Research Article

Contribution to the Taxonomy and Distribution of Six Shark Species (Chondrichthyes, Elasmobranchii) from the Gulf of Thailand

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A collection of nine shark specimens from six different species, obtained in 1993 from the Gulf of Thailand, was examined in this study. The sharks were determined, morphometrically and meristically analyzed, photographically documented, and compared with relevant literature. Additionally, further available material from the fish collections of the Zoological Museum Hamburg, the Senckenberg Naturmuseum Frankfurt, and the Muséum national d’Histoire naturelle, Paris, was examined by way of comparison. Contrary to most references, prominent dorsal ridges were detected in several specimens of *Chiloscyllium griseum*. Additionally, one of the specimens had a very unusual big ocellar blotch on the head which had not been reported for this genus before. For *Paragaleus randalli*, it could be proven that the teeth morphologically deviate strongly from those shown in literature due to having much larger cusps. Furthermore, the known distribution area of *Paragaleus randalli* could be extended considerably eastwards by about 2000 km. For a seventh species, *Paragaleus tengu*, differences between the actual morphology of upper lateral teeth and those drawn in the original description were detected.

1. Introduction

About 500 of the more than 1200 globally known species of Chondrichthyes are sharks, including the world’s biggest fish species [1]. The highest diversity of Chondrichthyes can be found in the East Indian Ocean [2–4], where the catches of elasmobranch fishes have increased significantly over the last decades from 18 600 t in 1950 to 77 700 t in 1997 [5]. Today Indonesia has the world’s largest chondrichthyan fishery [3]. Extensive targeted fishery and bycatch belong to the most important reasons for the recent decline of the populations of many elasmobranch species [6, 7]. Sharks are especially susceptible to population declines because the lifestyle of many species is characterized by late attainment of sexual maturity, slow growth, and low reproductive output [2, 8, 9]. Due to the numerous population declines, it is very important to develop management and protection programs for many elasmobranch species, which require well-founded knowledge about the taxonomy, distribution, and abundance of the species. However, although many new elasmobranch species have been described in recent years [1, 10–13], the knowledge on many known species is still scarce due to the often very old and sketchy original descriptions like those by Müller and Henle [14]. Another reason for the gaps in knowledge is the often insufficient declaration of elasmobranch catches by fishermen, who classify most caught specimens simply as “diverse Elasmobranchii” or “small sharks” instead of making a more detailed determination [5, 15].

In order to make a contribution to the filling of these knowledge gaps, a collection of nine shark specimens from the Gulf of Thailand and many comparative specimens were examined in this study. Thailand was the fifth most important chondrichthyan fishing nation in the East Indian Ocean in 1997 with 5600 t officially landed [5]. The examined Thai specimens belong to the Carcharhinidae species *Carcharhinus dussumieri*, the two Hemigaleidae species *Hemigaleus microstoma* and *Paragaleus randalli*, the Sphyrnidae species *Sphyrna lewini* and the two Hemiscyllidae species *Chiloscyllium griseum* and *C. punctatum*. 
The Carcharhinidae is by far the most speciose shark family in Thai and adjacent waters with 30 species [16]. Its members are characterized by two nonspiny dorsal fins, nasoral grooves and barbles, an under, or beyond-the-eyes located mouth and nictitating eyelids [17] as well as a precardial pit and an intestinal valve of scroll type [18]. The second most speciose family in this region is the family Triakidae with only seven species [16]. The family Hemigaleidae is represented in the region by four species [16]. It is morphologically similar to the family Carcharhinidae, but all of its members have an intestinal valve of spiral type [18]. The Sphyrnidae, represented by four species in Thai and adjacent waters [16], have a cephalofoil, a uniquely formed head with lateral, bladelike expansions [18]. The Hemiscyllidae with four species in the region [16] are—like all Orectolobiformes—characterized by the presence of an anal fin, two equal-sized, nonspiny dorsal fins, barbles, nasoral grooves, and a short mouth that ends in front of the eyes [19]. The species of Hemiscyllidae in particular have a slender, conical body, large spiracles, and short barbles [17].

This study provides extensive morphometrical analyses for six shark species for most of which such detailed morphometrics have not been published before. Additionally, tooth row counts are given for all specimens from the Thailand collection as well as morphological descriptions and comparisons with relevant literature.

A morphologically correct image of upper anterolateral teeth of Paragaleus randalli is shown here for the first time. Furthermore, the known distribution area of Paragaleus randalli is extended.

2. Material and Methods

The examined Thai collection of nine sharks from six different species was collected by Matthias Stehmann during a Thailand expedition that took place from the 5th to the 11th December 1993 after the fourth Indo-Pacific Fish Conference (IPFC). The specimens were acquired from local fishermen in the two Thai harbors shown in the map in Figure 1: Cha-Am (12°49′N, 100°E) and Pak Phanang (8°20′N, 100°15′E). According to the fishermen, the sharks were caught nearby those harbors. All specimens were fixed in 4% formaldehyde solution soon after the catch and preserved in 70% ethanol afterwards.

The map was generated using ArcMap 9.3.1 by ESRI [20] and based on the Global Relief ModelETOPO 1 of the National Geophysical Data Center (NOAA) [21]. The country borders were visualized by means of the shapefiles supplied by ESRI for the ArcExplorer-Java Edition for Education 2.3.2 (AEJEE) [22]. Land below the sea level was colorized in the color of the lowest land elevation class using Adobe Photoshop CS 4 [23].

Additionally to the nine specimens from the Thai collection, the following material from the fish collections of the Zoological Museum Hamburg (ZMH), the Senckenberg Naturmuseum Frankfurt (SMF) and the Muséum national d’Histoire naturelle, Paris (MNHN) was examined by way of comparison.

2.1. Carcharhinus dussumieri. ZMH 2137: male postembryo, 264 mm total length (TL) and female postembryo, 335 mm TL, China: Futschau, Fokien, 8 Sep. 1911, Cons. G. Siemssen. ZMH 2149: male postembryo, 247 mm TL, male postembryo, 262 mm TL and female postembryo 246 mm TL, China: Futschau, Fokien, 9 Sep. 1904, Cons. G. Siemssen. ZMH 25479: female postembryo, 260 mm TL, Indonesia: Sumatra.

2.2. Carcharhinus sealei. ZMH 103117 (ISH 145-1965): female, 855 mm TL (with two female embryos of 365 and 373 mm TL) and female, 875 mm TL, off Pakistan: 22°10′N, 68°34′E, RV “Meteor” station 230a/65, Indian Ocean Exped., 8 Mar. 1965, 45–56 m deep, Kutter Trawl, uncataloged material: juvenile male, 530 mm TL, Sokotra Islands: 12°39′N, 53°27′E–12°36′N, 53°20′2″E, RV “Vityaz” cruise 17 station 2567, 28 Oct. 1988, 41–43 m deep, BOT 30 m. Adult male, 850 mm TL, Sokotra Islands: 12°04.8′N, 53°12.6′E–12°09.2′N, 53°10.1′E, RV “Vityaz” cruise 17 station 2829, 15 Jan. 1989, 36–40 m deep, 29 m-Shrimp Trawl.

2.3. Hemigaleus microstoma. ZMH 120307 (ISH 57-1982): juvenile male, 540 mm TL, Indonesia: Moyo Island: 28°42.88′N, 48°26.30′E–28°44.07′N, 48°27.64′E, 24 Apr. 1995.

