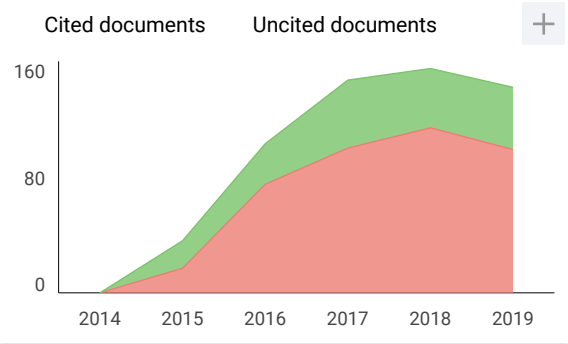

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Table of Contents

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References

Allen, G.R., Midgley, S.H. & Allen, M. (2003) Field guide to the freshwater fishes of Australia, 2nd Edit. Western Australian Museum, Perth, 394 p.

Compagno, L.J.V. & Niem, V.H. (1998) Carcharhinidae. Requiem sharks. *In*: Carpenter, K.E. & Niem, V.H. (Eds.), *FAO identification guide for fishery purposes. The living marine resources of the Western Central Pacific) Volume 2. Cephalopods, crustaceans, holothurians and sharks.* FAO, Rome, pp 1312-1360.

Compagno, L., Dando, M. & Fowler, S. (2005) A Field Guide to the sharks of the world. Princeton University Press, New Jersey, 368 p.

Ebert, D., Fowler, S. & Compagno, L. (2013) Sharks of the world, a fully illustrated guide. Wild Nature Press, Plymouth. 528 p.

Fahmi (2010) Sharks and rays in Indonesia. *Marine Research in Indonesia*, 35(1), 43-54.

Fahmi & Adrim, M. (2009) The first record of a shark of the genus *Glyphis* in Indonesia. *The Raffles Bulletin of Zoology*, 57(1), 113-118.

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Heupel, M.R. & Simpfendorfer, C.A. (2008). Movement and distribution of young bull sharks *Carcharhinus leucas* in a variable estuarine environment. *Aquatic Biology*, 1, 277-289.

Husnah., Nurhayati, E. & Suryati, N.K. (2008) Diversity, morphological characters and habitat of fish in Musi River drainage area, South Sumatra. Research Institute for Inland Fisheries, Palembang, 436 p.

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Iqbal, M. & Yustian, I. (2016) Occurrence of the giant freshwater stingray *Urogymnus polylepis* in Sumatra, Indonesia (Chondrichthyes: Dasyatidae). *Ichthyological Exploration of Freshwaters*, 27, 333 –336.

Kottelat, M., Whitten, A.J., Kartikasari, S.N. & Wirjoatmodjo, S. (1993) Freshwater fishes of Western Indonesia and Sulawesi. Periplus, Hong Kong, 259 p + 84 pls

Last, P.R. & Stevens, J.D. (1994) Sharks and Rays of Australia. CSIRO, Australia. 513 p.

Martin, R.A. (2005) Conservation of freshwater and euryhaline elasmobranchs: a review. *Journal of the Marine Biological Association of the United Kingdom*, 85, 1049-1073.

Nelson, J.S., Terry, C., Grande, T.C. & Wilson, M.V.H. (2016) Fishes of the World, 5thEdit. John Wiley & Sons, Hoboken, 752 pp.

Pillans, R.D. (2006) The physiological ecology of the bull shark *Carcharhinus leucas* in the Brisbane River. PhD Thesis, School of Integrative Biology, University of Queensland.

Simpfendorfer, C. & Burgess, G.H. (2009) *Carcharhinus leucas*. *The IUCN Red List of Threatened Species* 2009: e.T39372A10187195. http://dx.doi.org/10.2305/IUCN.UK.2009-.RLTS.T39372A10187195.en [accessed 20/June/2018].

Snelson, F.F., Timothy J. Mulligan, T.J. & Williams, S.E. (1984) Food habits, occurrence, and population structure of the bull shark, *Carcharhinus leucas* in florida coastal lagoons. *Bulletin of Marine Science*, 34(1), 71-80.

Tan, H.H. & Lim, K.K.P. (1998) Freshwater elasmobranchs from the Batang Hari basin of Central Sumatra, Indonesia. *Raffles Bulletin of Zoology*, 46, 425-429.

Thorson, T.B., Cowan, C.M. & Watson, D.E. (1973) Body Fluid Solutes of Juveniles and Adults of the Euryhaline Bull Shark *Carcharhinus leucas* from Freshwater and Saline Environments. *Physiological Zoology*, 46, 29-42.

