

## Freshwater Elasmobranchs from Lake Naujan, Perak River, and Indragiri River, Southeast Asia

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Elasmobranchs are generally marine dwellers whose body structures and functions are adapted to marine environments. They appear to have been ocean dwellers since their first appearance in the Devonian (Romer, 1966:37). However, it has been widely known that elasmobranchs inhabit rivers and lakes of tropical and subtropical regions of various parts of the world. Some freshwater elasmobranchs are given taxa independent of marine relatives. For instance, the family Potamotrygonidae was established for river stingrays living in Middle and South America (Garman, 1913). In sharks, *Carcharhinus gangeticus* (Müller et Henle), *C. nicaraguensis* (Gill et Bransford), and *C. zambezensis* (Peters) were named for the sharks in the Ganges River, Lake Nicaragua, and Zambezi River respectively. In recent years, however, *C. nicaraguensis* and *C. zambezensis* have been regarded as synonymous with *C. leucas* (Müller et Henle) (Bigelow and Schroeder, 1961; Bass et al., 1973). Further, most of the recorded *C. gangeticus* outside the Indo-Pakistan Peninsula are identical with *C. leucas* (Boeseman, 1964).

I was given the opportunity of participating in the scientific expedition for Southeast Asia sponsored by the Ministry of Education of Japan, entitled "Research on the evolution and adaptation of freshwater sharks", from November, 1976 to February, 1977. Here the findings on the freshwater elasmobranchs examined in three localities in Southeast Asia are presented.

### Localities and methods

I first investigated Lake Naujan, Mindoro Island, the Philippines, during the middle of December, 1976, and later the Perak River near Telok Anson, Malaysia, at the end of December, 1976, and lastly in the Indragiri River near Rengat, Sumatra, Indonesia, in

January, 1977.

Specimens examined were discarded after measurements and photographing except for saws and jaws of *Pristis microdon*.

Identification of elasmobranchs was made chiefly according to Matsubara (1936a, b), Fowler (1941), Bigelow and Schroeder (1948, 1953), Garrick and Schultz (1963), Springer (1964), Smith (1965), and Chen and Chung (1971).

Measurements followed those of Bigelow and Schroeder (1948, 1953).

### Results

**Investigation in Lake Naujan.** Lake Naujan is situated about 20 km from the sea with the Butas River as its outlet. Both the lake and the river proved to be freshwater at least during our investigation (Sonoda, 1977). Sharks come into the lake chasing mullet and milk fish which migrate seasonally from the sea into the lake (pers. comm. from Mr. Rayes). During the investigation, attempts were made to catch sharks both by fishermen and by ourselves with long lines. However, no sharks were found there possibly because they might have returned to the sea pursuing prey. Mr. Lasarte, special technician of the shark repellent program there, showed us a picture of a shark taken in Lake Naujan in the first half of 1976. He told us that he had caught more than 60 sharks in the lake. The picture matched the characteristics of the *C. leucasgangeticus* group as defined by Garrick and Schultz (1963) in having a blunt snout, forward position of the first dorsal fin, and no marked colour pattern. This shark appeared to be more similar to *C. leucas* described by Bigelow and Schroeder (1948) than *C. gangeticus* pictured by Garrick and Schultz (1963) and Budker (1971). Another picture of sharks provided by Mr. Rayes, Director of Naujan Station, indicated the presence of *C. melanopterus* in the Butas River. This shark is called the black fin at Mindoro Island. I was informed that these sharks were captured by cast nets in the lower waters of the Butas River in June, 1976.

**Investigation in the Perak River near Telok Anson.** The Perak River near Telok Anson

is 70 km distant from its river mouth. According to water analysis, this area proved to be freshwater (Sonoda, 1977). I collected five species of elasmobranchs at Telok Anson, but *Dasyatis bennetti* (Müller et Henle) was the only species that was taken in the freshwater area. Since the others were obtained at the fish market at Telok Anson, the exact localities were unknown. However, it is most probable that *Scoliodon laticaudus* (Müller et Henle) was captured in the freshwater area of the river, judging from information acquired from fishmongers. The other three were *Chilloscyllum indicum* (Günther), *Rhizoprionodon acutus* (Rüppell), and *Rhynchobatus djiddensis* (Forsskål).

Proportional dimensions in percent of disk breadth of *D. bennetti* are given below on the basis of a female, 247 mm broad. Disk: vertical height 107.7. Snout length: in front of orbits 28.3; in front of mouth 27.9. Orbits: horizontal diameter 5.3; distance between 11.7. Spiracles: length 6.1; distance between 16.6. Mouth: breadth 8.9. Exposed nostrils: distance between inner ends 8.5. Gill openings: distance between inner ends, 1st 24.3; 5th 16.2. Distance: from tip of snout to center of cloaca 89.5. Tail: length 402.8.