2.4. Paragaleus randalli. Paratype ZMH 103119 (ISH 150-1965): adolescent male, 590 mm TL, Arabian Sea: 22°01′-02′N, 68°10′-15′E, RV “Meteor” station 229a/65, Indian Ocean Exped., 7 Mar. 1965, 88–94 m deep. Paratype SMF 28109: adult male, 685 mm TL, Arabian Gulf: Kuwait: 28°42.88′N, 48°26.30′E–28°44.07′N, 48°27.64′E, 24 Apr. 1995.

2.5. Sphyrna lewini. ZMH 5326: female postembryo 385 mm TL, female postembryo 410 mm TL and female postembryo 415 mm TL, Thailand: Kokra, RV “Meteor”, 14 May 1966, 25 m deep, Trawl. ZMH 10212: juvenile male, 473 mm TL, China: Prov. Fokien, 12 Dec. 1905, Cons. G. Siemssen. ZMH 22417: head only, width of cephahlofoil: 223 mm, Gold Coast: Lahou, 14 Mar. 1929. ZMH 25482: female postembryo, 329 mm TL and female postembryo, 356 mm TL, Tonga, Palze. ZMH 101459 (ISH 139-1962): juvenile female, 510 mm TL, Guinea: 8°50′–9°47′N, 13°38′–14°05′W, fishing boat “Hilda”, Oct./Nov. 1962, 13–40 m deep, Bottom Trawl. ZMH 101553 (ISH 201-1963): female embryo 188 mm TL, female embryo 198 mm TL, female embryo 203 mm TL, male embryo 197 mm TL, male embryo 204 mm TL, male embryo 205 mm TL and male embryo 206 mm TL, Guinea: Conakry: 09°45′N, 14°05′W, fishing boat “Hilda”, 4 Feb. 1963, 10–13 m deep, Kutter Trawl. ZMH 104704 (ISH 1019-1966): juvenile male, 563 mm TL, South Brasil: 32°45′S, 51°02′W, RV “Walter Herwig” station 218/66, 10 Jun. 1966, 75 m deep, 140′-Ground Trawl. ZMH 113340 (ISH 266–1975): juvenile male, 1060 mm TL, Pacific: North Mexico: 24°02′N, 111°04′W, RV “Weser” station 187, 6 Jan. 1975, 70 m deep, Bottom Trawl. Uncataloged material: juvenile female, 615 mm TL, without data. juvenile female, 820 mm TL,
Northwest Madagascar: 12°34'2"S, 48°39'1''E, RV “Vityaz” cruise station 2591, 11 Nov. 1988, 53 m deep, BOT 30 m.

2.6. *Chiloscyllium arabicum*. ZMH 1370: juvenile male, 361 mm TL, Arabian Sea: India, Maharashtra State, off Alibag, German Indian Ocean Expedition, 25 Nov. 1955, v. Maydell. ZMH 1371: male postembryo, 115 mm TL, Arabian Sea: India, Karnataka State, North Kanara, off Karwar, German Indian Ocean Expedition, 14 Feb. 1956, v. Maydell. ZMH 25397 (ISH 1–1961): juvenile male, 320 mm TL, Arabian Sea: India, Maharashtra State, off Alibag, German Indian Ocean Expedition, 25 Nov. 1955, v. Maydell.

2.7. *Chiloscyllium griseum*. ZMH 1372: juvenile female, 175 mm TL, Arabian Sea: India, Maharashtra State, off Alibag, German Indian Ocean Expedition, 25 Nov. 1955, v. Maydell. ZMH 1373: juvenile male, 149 mm TL, Arabian Sea: India, Karnataka State, North Kanara, off Karwar, German Indian Ocean Expedition, 14 Feb. 1956, v. Maydell. Paralecotypes MNHN 1009: adult male, 453 mm TL, female, 520 mm TL and adult male, 548 mm TL, India: Kerala State, Malabar, Dussumier. Lectotype MNHN 1010: juvenile male, 374 mm TL, India: Kerala State, Malabar, Dussumier. Paralecotypes MNHN 1011: female, 524 mm TL, India: Kerala State, Malabar, Dussumier.

2.8. *Chiloscyllium indicum*. ZMH 5325: adult male, 415 mm TL, Thailand: Prachuap Khiri Khan, 13 Oct. 1965, 40 m deep, Trawl. ZMH 10121: female, 445 mm TL, Singapore.

2.9. *Chiloscyllium plagiosum*. ZMH 10115: female, 470 mm TL and female postembryo, 138 mm TL, China: Futschau, Fokien, 1 Jun. 1911, Cons. G. Siemssen. ZMH 10116: female, 555 mm TL (with abnormal caudal, first dorsal, and anal fin) and female, 580 mm TL, China: Futschau, Fokien, 1 Apr. 1905, Cons. G. Siemssen. ZMH 10117: juvenile male, 538 mm TL, China: Futschau, Fokien, 18 Dec. 1905, Cons. G. Siemssen. ZMH 10119: female, 499 mm TL, China: Canton. ZMH 10122: juvenile female, 267 mm TL, Manila, 1878. ZMH 22303: adult male, 650 mm TL, China: Futschau, Fokien, 1906, Cons. G. Siemssen. ZMH 22307: juvenile male, 447 mm TL, Bohol, 1874, Semper.

2.10. *Chiloscyllium punctatum*. ZMH 5324: juvenile male, 322 mm TL and juvenile female, 335 mm TL, Thailand: Prachuap Khiri Khan, 22 Nov. 1965, 40 m deep, Otter Trawl. ZMH 120168 (ISH 53–1982): semiaudiult male, 720 mm TL and adult female, 900 mm TL, Indonesia: South Java: 7°28'S, 109°12' E, RV "Jurong", 1981, 45 m deep, Bottom Trawl, T. Gloerfelt-Tarp.

Descriptions in literature were analyzed for a seventh species, *Paragaleus tenuis*. Morphometrics and meristics were done following Compagno [24] with very minor modifications. The habitus photographs were taken with a Nikon D90 and a Nikkor 18–105 mm zoom lens and afterwards reworked using Adobe Photoshop CS4 [23]. Detail photographs were taken using a Canon EOS 350D, a Tamron...
### Table 1: Classifications, numbers, and locations of the examined specimens from the Thai collection.

| Class          | Subclass       | Order          | Family         | Genus   | Species      | Number | Harbor |
|----------------|----------------|----------------|----------------|---------|--------------|--------|--------|
| Chondrichthyes | —              | Elasmobranchii | —              | —       | Carcharhinidae | —      | —      |
|                | —              | —              | Carcharhiniformes | —       | Carcharhinus | —      | —      |
|                | —              | —              | —              | —       | Carcharhinus dussumieri | 1 | PP |
|                | —              | —              | —              | —       | Hemigaleidae | —      | —      |
|                | —              | —              | —              | —       | Hemigaleus | microstoma | 1 | PP |
|                | —              | —              | —              | —       | Paragaleus | randalli | 1 | PP |
|                | —              | —              | —              | —       | Sphyrnidae | —      | —      |
|                | —              | —              | —              | —       | Sphyrna lewini | 2 | PP |
|                | —              | —              | —              | —       | Orectolobiformes | —      | —      |
|                | —              | —              | —              | —       | Chiloscyllium griseum | 2 | CA |
|                | —              | —              | —              | —       | —              | punctatum | 2 | PP |

28–200 mm zoom lens, and a Soligor Extension Tube. For verifying the tooth row counts, radiographs were taken of all specimens from the Thai collection with a 1979 launched MG 101 X-ray equipment for radiography by Philips.