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Article

First photographic inland records of bull shark *Carcharhinus leucas* (Carcharhiniformes: Carcharhinidae) in Sumatran waters, Indonesia

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Abstract
Two specimens (c.700 mm) of bull sharks *Carcharhinus leucas* (Müller & Henle, 1839) were caught and photographed by fishermen using trammel net on 29 September and 1 October 2017 in Musi River, South Sumatra province, Indonesia. These photos are considered as second record after 20 years (1997-2017), and first confirm inland record for Sumatra. Photographic records indicate specimens of *C. leucas* found in Musi River basin recorded about 75 km inland, and apparently very young juveniles. Further study and monitoring is needed to asses the possibility of the importance of Musi River basin as nursery area of *C. leucas*.

Key words: Present, Carcharhinidae, *Carcharhinus leucas*, Indonesia, Musi River, freshwater.

Introduction

The requiem sharkfamily (Carcharhinidae) is one of the largest, most important shark families, with many common and wide-ranging species in tropical and warm temperates waters (Campagno & Niem, 1998; Ebert et al., 2013). Although most species inhabitat continental coastal and offshore marine waters, but the family includes the only freshwater shark species (Compagno et al., 2005; Ebert et al., 2013). At least, seven species enter freshwater, with extended movements by bull shark *Carcharhinus leucas* and Ganges Shark *Glyphis gangeticus* (the latter, long thought to be conspecific to fresh and brackish water, may be conspecific with populations in Pakistan and Borneo on mtDNA evidence) (Nelson et al., 2016).

The bull shark *C. leucas* (Müller & Henle, 1839) is world-wide species of Carcharhinidae family that occur in tropical and subtropical waters (Compagno et al., 2005). This species is an euryhaline species and possibly the widest-ranging of all freshwater elasmobranchs, being found in numerous river systems as well as even in hypersaline lakes (Thorson et al., 1973). A Synopsis of global freshwater occurrences of the *C. leucas* was summarized by Gausmann (2018). Some examples of the presence of the *C. leucas* in rivers from other parts of the world are: a inland record of 120 km up the river in Zambesi River, Zimbabwe; reported up

to 420 km inland in Karun River, Iran; a record of approximately 130 km far inland in Lake Jamur, West Papua, Indonesia; a verified as far as 115 km from the sea at Wyrallah, Richmond River, Australia; a female *C. leucas* was caught by local fishermen in the Mearim River, 80 km far from the river's mouth, Maranhão State, Brazil; daily activity spaces of 67 juvenile *C. leucas* were monitored in Caloosahatchee River between 2003 and 2006 using an array of 25 acoustic receivers, ranged 0 to 14 km with most <5 km from from the river's mouth, southwest Gulf Coast of Florida, United States (Martin, 2005; Heupel et al., 2010, Feitosa et al., 2016; Gausmann 2018).

The *C. leucas* is one species of requiem shark families that occur in Indonesian waters (Kottelat et al., 1993; Fahmi, 2010; Ebert et al., 2013). However, Sumatra island of Indonesia is not include in the distribution map of *C. leucas* in many major shark references (Last & Stevens , 1994; Campagno & Niem, 1998; Compagno et al., 2005; Ebert et al., 2013). Record of two specimens of *C. leucas* from fish market in Jambi were reportedly caught from the Batang Hari basin during the dry season in July 1997 (Tan & Lim, 1998), is only known record of this species in Sumatra.

Recently recorded specimens of *C. leucas* based photographic evidences increase the knowledge and ranges of occurence of this species in western Indonesian waters. This paper presented second record of *C. leucas* after 20 years (1997-2017), and first confirm inland record for Sumatra.

Materials and Methods

Two specimens of *C. leucas* (c. 700 mm) were collected and photographed in 29 September and 1 October 2017 at two localities of the Musi River basin: One at Air Itam Timur village waters of Penukal subdistrict, Penukal Abab Lematang Ilir district (3°2'51.96"S,104°9'37.40"E), and second at Teluk Kijing village waters, Lais subdistrict, Musi Banyuasin district (2° 59' 7.33" S, 104° 7' 30.71"E) (Fig. 1). The distance of Air Itam Timur village and Teluk Kijing village waters were about 10 km, and these localities are about 75 km from the sea. Photos of these specimens were shown to us by fishermen through local angler facebook group. Both specimens were reported caught by trammel gill net. The specimens are unpreserved, due to the limitation of knowledge and lacking materials for preservations. First specimen caught at Air Itam Timur village waters has about 70 cm TL and 4 kg weigth (Figs. 2 and 3). No specific details of measurements for second species, but it was presumed having similar size and weight.