**Investigation in the Indragiri River near Rengat.** The Indragiri River near Rengat is about 70 km distant from its river mouth, and from water analysis the river water was found to be freshwater (Sonoda, 1977).

Three species of batoid fishes, *Dasyatis bennetti*, *D. sephen* (Forsskål), and *Pristis microdon* Latham were collected during this investigation. Of these species, *D. sephen* and *P. microdon* were caught with gill net from the main streams of the river and *D. bennetti* was caught with cast net in small waterways flowing into the Indragiri River. Pictures of these three species are shown in Figs. 1~3.

Proportional dimensions in percent of disk breadth of *D. bennetti* are given below on the basis of two females, 191 mm and 145 mm broad, respectively. Disk: vertical length 102.6, 106.9. Snout length: in front of orbits 27.2, 27.6; in front of mouth 25.1, 26.9. Orbits: horizontal diameter 5.6, 5.4; distance

between 11.0, 12.4. Spiracles: length 6.2, 6.0; distance between 16.2, 17.9. Mouth: breadth 7.3, 9.0. Exposed nostrils: distance between inner ends 8.4, 8.3. Gill openings: lengths, 1st 3.1, 2.4; 3rd 3.1, 3.1; 5th 2.1, 2.5; distance between inner ends, 1st 21.5, 23.4; 5th 14.1, 15.9. Distance: from tip of snout to center of cloaca 84.8, 85.5. Tail: length 395.3, 382.1.

Proportional dimensions in percent of disk breadth of *D. sephen* are given below on the basis of a female, 284 mm broad. Disk: vertical length 94.4. Snout length: in front of orbits 18.7; in front of mouth 19.0. Orbits: horizontal diameter 5.3; distance between 13.0. Spiracles: distance between 16.9. Mouth: breadth 8.1. Exposed nostrils: distance between inner ends 8.1. Gill openings: lengths, 1st 3.2; 3rd 3.2; 5th 2.5; distance between inner ends, 1st 21.5; 5th 17.6. Distance: from tip of snout to center of cloaca 84.2. Tail: length 332.7.

Proportional dimensions in percent of total length of *P. microdon* are given below on the basis of two males, 907 mm and 892 mm TL, and three females, 929 mm, 916 mm, and 864 mm TL respectively. Snout length: in front of orbits 28.1, 29.7, 29.3, 29.2, 30.0. in front of mouth 32.5, 33.1, 31.9, 32.2, 32.9. Orbits: horizontal diameter 1.9, 1.8, 1.7, 1.6, 1.7. Spiracles: length, 1.5, 2.1, 1.8, —, 1.7; distance between —, 4.5, —, 4.2, —. Mouth: breadth 5.6, 5.6, 5.5, 5.3, 5.8. Nostrils: distance between inner ends 2.1, 2.2, 2.4, 2.0, 2.2. Gill openings: lengths, 1st 1.3, 1.3, 1.4, 1.0, 1.4; 3rd 1.7, 1.7, 1.7, 1.4, 1.7; distance between inner ends, 1st 9.4, 9.3, —, 9.0, 9.5; 5th 7.9, 7.2, 7.3, 7.0, 7.5. First dorsal fin: vertical height 7.7, 7.8, 7.4, 7.6, 8.1; length of base 7.4, 7.3, 7.0, 7.3, 7.4. Second dorsal fin: vertical height 7.7, 7.8, 7.5, 7.4, 8.1; length of base 5.6, 5.4, 5.5, 5.3, 5.8. Caudal fin: upper anterior margin 16.4, 16.1, 16.1, 15.8, 17.4; lower anterior margin 9.3, 9.0, 9.3, 8.3, 9.0. Pelvic: anterior margin 7.2, 6.7, 6.2, 6.6, 6.6. Distance from tip of snout to: 1st dorsal 56.8, 54.5, 54.3, 55.1, 56.4; pelvics 60.4, 60.0, 59.4, 59.7, —; center of cloaca 63.1, 62.6, 61.6, —, 65.4. Rostral teeth: number on each side 20, 19, 18, 18, 17.

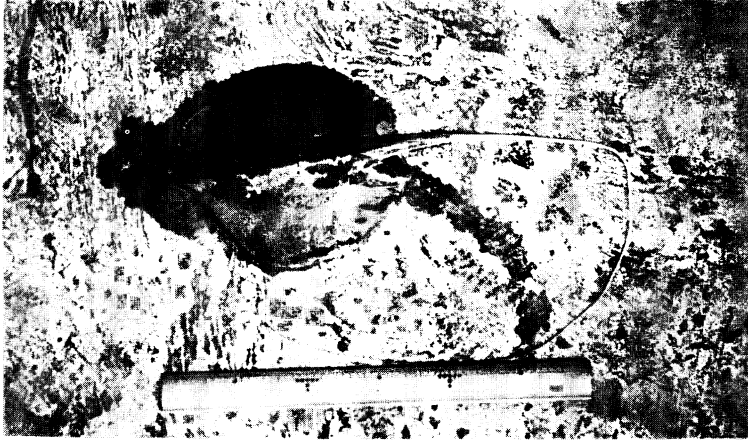


Fig. 1. *Dasyatis bennetti*, taken from the Indragiri River.