### 3. Results

The nine examined Thai specimens represent six different shark species from two orders, four families, and five genera. Their classifications, numbers of individuals, and catch locations are shown in Table 1. The abbreviations of the harbors stand for CA: Cha-Am and PP: Pak Phanang.

The following species descriptions refer to the specimens from the Thai collection if not otherwise stated. However, the available comparative specimens were always checked for correspondence in the described characters.

Typical characteristics which proved to be important for the determination are provided, as well as comparisons with relevant literature and—in the case of more complex determination procedures—differences to similar species. Furthermore, comments about aberrations in the examined specimens from the descriptions in literature and possible mistakes or problems in the references including taxonomically problematic cases are given. These themes are not part of the conclusion chapter, but have been included directly in the results chapter to allow direct comparisons with the species descriptions. Three habitus photographs are shown for each of the nine examined specimens from the Thai collection. A distribution map is given for *Paragaleus randalli* due to the newly discovered occurrence. For distribution maps of the other examined species, see for example Compagno et al. [17]. Measurements of all nine specimens from the Thai collection can be found in Tables 2–10. A collection of 24 batoids from the same expedition was described by the author in a previous paper [25].

#### 3.1. Carcharhinus dussumieri (Müller and Henle) [14].

*Carcharhinus dussumieri* is a common, but heavily fished species, which is distributed from the Arabian Sea over the shelf areas of the northern and eastern Indian Ocean until South Japan in the north [17].

The specimen of *Carcharhinus dussumieri* (ZMH 25683) was caught by local fishermen in the Gulf of Thailand near Pak Phanang on the 7th December 1993. It is a 75 cm long male with fully developed claspers (Figure 2(c)) and thus can be considered to be adult. Following Compagno et al. [17], *Carcharhinus dussumieri* reaches a maximal total length of 100 cm.

Three habitus photographs of specimen ZMH 25683 are shown in Figure 2 and its measurements in Table 2. As described for this species by Last and Stevens [1], it has a conspicuous black tip to the second dorsal fin while all other fins do not have distinct markings (Figures 2(a), 2(b)). Additionally, the species has a low interdorsal and no lateral ridge on the tail stock, the first dorsal-fin origin is over, or slightly anterior to, the free rear tips of the pectoral fins and the second dorsal fin originates over, or usually a little bit behind, the anal fin origin [1].

The most obvious character, the dark tip to the second dorsal fin, is also present in diverse other species of the genus *Carcharhinus*, but there is only one further species, *Carcharhinus sealei* (Pietschmann) [26], in which all fins except the second dorsal fin are plain and without blotches [18].
However, contrary to *Carcharhinus sealei*, the teeth of the examined specimen have no cusplets and the first dorsal fin is triangular (Figure 2(a)), whereas it is falcate in *Carcharhinus sealei* [18]. Furthermore, the examined specimen has—as described for *Carcharhinus dussumieri* by Compagno [18]—semifalcate pectoral fins (Figure 2(a)), while those of *C. sealei* are strongly falcate. Additionally, the mouth width of the examined specimen is 6.9% of its total length. Following Compagno [18] the mouth width is 6.4 to 8.3% of total length in *Carcharhinus dussumieri*, whereas it is 4.2 to 6.6% in *C. sealei*.

The examined specimen ZMH 25683 has 26 tooth rows each in the upper and lower jaw. Last and Stevens [1] list 25 to 28 (seldom 24–31) tooth rows in the upper and also 25 to 28 (sometimes 22–32) in the lower jaw for *Carcharhinus dussumieri*. Fowler [27] specifies 24 to 25 tooth rows per jaw for this species. *Carcharhinus sealei* usually has 26 tooth rows in the upper and 25 rows in the lower jaw [28].

### 3.2. *Hemigaleus microstoma* Bleeker [29].

Despite the intensive commercial use of this species, populations are growing due to rapid reproduction rates. However, the known distribution area is patchy: it consists of the Red Sea, South India, parts of Southeast Asia, and East China [17].

The specimen of *Hemigaleus microstoma* (ZMH 25682) was caught by local fishermen in the Gulf of Thailand near Pak Phanang on the 7th December 1993. It is a mature male of 79 cm total length with fully developed claspers (Figure 3(b)). This corresponds with the description by Compagno et al. [17], after whom this species matures at about 60 cm total length and reaches a maximal length of 94 cm.

Three habitus photographs of specimen ZMH 25682 are shown in Figure 3 and its measurements in Table 3.

Contrary to the genera *Chaenogaleus* and *Hemipristis*, the cusps of the lower anterolateral teeth of all *Hemi- and Paragaleus* species do not protrude from the mouth and the gill slits are clearly shorter compared to the eye length [18]. In contrast to the species of the genus *Paragaleus*, both described *Hemigaleus* species have—following Compagno [18]—anterolateral teeth with short cusps in their upper jaws (Figure 4) as well as strongly falcate pelvic and dorsal fins and a falcate ventral lobe of the tail fin (Figure 5(a–d)).

Additionally, the two species of *Hemigaleus* have 6 to 20 tooth rows more in the lower than in the upper jaw, whereas all *Paragaleus* species have between one less and five more.

The examined specimen has 25 tooth rows in the upper and 37 rows in the lower jaw. Due to the lateral white blotches on its body (Figure 3(c)) and the white margins of the dorsal and pelvic fins as well as the anal fin and the ventral part of the caudal fin (Figure 5(a–d)), the examined specimen was determined as *Hemigaleus microstoma*, which has about 32 tooth rows in the upper jaw according to Fowler [27]. The other species of *Hemigaleus*, *H. australiensis* White, Last and Compagno [30], has a plain body and, instead of the white fin margins, a second dorsal and caudal fin with dark margins and tips [17].

### 3.3. *Paragaleus randalli* Compagno, Krupp and Carpenter [31]. *Paragaleus randalli* is an inshore species, which lives in shallow water to 18 m depth on the continental shelf. Abundance and commercial use are unknown. The known distribution area includes only few small regions in the northern Indian Ocean, which partially are far away from each other: the Arabian Gulf, the Gulf of Oman, India, and Sri Lanka [17].

The specimen of *Paragaleus randalli* (ZMH 25681) was caught by local fishermen in the Gulf of Thailand near Pak Phanang on the 7th December 1993. Therefore, this specimen was caught about 2000 km more easterly than the former easternmost record from East India. The fully developed
Three claspers (Figure 6(a)) of the 75 cm long specimen show that it is mature, which corresponds with the total length of at least 81 cm and maturing size of 60–70 cm, which are mentioned by Compagno et al. [17].

Three habitus photographs of specimen ZMH 25681 are shown in Figure 6. A distribution map for Paragaleus randalli is pictured in Figure 7, in which the distribution area after Compagno et al. [17] is marked in red and white stripes and the catch location of specimen ZMH 25681 as a blue spot. Its measurements can be found in Table 4.

The distribution map for Paragaleus randalli was generated using ArcMap 9.3.1 [20] and based on the shapefiles supplied by ESRI for the ArcExplorer-Java Edition for Education 2.3.2 (AEJEE) [22]. The distribution area and catch location were drawn with Adobe Photoshop CS4 [23].