The sharks were immediately identified as *C. leucas* by combination of morphological characters and behaviour.

Results and Discussions

Both specimens of *C. leucas* found in Musi River basin have snout broadly, rounded and shot, its length less than distance between nostrils, and much lesser than mouth width; nostrils with a low, broadly triangular anterior nasal flap; first dorsal fin high and broad with a pointed or slightly rounded apex, its origin a little in advance of a short posterior lobe, its inner margin less than the fin height and its origin slightly in front of that of anal fin; pectoral pins broad, with narrow pointed tips; the baby has greyish back, belly white, tips of fins dark; and small eyes. The characters above are fitted well to the features of *C. leucas* (Compagno & Niem Niem, 1998; Compagno et al., 2005; Ebert et al., 2013). Based on freshwater habitat localities, both specimens could be a species of freshwater shark from genus *Glyphis*, which also occur in western Indonesia waters (Last & Stevens, 1994; Fahmi & Adrim, 2009; Fahmi, 2010). However, It was shortly recognized that these specimens differ from *Glyphis* by its small second dorsal fin, while *Glyphis* has large relative size of the second dorsal-fin (Last & Stevens, 1994; Fahmi & Adrim, 2009).

The *C. leucas* is a very rare species in Sumatra, with only recorded once from fish market in Jambi province which reported caught from Batang Hari River basin during the dry season in July 1997 (Tan & Lim, 1998). Recent discovery of *C. leucas* in South Sumatran waters could be represent a second documentation after 20 years (1997-2017), and first confirm inland record for Sumatra. The present dicovery extends distribution of *C. leucas* for Musi River basin, Southern Sumatran waters, which had never been recorded for this basin (Utomo et al., 2007; Husnah et al., 2008). Record of *C. leucas* in Musi River represent second record and first inland record for Sumatran waters, including add about 200 km further south from it previous known localities (Batang Hari River). *C. leucas* is a species inhabiting shallow waters, especially in

bays, river estuarines, rivers, lakes and may thousand km upstream in warm rivers (often in very turbid water) (Compagno & Niem, 1998; Compagno et al., 2005; Ebert et al., 2013). Capable of covering great distance (up to 180 km in 24 hours) moving between fresh and brackish water at random (Allen et al., 2003), and it has been found nearly 4000 km from the sea in the Amazon system (Last & Stevens,1994).