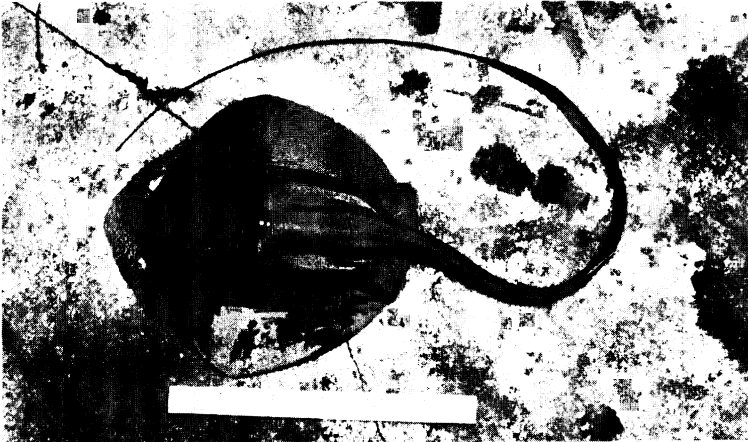


Fig. 2. *Dasyatis sephen*, taken from the Indragiri River.

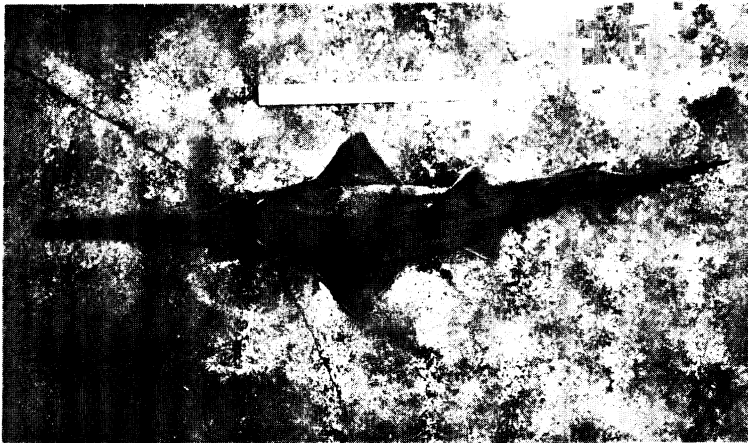


Fig. 3. *Pristis microdon*, taken from the Indragiri River.

### Discussion

I recognized two species of sharks occurring in Lake Naujan and the Butas River judging from pictures, whereas Herre (1927) listed only *C. gangeticus* in Lake Naujan. Boeseman (1964) stated that *C. gangeticus* recorded by Herre (1927) was identical with *C. leucas*. I agree with Boeseman because *C. leucas* has been reported from freshwater areas of the various parts of the world (Boeseman, 1964; Budker, 1971; Bass et al., 1973) whereas *C. gangeticus* is almost completely confined to the Indo-Pakistan Peninsula. Japanese distribution of *C. gangeticus* is dubious (Taniuchi, 1971). However, I could not determine its scientific name with certainty since *C. amboinensis*, which was synonymized with *C. leucas*, has recently been regarded as a valid species (Bass et al., 1973). The occurrence of *C. melanopterus* in the Butas River is reasonable because this species was reported to occur in the Perak River (Smith, 1931).

In the Perak River, *D. bennetti* is the only elasmobranch that was verified to be a freshwater dweller. However, of other four elasmobranchs collected from Telok Anson, *S. laticaudus* and *R. acutus* are likely to be distributed in the freshwater area of the Perak River because the two species were reported to occur in freshwater under the name *S. walbeehmi* and *S. palasorrah* respectively (Smith, 1936). *P. microdon*, *D. uarnak*, and *C. melanopterus* reported from the Perak River by Smith (1931) were not examined during my stay at Telok Anson.

Among the batoid fishes taken from the Indragiri River, *P. microdon* was recorded from the Perak River which pours into the strait of Malacca from the Malay Peninsula (Smith, 1931). Therefore, it is natural that this sawfish is distributed in the Indragiri River which flows into the same strait from Sumatra.

*Dasyatis sephen*, recorded in the Indragiri River in the present study, was also reported from freshwaters in Thailand (Smith, 1931). Similarly, *D. bennetti* was reported from both rivers in the present study. Thus, three species of batoid fishes recorded in the Indragiri River in the present study were all recorded

from the other freshwaters.