Contrary to the genera Chaenogaleus and Hemipristis, the cusps of the lower anterolateral teeth of all Para-and Hemigaleus species do not protrude from the mouth (Figure 6(c)), and the gill slits are clearly shorter compared to the eye length [18]. The examined specimen differs from the genus Hemigaleus—following Compagno [18]—in having anterolateral upper teeth with long cusps (Figure 8(a)), whereas they have short cusps in both Hemigaleus species. Additionally, the pelvic and dorsal fins and the ventral lobe of the caudal fin are not falcate in the examined specimen (Figure 6(c)), while these fins are falcate in Hemigaleus [18]. A further character that classifies the examined individual clearly to the genus Para-and not Hemigaleus is the number of tooth rows: the examined specimen has 29 tooth rows each in the upper and lower jaw. According to Compagno [18], the genus Paragaleus possesses one less to five more tooth rows in the upper than in the lower jaw, whereas there are 6 to 20 tooth rows more in the upper than in the lower jaw in Hemigaleus.

The examined specimen was determined as Paragaleus randalli because its second dorsal fin and the dorsal lobe of the caudal fin have light margins (Figure 6(b)), which is not present in any other species of the genus following Compagno et al. [17]. Furthermore, the examined specimen has two narrow black lines ventrally on the snout (Figure 6(a)). According to Compagno et al. [17], the only Paragaleus species that have such lines are P. randalli and P. tengi (Chen) [32]. The studied specimen was not determined as Paragaleus tengi because it has—like described for P. randalli by Compagno et al. [31]—a long and narrowly rounded prenarial snout, whereas it is rounded in P. tengi and has clearly larger pectoral fins than those described for P. tengi (Figure 6(a)).
The ratio length of the longest gill slit to the eye length is 1.2 in the examined specimen. According to Compagno et al. [17], this ratio would be suggestive of *Paragaleus tengi*, because they specify a ratio of 1.2 to 1.3 for *P. tengi* and about 1 for *P. randalli*. However, when analyzing the original description of *Paragaleus randalli* [31], one can see that already in only 14 measured specimens the longest gill slit is between 0.9 and 1.3 times as long as the eye of the respective animal. Accordingly, the specimen ZMH 25681 is in line with *Paragaleus randalli* even in this character and the information in Compagno et al. [17] should be extended correspondingly.

The fact that male *Paragaleus tengi* specimens mature not until 78–88 cm total length [17] is another criterion for the exclusion of *P. tengi* in the determination of the 75 cm long mature Thai specimen.

As already mentioned, the examined specimen of *Paragaleus randalli* (ZMH 25681) has 29 tooth rows per jaw. Following Compagno et al. [31], this species has 28–30 rows in the upper and 28–33 in the lower jaw. *Paragaleus tengi*, in contrast, has 26 tooth rows in the upper and 27 in the lower jaw [32].

It appears that the drawing of a left, anterolateral tooth from the upper jaw of the paratype SMF 28109 of *Paragaleus randalli* (Figure 8(b), white arrow) in the original description [31] and, therefore, also in Compagno et al. [17] is inaccurate: the drawn tooth looks similar to the anterolateral teeth of *Hemigaleus microstoma* (Figure 4) due to its short cusp, which is much shorter than in the examined specimen ZMH 25681 (Figure 8(a), white arrow). The examination of paratype SMF 28109 proved that the cusps are not really...
shorter than in specimen ZMH 25681. Possibly a blunt tooth was drawn by Compagno et al. [31], because the intact teeth have clearly longer cusps than in their drawing. Hence, their morphology is very similar to that of the teeth of the examined specimen ZMH 25681 (Figure 8(a)) as well as to that of the teeth of paratype ZMH 103119 (ISH 150-1965), which was also examined by way of comparison.

A comparison of the upper teeth of the mentioned Paragaleus randalli specimens with the tooth drawings in the original description of *P. tengu* [32] reveals conspicuous morphological differences because the drawn upper teeth of *P. tengu* hardly bear cusplets (Figure 9). However, the photograph of upper teeth of *Paragaleus tengu* in Compagno [33] indicates that the drawing of Chen [32] is apparently imprecise, because the teeth pictured in Compagno [33] do have distinct cusplets (Figure 10) and, hence, look very similar to those of *P. randalli*.

The posterior margins of the lateral blades of head are arching posterolaterally in the examined specimens as described for *Sphyrna lewini* by Compagno [18]. As typical for this species following Compagno et al. [17], the broadly arched and narrow-bladed head of the examined specimens has a central notch and two smaller lateral indentations (Figures 11(a), 11(c), 11(d), and 12(b)). Further characteristics according to Compagno et al. [17] are the only moderately high first dorsal fin and the dark-tipped lower caudal fin lobe, second dorsal fin, and pectoral fins (Figures 11(b), 11(d)).

Both examined specimens (ZMH 25679 and ZMH 25680) have 33 tooth rows each in their upper and in their lower jaws. Last and Stevens [1] list 32 to 33 (seldom 32 to 36) for the upper and 31 to 33 (sometimes 30 to 34) for the lower jaw of *Sphyrna lewini*. Following Bass et al. [35], this species has 32 tooth rows in the upper and 31–33 rows in the lower jaw.

3.4. *Sphyrna lewini* (Griffith and Smith) [34]. *Sphyrna lewini* can be found in shelf regions as well as adjacent deep water areas to over 275 m depth. However, this species lives mainly inshore. It is found worldwide in all warm temperate and tropical seas. Although it is still common and widespread, it is extremely heavily fished in most regions [17] so that, without catch limitations, strong population decreases can be expected.

The two specimens of *Sphyrna lewini* (ZMH 25679 and ZMH 25680) were caught by local fishermen in the Gulf of Thailand near Pak Phanang on the 7th December 1993. Considering the maximal total length of 420 cm and the size at birth of 42 to 55 cm of this species [17], the two examined specimens with total lengths of 51.3 cm and 58 cm, respectively, are young juveniles caught shortly after birth.

Three habitus photographs of each of the specimens ZMH 25679 and ZMH 25680 are shown in Figures 11 and 12 and their measurements in Tables 5 and 6.

3.5. *Chiloscyllium griseum* Müller and Henle [14]. Chiloscyllium griseum is an inshore and quite common shark species that lives on rocks and in lagoons from 5 to 80 m depth. Its distribution area ranges from Pakistan and India over most parts of Southeast Asia to Papua New Guinea in the south and East China and South Japan in the north [17].

The two specimens of *Chiloscyllium griseum* (ZMH 25675 and ZMH 25676) were caught by local fishermen in the Gulf of Thailand near Cha-Am in about 30 m depth on the 5th December 1993. The maximal total length of *Chiloscyllium griseum* is about 77 cm, and the males mature at a total length of about 45 cm [17]. Hence, the two examined specimens with total lengths of 56 cm and 59.5 cm, respectively, are probably adult.

Three habitus photographs of each of the specimens ZMH 25675 and ZMH 25676 are shown in Figure 13 and their measurements in Tables 7 and 8.

Contrary to the similar species *Chiloscyllium arabicum* Gubanov [36], the two examined specimens have faded...
stripes on their caudal fin and the base of the second dorsal fin is not longer than that of the first dorsal fin (Figures 13(b), 13(c), and 13(f)). The rudimentary dark and light bands clearly show that the two examined specimens do not belong to *Chiloscyllium arabicum* because this species is plain-colored in all stages without any color patterns. Additionally, *Chiloscyllium arabicum* has only been reported from the northwestern Indian Ocean, from the Persian Gulf to the western coast of India [17]. A striped pattern of alternating dark and light bands (which is very distinct in juveniles but pales almost completely into plain brown or gray when maturing) is only present in three species of *Chiloscyllium*: *C. griseum*, *C. hasseltii* Bleeker [29], and *C. punctatum* Müller and Henle [14]. Of these species *Chiloscyllium punctatum* can be excluded from the determination of the two examined specimens because in this species the posterior margins of the dorsal fins are concave and the free rear tips are elongated [37], whereas in the specimens ZMH 25675 and ZMH 25676 the dorsal fins have convex posterior margins and not elongated free rear tips (Figures 13(c), 13(d)).