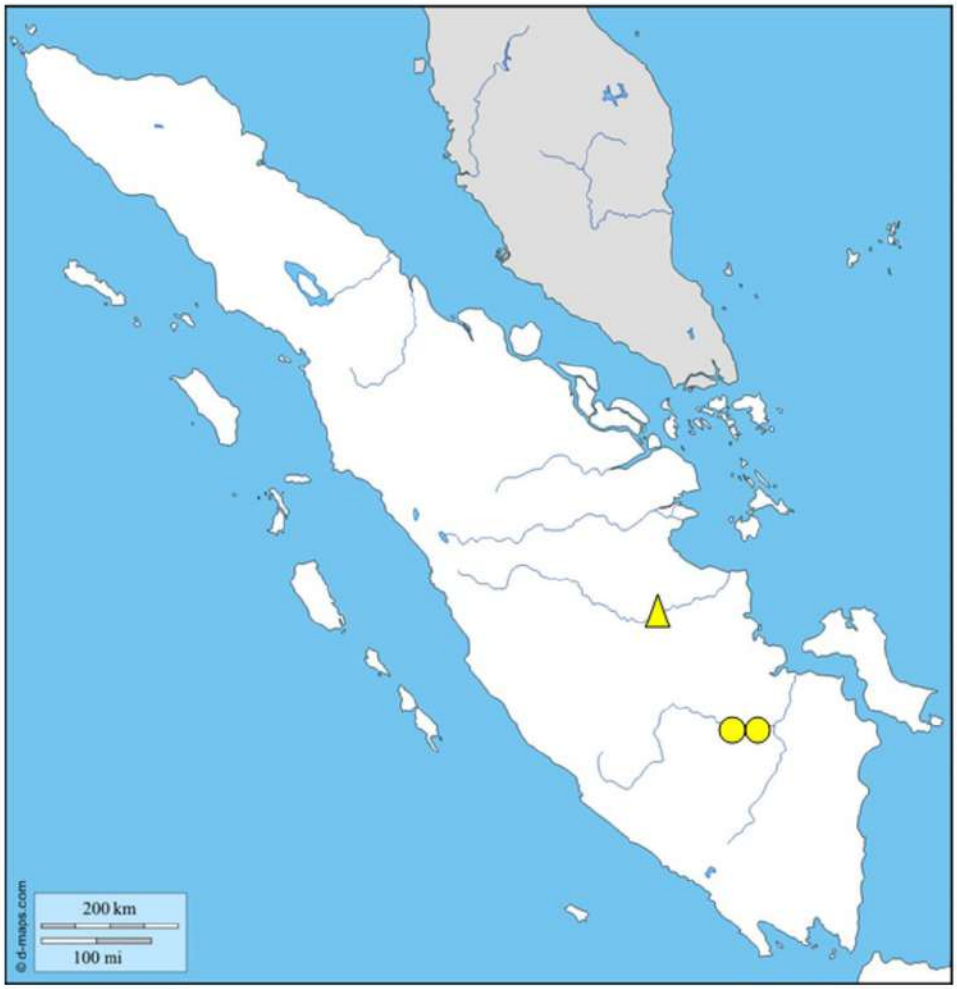

Figure 1. Location of known *C. leucas* caught in Sumatran waters. Triangle show previous record from Jambi market, Jambi province; and circle shows recent record from South Sumatran waters, Indonesia.

Specimens of *C. leucas* found in Musi River have black tip of fins and size around 70 cm of TL, show specific characters of very young individuals (Compagno & Niem, 1998). Pregnant female give birth to their pups in estuaries and rivers after estimated 10-11 month gestation (Compagno & Niem, 1998; Ebert et al., 2013). The finding of very young juveniles of *C. leucas* in Musi River basin indicate this river was nursery area for this species in Southern Sumatra. The young readily tolerate low salinities, and some are born in freshwater (Compagno & Niem, 1998). The size of two juveniles of *C. leucas* in Musi River are meet to other records of the juveniles of this species from around the world, including presence of very young *C. leucas* in Brisbane River, Australia, range from 65-83 cm TL, and the 14 small specimens of *C. leucas* in brackish Indian River lagoon system on the central east coast of Florida, USA, ranged from 73-85 cm TL (Snelson et al., 1984; Pillans, 2006). The captured adult female specimen from inland of Mearim River, Brazil, measured approximately 130 cm (Feitosa et al., 2016).

Figure 2. The ventral-lateral view of *C. leucas* caught on the Air Itam Timur village, Penukal Abab Lematang Timur district, South Sumatra province, Indonesia. Photo A. Kurniawan.

Figure 3. The dorsal view of *C. leucas* caught on the Teluk Kijing village, Musi Banyuasin district. Photo A. Kurniawan.

Further study and monitoring is needed to looking at the importance of Musi River basin as nursery area of *C. leucas* in western Indonesian waters. The location of nursery areas in estuarine and freshwater systems makes the species vulnerable to pollution and habitat modification, but there has been only limited study of these impacts on *C. leucas* (Simpfendorfer & Burgess, 2009). It is more likely that *C. leucas* had not been reported because fish fauna of South Sumatran waters had not been explored enough than species recently colonized in this area. Recent works show that few species had been known occur locally but lacking for publication, such as *Fluvitrygon oxyrhynchus, Urogymnus polylepis* and *Lobocheilos ixocheilos* (Iqbal & Yustian, 2016; Iqbal et al., 2017a; Iqbal et al., 2017b). The reason why the *C. leucas* recently found in Musi basin is not specifically justified, but following Heupel et al. (2008), it is thought to be a physiological strategy of *C. leucas* to improve juvenile survival (possibly to adapt to new environment condition in Sumatran waters) and a way to increase overall fitness.

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References

Allen, G.R., Midgley, S.H. & Allen, M. (2003) Field guide to the freshwater fishes of Australia, 2nd Edit. Western Australian Museum, Perth, 394 p.

Compagno, L.J.V. & Niem, V.H. (1998) Carcharhinidae. Requiem sharks. *In*: Carpenter, K.E. & Niem, V.H. (Eds.), *FAO identification guide for fishery purposes. The living marine resources of the Western Central Pacific) Volume 2. Cephalopods, crustaceans, holothurians and sharks.* FAO, Rome, pp 1312-1360.

Compagno, L., Dando, M. & Fowler, S. (2005) A Field Guide to the sharks of the world. Princeton University Press, New Jersey, 368 p.

Ebert, D., Fowler, S. & Compagno, L. (2013) Sharks of the world, a fully illustrated guide. Wild Nature Press, Plymouth. 528 p.

Fahmi (2010) Sharks and rays in Indonesia. *Marine Research in Indonesia*, 35(1), 43-54.