### Acknowledgments

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### Literature cited

- Bass, A. J., J. D. D'Aubrey, and N. Kistnasamy. 1973. Sharks of the east coast of southern Africa I. The genus *Carcharhinus* (Carcharhinidae). Oceanog. Res. Inst. Invest. Rep., 33: 1~168, figs. 1~32, pls. 1~17.
- Bigelow, H. B., and W. C. Schroeder. 1948. The fishes of the western North Atlantic. Mem. Sears Found. Mar. Res., 1(1): 1~576, figs. 1~106.
- Bigelow, H. B., and W. C. Schroeder. 1953. The fishes of the western North Atlantic. Mem. Sears Found. Mar. Res., 1(2): 1~588, figs. 1~127.
- Bigelow, H. B., and W. C. Schroeder. 1961. *Carcharhinus nicaraguensis*, a synonym of the bull shark, *C. leucas*. Copeia, 1961 (3): 359.
- Boeseman, M. 1964. Notes on the fishes of western New Guinea, III. The freshwater shark of Jamoer Lake. Zool. Meded., Leiden, 40(3): 9~22, fig. 1.
- Budker, P. 1971. The life of sharks. Weidenfeld and Nicolson, London, xvii+222 pp.
- Chen, J. T. F., and I. H. Chung. 1971. A review of rays and skates or Batoidea of Taiwan. Tunghai Univ. Ichthyol. Ser., 2: 1~53, figs. 1~31.
- Fowler, H. W. 1941. Contribution to the biology of the Philippine Archipelago and adjacent regions. The fishes of the group Elasmobranchii. Bull. U. S. Nat. Mus., 100 (13): 1~879, figs. 1~30.
- Garman, S. 1913. The Plagiostomia (sharks, skates and rays). Mem. Mus. Comp. Zool. Harvard, 36: 1~515, pls. 1~77.
- Garrick, J. A. F., and L. P. Schultz. 1963. A guide to the kinds of potentially dangerous sharks. In P. W. Gilbert, ed. Sharks and survival. D. C. Heath and Co., Boston, 3~60,

- figs. 1~33.
- Herre, A. W. 1927. The fisheries of Lake Taal (Bonban), Luzon, and Lake Naujan, Mindoro. *Philippine J. Sci.*, 34:287~306.
- Matsubara, K. 1936a. Order Plagiostomi I (sharks). *Fauna Nipponica*, Vol. XV, Fas. II, No. 1, 160 pp. 93 figs. (In Japanese).
- Matsubara, K. 1936b. Order Plagiostomi II (rays). *Fauna Nipponica*, Vol. XV, Fas. II, No. 2, 70 pp., 40 figs. (In Japanese).
- Romer, A. S. 1966. *Vertebrate paleontology*. 3rd ed. Univ. Chicago Press, viii+468 pp., 443 figs.
- Smith, H. W. 1931. The absorption and excretion of water and salts by the elasmobranch fishes I. Freshwater elasmobranchs. *Amer. J. Physiol.*, 98:279~295.
- Smith H. W. 1936. The retention and physiological role of urea in the elasmobranchii. *Biol. Rev.*, 11:48~82.
- Smith, J. L. B. 1965. The sea fishes of southern Africa. 5th ed. Central News Agency, 586 pp, 111 pls.
- Sonoda, S. 1977. On the environment of the habitat of freshwater elasmobranchs. In *Research Report of the scientific overseas expedition "Research on the evolution and adaptation of freshwater sharks"*, 4~13. (In Japanese).
- Springer, V. G. 1964. A revision of the carcharhinid shark genera, *Scoliodon*, *Loxodon*, and *Rhizoprionodon*. *Proc. U.S. Nat. Mus.*, 115:559~632, figs. 1~14.
- Taniuchi, T. 1971. Reproduction of the sandbar shark, *Carcharhinus milberti*, in the East China Sea. *Japan. J. Ichthyol.*, 18(2):94~98, figs. 1~2.
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東南アジアのナウハン湖、ベラク川、インドラギリ川における淡水産板鰐類

谷内 透

筆者は1976年12月より1977年2月にかけて東南アジアの3地点で淡水産板鰐類の調査を行なった。まず、フィリピンのミンドロ島にあるナウハン湖とそこから流れ出るプータス川では、直接板鰐類を観察できなかったが、写真から判断して、*Carcharhinus melanopterus* と *C. leucas* と思われる2種が分布すると推定した。次に、マレーシアのテロクアンソン市を流れるベラク川から *Dasyatis bennetti* を採集した。さらに、インドネシアのスマトラ島のレンガット市を流れるインドラギリ川からは *D. bennetti*, *D. sephen*, *Pristis microdon* の3種を観察した。

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