The two examined specimens differ from *Chiloscyllium hasseltii* in having only pale dark bands compared to the light bands as well as broader and, therefore, fewer light bands. In *Chiloscyllium hasseltii* the dark bands are more distinct and black edged and there are more and narrower light bands [19]. Furthermore, the height of the first dorsal fin is 7.8% of total length in specimen ZMH 25675 and 7.2% in ZMH 25676. Following Dingerkus and DeFino [37] and Gloerfelt-Tarp and Kailola [38], this ratio is over 6.6% in *Chiloscyllium griseum* and less than that in *C. hasseltii*. Additionally, the height of the second dorsal fin compared to the total length is 6.3% in ZMH 25675 and 6.1% in ZMH 25676. This ratio is over 5.8% in *Chiloscyllium griseum* and less than 5.8% in *C. hasseltii* [37, 38]. The same values for these two ratios are given by Compagno [19] in his key to species. However, in his detailed descriptions of both species the values for the first and second dorsal fins are interchanged in each species because the height of the first dorsal fin is specified as being smaller than that of the second one. In the Thai and comparative specimens as well as following Compagno et al. [17], Compagno [24] and Dingerkus and DeFino [37], the first dorsal fins are higher than the second ones in both species.

The third proportion mentioned by Compagno [19] is the ratio between the interdorsal space and the total length. In specimen ZMH 25675 this ratio is 7.3% and in ZMH 25676 it is 7.9%. Compagno [19] lists a ratio of 8.7–11.5% for *Chiloscyllium griseum* and 6.6–11.1% for *C. hasseltii*. Therefore, both examined specimens are rather accord with the description of *Chiloscyllium hasseltii* than with that of *C. griseum* regarding this ratio. However, this proportion seems to be rather insignificant due to its high margin of variation.

In contrast to Compagno [19], who indicates that the base of the first dorsal fin is longer than that of the second one in *Chiloscyllium griseum*, the bases of both fins are about equal in length in each of the two examined specimens. The only species of *Chiloscyllium*, in which the first dorsal fin base is not longer than the second one, are *C. arabicum* and *C. punctatum*, which can be excluded from the determination due to the earlier mentioned differences. In *Chiloscyllium arabicum* the base of the second dorsal fin is even longer than that of the first one [17, 19, 24].

Although the dorsal ridges of *Chiloscyllium griseum* are not prominent following Compagno [19, 24] or even absent after Compagno et al. [17], both examined specimens have distinct pre—and interdorsal ridges. The *Chiloscyllium griseum* specimens which were examined by way of comparison also have quite prominent to prominent ridges pre—and interdorsally. According to Compagno [19, 24]...
Figure 10: *Paragaleus tengi*. Teeth from the left upper jaw after Compagno [33].

Figure 11: *Sphyrna lewini* (a)–(c) ZMH 25679: (a) dorsal view, (b) lateral view, (c) ventral view. Scale bar (a)–(c) 5 cm. (d) ZMH 25680: dorsal view. Scale bar (d) 5 cm.

Figure 12: *Sphyrna lewini*, ZMH 25680: (a) lateral view, (b) ventral view. Scale bar (a)–(b) 5 cm.
and Compagno et al. [17], only *Chiloscyllium arabicum*, *C. indicum*, and *C. plagiosum* have prominent dorsal ridges but these species can be excluded from the determination of the examined Thai specimens by means of other, unambiguous differences. Dingerkus and DeFino [37] specify the dorsal ridges of *Chiloscyllium griseum* at least as quite prominent, but slightly less pronounced than in *C. arabicum*.

One highly unusual character can be found in the specimen ZMH 25676, which has a very big ocellar blotch on the head (Figure 13(f)). Such a blotch has not been described before for a species of the genus *Chiloscyllium* and is probably the remains of an untypical juvenile color pattern.

Specimen ZMH 25675 has 29 tooth rows in the upper and 27 rows in the lower jaw, specimen ZMH 25676 has 31 and 27 tooth rows. Fowler [27] lists 30 to 32 tooth rows per jaw for *Chiloscyllium griseum*.

3.6. *Chiloscyllium punctatum* Müller and Henle [14]. *Chiloscyllium punctatum* lives in coral reefs and, possibly, also in offshore soft bottoms to at least 85 m depth. Its distribution area ranges from East India over most parts of Southeast Asia to the whole northern coast of Australia in the south and East China and South Japan in the north [17].

The two specimens of *Chiloscyllium punctatum* (ZMH 25677 and ZMH 25678) were caught by local fishermen in the Gulf of Thailand near Pak Phanang on the 7th December 1993. Last and Stevens [1] list a maximal total length of at least 132 cm (144 cm in captivity) with the males maturing at 82 cm and the females at 87 cm total length. Accordingly, both examined specimens with total lengths of 56 cm and 61.7 cm, respectively, have to be considered as juveniles. This is also evidenced by the not-yet-well-developed claspers of the male specimen ZMH 25678 (Figure 14(f)).

Three habitus photographs of each of the specimens ZMH 25677 and ZMH 25678 are shown in Figure 14 and their measurements in Tables 9 and 10.

As described for *Chiloscyllium punctatum* by Last and Stevens [1]—and contrary to all other species of the genus—the examined specimens have dorsal fins with concave posterior margins and elongated free rear tips (Figures 14(b), 14(e)). Additionally, following Last and Stevens [1], the origin of the first dorsal fin is situated far anteriorly (over the anterior base of the pelvic fins), the bases of both dorsal fins are about equal in length, there are no lateral ridges on the body and the origin of the anal fin is situated about under or slightly behind the free rear tip of the second dorsal fin (Figures 14(b), 14(e)).

Figure 13: *Chiloscyllium griseum*: (a)–(c) ZMH 25675: (a) ventral view, (b) dorsal view, (c) lateral view. Scale bar (a)–(c) 5 cm. (d)–(f) ZMH 25676: (d) lateral view, (e) ventral view, (f) dorsal view. Scale bar (d)–(f) 5 cm.
Both examined specimens show faded alternating dark and bright bands, which are remains of the distinct juvenile color pattern of this species (Figures 14(a), 14(b), 14(d), and 14(e)). Additionally, both specimens—especially specimen ZMH 25677—have black spots on the body (Figures 14(a), 14(b), 14(d), and 14(e)) as typical for older juveniles of the species following Dingerkus and DeFino [37]. Adult specimens of *Chiloscyllium punctatum* are almost plain brown, similar to those of *C. arabicum*, *C. griseum*, and *C. hasseltii* [37].

Specimen ZMH 25677 has 32 tooth rows in the upper and 31 in the lower jaw, and specimen ZMH 25678 has 31 and 30 tooth rows. Last and Stevens [1] specify between 31 and 33 tooth rows for the upper and 30 to 33 for the lower jaw of *Chiloscyllium punctatum*. Fowler [27] lists 30 tooth rows for the upper and 28 rows for the lower jaw of this species.