Fahmi & Adrim, M. (2009) The first record of a shark of the genus *Glyphis* in Indonesia. *The Raffles Bulletin of Zoology*, 57(1), 113-118.

Feitosa, L.M., Martins, A.P.B. & Nunes, J.L. (2016) New record of *Carcharhinus leucas* (Valenciennes, 1839) in an equatorial river system. *Marine Biodiversity Records* 9, 1-4.

Gausmann, P. (2018). Synopsis of global freshwater occurrences of the bull shark (*Carcharhinus leucas* Valenciennes 1839, Carcharhinidae) with comments on the geographical range. Unpublished report.

Heupel, M.R., Yeiser, B.G., Collins, B,G., Ortega, C.L. & Simpfendorfer, C.A. (2010) Long-term presence and movement patterns of juvenile bull sharks, *Carcharhinus leucas*, in an estuarine river system. *Marine and Freshwater Research*, 61, 1-10.

Heupel, M.R. & Simpfendorfer, C.A. (2008). Movement and distribution of young bull sharks *Carcharhinus leucas* in a variable estuarine environment. *Aquatic Biology*, 1, 277-289.

Husnah., Nurhayati, E. & Suryati, N.K. (2008) Diversity, morphological characters and habitat of fish in Musi River drainage area, South Sumatra. Research Institute for Inland Fisheries, Palembang, 436 p.

Iqbal, M., Setiawan, A., Aprillia, I., Isa, M. & Yustian, I. (2017a) First record of *Lobocheilos ixocheilos* Kottelat & Tan, 2008 (Cypriniformes, Cyprinidae) in South Sumatra province, Indonesia. *Check List,* 13(6), 931-933.

Iqbal, M., Setiawan, D. & Ajiman (2017b) Presence of *Fluvitrygon oxyrhynchus* in Sumatra, Indonesia (Chondrichthyes: Dasyatidae). *Ichthyological Exploration of Freshwaters,* 28(1), 83-86.

Iqbal, M. & Yustian, I. (2016) Occurrence of the giant freshwater stingray *Urogymnus polylepis* in Sumatra, Indonesia (Chondrichthyes: Dasyatidae). *Ichthyological Exploration of Freshwaters*, 27, 333 –336.

Kottelat, M., Whitten, A.J., Kartikasari, S.N. & Wirjoatmodjo, S. (1993) Freshwater fishes of Western Indonesia and Sulawesi. Periplus, Hong Kong, 259 p + 84 pls.

Last, P.R. & Stevens, J.D. (1994) Sharks and Rays of Australia. CSIRO, Australia. 513 p.

Martin, R.A. (2005) Conservation of freshwater and euryhaline elasmobranchs: a review. *Journal of the Marine Biological Association of the United Kingdom*, 85, 1049-1073.

Nelson, J.S., Terry, C., Grande, T.C. & Wilson, M.V.H. (2016) Fishes of the World, 5thEdit. John Wiley & Sons, Hoboken, 752 pp.

Pillans, R.D. (2006) The physiological ecology of the bull shark *Carcharhinus leucas* in the Brisbane River. PhD Thesis, School of Integrative Biology, University of Queensland.

Simpfendorfer, C. & Burgess, G.H. (2009) *Carcharhinus leucas*. *The IUCN Red List of Threatened Species* 2009: e.T39372A10187195. http://dx.doi.org/10.2305/IUCN.UK.2009-2.RLTS.T39372A10187195.en. [accessed 20/June/2018].

Snelson, F.F., Timothy J. Mulligan, T.J. & Williams, S.E. (1984) Food habits, occurrence, and population structure of the bull shark, *Carcharhinus leucas* in florida coastal lagoons. *Bulletin of Marine Science*, 34(1), 71-80.

Tan, H.H. & Lim, K.K.P. (1998) Freshwater elasmobranchs from the Batang Hari basin of Central Sumatra, Indonesia. *Raffles Bulletin of Zoology*, 46, 425-429.

Thorson, T.B., Cowan, C.M. & Watson, D.E. (1973) Body Fluid Solutes of Juveniles and Adults of the Euryhaline Bull Shark *Carcharhinus leucas* from Freshwater and Saline Environments. *Physiological Zoology*, 46, 29-42.

Utomo, A.D., Muflikah, N., Nurdawati, S., Raharjo, M.F. & Makmur, S. (2007) Ichtiofauna Sungai Musi, Sumatera Selatan. Balai Riset Perikanan Perairan Umum, Palembang, 250 p. [in Indonesian]

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Total = (100%)	40					39
Kontribusi Pengusul (Penulis Pertama /Anggota Utama)	Anggota Utama (0,4x39)/4=3,9					**3,9**

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