### 4. Conclusion

The results provide several new findings regarding the taxonomy and distribution of the examined species. Additionally, inaccuracies and errors from different references are described and clarified. As 26 to 73 million sharks get caught in commercial fishery each year [39], it is very important to improve our knowledge about these animals. In order to find out which species are particularly used commercially, it is very important to be able to identify the species quickly and accurately. A reliable determination is essential for effective protection and management programs. As mentioned before, detailed morphological information is scarce for several species due to the partially sketchy original descriptions like those by Müller and Henle [14]. Detailed morphological, morphometrical, and meristical descriptions as well as meaningful and detailed drawings are usually missing in their descriptions. Additionally, the margin of variation of a character or ratio in one species is often not fully known, as detected for example in *Paragaleus randalli*. Furthermore, extensive data about the abundance and the conservation status are not available for almost half of all Elasmobranchii [40]. The disagreement about the exact number of known cartilaginous fish species (1168 according to Fowler et al. [2], 1115 after Camhi et al. [40], over 1200 following Last and Stevens [1]) as well as the many newly described species in recent years [1, 10–13] also shows that there is still a huge need for further taxonomic and systematic research in sharks.

The knowledge deficits revealed in this study are, at least partially, based on short and imprecise original descriptions.
Table 2: Measurements of *Carcharhinus dussumieri*, ZMH 25683. Weight: 1831 g, sex: male.

| Measurement                                      | [mm] | [%TL] |
|--------------------------------------------------|------|-------|
| TL, total length                                 | 750  | 100.0 |
| FOR, fork length                                 | 614  | 81.9  |
| PRC, precaudal length                            | 555  | 74.0  |
| PD2, pre-D2-length                               | 458  | 61.1  |
| PD1, pre-D1-length                               | 250  | 33.3  |
| HDL, head length                                 | 160  | 21.3  |
| PG1, prebranchial length                         | 121  | 16.1  |
| PDP, prespiracular length                        | —    | —     |
| POB, preorbital length                           | 59   | 7.9   |
| PP1, prepectoral length                          | 147  | 19.6  |
| PP2, prepelvic length                            | 325  | 43.3  |
| SVL, snout—anterior vent length                  | 343  | 45.7  |
| PAL, preanal fin length                           | 457  | 60.9  |
| IDS, interdorsal space                           | 181  | 24.1  |
| DCS, dorsal (D2)—caudal space                    | 62   | 8.3   |
| PPS, pectoral—pelvic space                       | 152  | 20.3  |
| PAS, pelvic—anal space                           | 82   | 10.9  |
| ACS, anal—caudal space                           | 59   | 7.9   |
| PCA, pelvic—caudal space                         | 193  | 25.7  |
| VCL, anterior vent—caudal tip l.                 | 400  | 53.3  |
| PRN, prenarial length                            | 22   | 2.9   |
| POR, preoral length                              | 45   | 6.0   |
| EYL, eye length                                  | 16.4 | 2.2   |
| EYH, eye height                                  | 13.6 | 1.8   |
| ING, intergill length 1st to last slit           | 38   | 5.1   |
| GS1, 1st gill slit height (unspread)             | 17   | 2.3   |
| GS2, 2nd gill slit height                        | 20   | 2.7   |
| GS3, 3rd gill slit height                        | 21   | 2.8   |
| GS4, 4th gill slit height                        | 20.3 | 2.7   |
| GS5, 5th gill slit height                        | 14   | 1.9   |
| P1A, pectoral anterior margin l.                 | 118  | 15.7  |
| P1B, pectoral base length                        | 41   | 5.5   |
| P1I, pectoral inner margin length                | 44   | 5.9   |
| P1P, pectoral posterior margin length            | 90   | 12.0  |
| P1H, pectoral height (base end to tip)           | 99   | 13.2  |
| P1L, pec. length (ant. base to post. tip)        | 79   | 10.5  |
| SOD, subocular pocket depth                      | 6    | 0.8   |
| CDM, dorsal caudal margin length                 | 190  | 25.3  |
| CPV, preventral caudal margin length             | 92.5 | 12.3  |
| CPU, upper postventral C margin l.               | 88   | 11.7  |
| CPL, lower postventral C margin l.               | 40   | 5.3   |
| CFW, caudal fork width                           | 54   | 7.2   |
| CFL, caudal fork length                          | 59   | 7.9   |
| CST, subterminal C margin length                 | 19   | 2.5   |
| CSW, subterminal caudal width                    | 18   | 2.4   |
| CTR, terminal caudal margin length               | 41   | 5.5   |
| CTL, terminal caudal lobe length                 | 53   | 7.1   |
| D1L, D1 total length                             | 118  | 15.7  |

Table 2: Continued.

| Measurement                                      | [mm] | [%TL] |
|--------------------------------------------------|------|-------|
| D1A, D1 anterior margin length                   | 120  | 16.0  |
| D1B, D1 base length                              | 78   | 10.4  |
| D1H, D1 vertical height                          | 73   | 9.7   |
| D1I, D1 inner margin length                      | 39   | 5.2   |
| D1P, D1 posterior margin length                  | 74   | 9.9   |
| D2L, D2 total length                             | 76   | 10.1  |
| D2A, D2 anterior margin length                   | 47   | 6.3   |
| D2B, D2 base length                              | 44   | 5.9   |
| D2H, D2 vertical height                          | 26   | 3.5   |
| D2I, D2 inner margin length                      | 31   | 4.1   |
| D2P, D2 posterior margin length                  | 42   | 5.6   |
| P2L, pelvic total length                         | 70   | 9.3   |
| P2A, pelvic anterior margin length               | 51.5 | 6.9   |
| P2B, pelvic base length                          | 39   | 5.2   |
| P2H, pelvic height = max. width                  | 34   | 4.5   |
| P2I, pelvic inner margin length                  | 22   | 2.9   |
| P2P, pelvic posterior margin length              | 39   | 5.2   |
| ANL, anal fin total length                       | 73   | 9.7   |
| ANA, anal fin anterior margin length             | 46   | 6.1   |
| ANB, anal fin base length                        | 41   | 5.5   |
| ANH, anal fin vertical height                    | 24   | 3.2   |
| ANI, anal fin inner margin length                | 33   | 4.4   |
| ANP, anal fin posterior margin l.                | 39.5 | 5.3   |
| HDH, head height at P origin                     | 80   | 10.7  |
| TRH, trunk height at P base end                  | 87   | 11.6  |
| ABH, abdomen height at D1B end                   | 100  | 13.3  |
|TAH, tail height at pelvic base end               | 68   | 9.1   |
| CPH, caudal peduncle height                      | 29   | 3.9   |
| DPI, D1 midpoint—pectoral base end               | 70   | 9.3   |
| DPO, D1 midpoint—pelvic origin                   | 70   | 9.3   |
| PDI, pelvic midpoint—D1 base end                 | 70   | 9.3   |
| PDO, pelvic midpoint—D2 origin                   | 110  | 14.7  |
| DAO, D2 origin—anal fin origin                   | 3    | 0.4   |
| DAI, D2 base end—anal base end                   | 5    | 0.7   |
| MOL, mouth length (arc radius)                   | 35   | 4.7   |
| MOW, mouth width                                 | 50   | 6.7   |
| ULA, upper labial furrow length                  | —    | —     |
| LLA, lower labial furrow length                  | —    | —     |
| NOW, nostril width                               | 12   | 1.6   |
| INW, internarial width                           | 30.5 | 4.1   |
| ANF, anterior nasal flap length                  | 3.5  | 0.5   |
| INO, interorbital space, "bony"                 | 60   | 8.0   |
| SPL, spiracle length                             | —    | —     |
| ESL, eye—spiracle space                         | —    | —     |
| HDW, head width at middle gill slits             | 79   | 10.5  |
| TRW, trunk width at P base ends                  | 76   | 10.1  |
| ABW, abdomen width at D1B end                    | 67   | 8.9   |
| TAW, tail width at pelvic base ends              | 54   | 7.2   |
| CPW, C peduncle width at C origin                | 25   | 3.3   |
| CLO, clasper outer margin length                 | 73   | 9.7   |
| CLI, clasper inner margin length                 | 78   | 10.4  |
| CLB, clasper base width                          | 10   | 1.3   |
| Barbel length                                    | —    | —     |
| Width of cephalofoil                             | —    | —     |
Table 3: Measurements of *Hemigaleus microstoma*, ZMH 25682. Weight: 1490 g, sex: male.

| Measurement                          | [mm] | [%TL] |
|--------------------------------------|------|-------|
| TL, total length                     | 790  | 100.0 |
| FOR, fork length                     | 660  | 83.5  |
| PRC, precaudal length                | 605  | 76.6  |
| PD2, pre-D2-length                   | 475  | 60.1  |
| PD1, pre-D1-length                   | 220  | 27.8  |
| HDL, head length                     | 155  | 19.6  |
| PG1, prebranchial length             | 119  | 15.1  |
| PDP, prespiracular length            | 80   | 10.1  |
| POB, preorbital length               | 56   | 7.1   |
| PP1, prepectoral length              | 146  | 18.5  |
| PP2, prepelvic length                | 340  | 43.0  |
| SVL, snout—anteorterior vent length  | 355  | 44.9  |
| PAL, preanal fin length               | 490  | 62.0  |
| IDS, interdorsal space               | 205  | 25.9  |
| DCS, dorsal (D2)—caudal space        | 76   | 9.6   |
| PPS, pectoral—pelvic space           | 190  | 24.1  |
| PAS, pelvic—anal space               | 120  | 15.2  |
| ACS, anal—caudal space               | 72   | 9.1   |
| PCA, pelvic—caudal space             | 220  | 27.8  |
| VCL, anterior vent—caudal tip l.     | 435  | 55.1  |
| PRN, prenarial length                | 25   | 3.2   |
| POR, preoral length                  | 54   | 6.8   |
| EYL, eye length                      | 20   | 2.5   |
| EYH, eye height                      | 16   | 2.0   |
| ING, intergill length 1st to last slit| 37 | 4.7    |
| GS1, 1st gill slit height (unspread) | 22   | 2.8   |
| GS2, 2nd gill slit height            | 25   | 3.2   |
| GS3, 3rd gill slit height            | 24   | 3.0   |
| GS4, 4th gill slit height            | 23   | 2.9   |
| GS5, 5th gill slit height            | 17   | 2.2   |
| P1A, pectoral anterior margin l.     | 119  | 15.1  |
| P1B, pectoral base length            | 34   | 4.3   |
| P1I, pectoral inner margin length    | 37   | 4.7   |
| P1P, pectoral posterior margin       | 82   | 10.4  |
| P1H, pectoral height (base end to tip)| 100 | 12.7  |
| P1L, pec. length (ant. base to post. tip)| 68 | 8.6    |
| SOD, subocular pocket depth          | 6    | 0.8   |
| CDM, dorsal caudal margin length     | 178  | 22.5  |
| CPV, preventral caudal margin length | 84   | 10.6  |
| CPU, upper postventral C margin l.   | 79.5 | 10.1  |
| CPL, lower postventral C margin l.   | 33   | 4.2   |
| CFW, caudal fork width               | 42   | 5.3   |
| CFL, caudal fork length              | 54   | 6.8   |
| CST, subterminal C margin length     | 21   | 2.7   |
| CSW, subterminal caudal width        | 16   | 2.0   |
| CTR, terminal caudal margin length   | 44   | 5.6   |
| CTL, terminal caudal lobe length     | 58   | 7.3   |
| D1L, D1 total length                 | 110  | 13.9  |

Table 3: Continued.

| Measurement                          | [mm] | [%TL] |
|--------------------------------------|------|-------|
| D1A, D1 anterior margin length       | 118  | 14.9  |
| D1B, D1 base length                  | 82   | 10.4  |
| D1H, D1 vertical height              | 60   | 7.6   |
| D1I, D1 inner margin length          | 25.5 | 3.2   |
| D1P, D1 posterior margin length      | 55   | 7.0   |
| D2L, D2 total length                 | 78   | 9.9   |
| D2A, D2 anterior margin length       | 67   | 8.5   |
| D2B, D2 base length                  | 56   | 7.1   |
| D2H, D2 vertical height              | 38   | 4.8   |
| D2I, D2 inner margin length          | 22   | 2.8   |
| D2P, D2 posterior margin length      | 41   | 5.2   |
| P2L, pelvic total length             | 68   | 8.6   |
| P2A, pelvic anterior margin length   | 65   | 8.2   |
| P2B, pelvic base length              | 43   | 5.4   |
| P2H, pelvic height = max. width      | 41   | 5.2   |
| P2I, pelvic inner margin length      | 27   | 3.4   |
| P2P, pelvic posterior margin length  | 40   | 5.1   |
| ANL, anal fin total length           | 62   | 7.8   |
| ANA, anal fin anterior margin length | 52   | 6.6   |
| ANB, anal fin base length            | 44   | 5.6   |
| ANH, anal fin vertical height        | 29   | 3.7   |
| ANI, anal fin inner margin length    | 19   | 2.4   |
| ANP, anal fin posterior margin l.    | 30   | 3.8   |
| HDH, head height at P origin         | 69   | 8.7   |
| TRH, trunk height at P base end      | 79   | 10.0  |
| ABH, abdomen height at D1B end       | 86   | 10.9  |
| TAH, tail height at pelvic base end  | 56   | 7.1   |
| CPH, caudal peduncle height          | 22.5 | 2.8   |
| DPI, D1 midpoint—pectoral base end   | 90   | 11.4  |
| DPO, D1 midpoint—pelvic origin       | 78   | 9.9   |
| PDI, pelvic midpoint—D1 base end     | 85   | 10.8  |
| PDO, pelvic midpoint—D2 origin       | 112  | 14.2  |
| DAO, D2 origin—anal fin origin       | 10   | 1.3   |
| DAI, D2 base end—anal base end       | 2    | 0.3   |
| MOL, mouth length (arc radius)       | 16   | 2.0   |
| MOW, mouth width                     | 44   | 5.6   |
| ULA, upper labial furrow length      | 12   | 1.5   |
| LLA, lower labial furrow length      | 7.8  | 1.0   |
| NOW, nostril width                   | 14.5 | 1.8   |
| INW, internarial width               | 29   | 3.7   |
| ANF, anterior nasal flap length      | 5.3  | 0.7   |
| INO, interorbital space, "bony"     | 48   | 6.1   |
| SPL, spiracle length                 | 2    | 0.3   |
| ESL, eye—spiracle space              | 8    | 1.0   |
| HDW, head width at middle gill slits | 63   | 8.0   |
| TRW, trunk width at P base ends      | 68   | 8.6   |
| ABW, abdomen width at D1B end        | 61   | 7.7   |
| TAW, tail width at pelvic base ends  | 52   | 6.6   |
| CPW, C peduncle width at C origin    | 17.5 | 2.2   |
| CLO, clasper outer margin length     | 56   | 7.1   |
| CLI, clasper inner margin length     | 63   | 8.0   |
| CLB, clasper base width              | 8    | 1.0   |
| Barbel length                        | —    | —     |
| Width of cephalofoil                 | —    | —     |
Table 4: Measurements of *Paragaleus randalli*, ZMH 25681. Weight: 1026 g, sex: male.

| Measurement                      | mm         | [%TL]  |
|----------------------------------|------------|--------|
| TL, total length                 | 750        | 100.0  |
| FOR, fork length                 | 620        | 82.7   |
| PRC, precaudal length            | 570        | 76.0   |
| PD2, pre-D2-length               | 450        | 60.0   |
| PD1, pre-D1-length               | 215        | 28.7   |
| HDL, head height                 | 150        | 20.0   |
| PG1, prebranchial length         | 111        | 14.8   |
| PDP, prespiracular length        | 75         | 10.0   |
| POB, preorbital length           | 52.5       | 7.0    |
| PP1, prepectoral length          | 140        | 18.7   |
| PP2, prepelvic length            | 320        | 42.7   |
| SVL, snout—anterior vent length  | 335        | 44.7   |
| PAL, preanal fin length          | 470        | 62.7   |
| ID6, interdorsal space           | 195        | 26.0   |
| DCS, dorsal (D2)—caudal space   | 85         | 11.3   |
| PPS, pectoral—pelvic space       | 160        | 21.3   |
| PAS, pelvic—anal space           | 110        | 14.7   |
| ACS, anal—caudal space           | 75         | 10.0   |
| PCA, pelvic—caudal space         | 225        | 30.0   |
| VCL, anterior vent—caudal tip l. | 430        | 57.3   |
| PRN, prenarial length            | 32         | 4.3    |
| POR, preoral length              | 46.5       | 6.2    |
| EYL, eye length                  | 17         | 2.3    |
| EYH, eye height                  | 9.5        | 1.3    |
| ING, intergill length 1st to last slit | 38     | 5.1    |
| GS1, 1st gill slit height (unspread) | 17.5 | 2.3    |
| GS2, 2nd gill slit height        | 18.5       | 2.5    |
| GS3, 3rd gill slit height        | 21         | 2.8    |
| GS4, 4th gill slit height        | 21.5       | 2.9    |
| GS5, 5th gill slit height        | 17         | 2.3    |
| P1A, pectoral anterior margin l. | 93         | 12.4   |
| P1B, pectoral base length        | 30         | 4.0    |
| P1l, pectoral inner margin length| 38         | 5.1    |
| P1P, pectoral posterior margin l. | 55        | 7.3    |
| P1H, pectoral height (base end to tip) | 78    | 10.4   |
| P1L, pec. length (ant. base to post. tip) | 67   | 8.9    |
| SOD, subocular pocket depth      | 8.5        | 1.1    |
| CDM, dorsal caudal margin length | 165        | 22.0   |
| CPV, prevalent caudal margin length | 66    | 8.8    |
| CPU, upper postventral C margin l.| 77         | 10.3   |
| CPL, lower postventral C margin l.| 20         | 2.7    |
| CFW, caudal fork width           | 39         | 5.2    |
| CFL, caudal fork length          | 49.5       | 6.6    |
| CST, subterminal C margin length | 24         | 3.2    |
| CSW, subterminal caudal width    | 15.7       | 2.1    |
| CTR, terminal caudal margin length | 39       | 5.2    |
| CTL, terminal caudal lobe length | 53         | 7.1    |
| D1L, D1 total length             | 89         | 11.9   |

Table 4: Continued.

| Measurement                      | mm         | [%TL]  |
|----------------------------------|------------|--------|
| D1A, D1 anterior margin length   | 83         | 11.1   |
| D1B, D1 base length              | 67         | 8.9    |
| D1H, D1 vertical height          | 50         | 6.7    |
| D1I, D1 inner margin length      | 25         | 3.3    |
| D1P, D1 posterior margin length  | 59         | 7.9    |
| D2L, D2 total length             | 66         | 8.8    |
| D2A, D2 anterior margin length   | 52         | 6.9    |
| D2B, D2 base length              | 50         | 6.7    |
| D2H, D2 vertical height          | 32         | 4.3    |
| D2I, D2 inner margin length      | 21         | 2.8    |
| D2P, D2 posterior margin length  | 43.5       | 5.8    |
| P2L, pelvic total length         | 65         | 8.7    |
| P2A, pelvic anterior margin length | 56        | 7.5    |
| P2B, pelvic base length          | 37         | 4.9    |
| P2H, pelvic height = max. width  | 32         | 4.3    |
| P2I, pelvic inner margin length  | 17         | 2.3    |
| P2P, pelvic posterior margin length | 31      | 4.1    |
| ANL, anal fin total length       | 57         | 7.6    |
| ANA, anal fin anterior margin length | 44     | 5.9    |
| ANB, anal fin base length        | 40.5       | 5.4    |
| ANH, anal fin vertical height    | 22         | 2.9    |
| ANI, anal fin inner margin length| 18         | 2.4    |
| ANP, anal fin posterior margin l. | 25.5       | 3.4    |
| HDH, head height at P origin     | 63         | 8.4    |
| TRH, trunk height at P base end  | 72         | 9.6    |
| ABH, abdomen height at D1B end   | 71         | 9.5    |
| TAH, tail height at pelvic base end | 54     | 7.2    |
| CPH, caudal peduncle height      | 21         | 2.8    |
| DPI, D1 midpoint—pectoral base end | 75    | 10.0   |
| DPO, D1 midpoint—pelvic origin   | 73         | 9.7    |
| PDI, pelvic midlength—D1 base end | 70       | 9.3    |
| PDO, pelvic midpoint—D2 origin   | 122        | 16.3   |
| DAO, D2 origin—anal fin origin   | 8          | 1.1    |
| DAI, D2 base end—anal base end   | 1          | 0.1    |
| MOL, mouth length (arc radius)   | 18         | 2.4    |
| MOW, mouth width                 | 32         | 4.3    |
| ULA, upper labial furrow length  | 12         | 1.6    |
| LLA, lower labial furrow length  | 8          | 1.1    |
| NOW, nostril width               | 9          | 1.2    |
| INW, internarial width           | 23.5       | 3.1    |
| ANF, anterior nasal flap length  | 3.5        | 0.5    |
| INO, interorbital space, "bony" | 42         | 5.6    |
| SPL, spiracle length             | 1          | 0.1    |
| ESL, eye—spiracle space          | 7          | 0.9    |
| HDW, head width at middle gill slits | 52       | 6.9    |
| TRW, trunk width at P base ends  | 58         | 7.7    |
| ABW, abdomen width at D1B end    | 51         | 6.8    |
| TAW, tail width at pelvic base ends | 43    | 5.7    |
| CPW, C peduncle width at C origin | 16        | 2.1    |
| CLO, clasper outer margin length | 55         | 7.3    |
| CLI, clasper inner margin length | 61         | 8.1    |
| CLB, clasper base width          | 9          | 1.2    |
| Barbel length                    | —          | —      |
| Width of cephalofoil             | —          | —      |
Table 5: Measurements of *Sphyrna lewini*, ZMH 25679. Weight: 766 g, sex: female.

| Measurement                        | [mm] | [%TL] |
|------------------------------------|------|-------|
| TL, total length                   | 580  | 100.0 |
| FOR, fork length                   | 425  | 73.3  |
| PRC, precaudal length              | 385  | 66.4  |
| PD2, pre-D2-length                 | 325  | 60.0  |
| PD1, pre-D1-length                 | 140  | 24.1  |
| HDL, head length                   | 135  | 23.3  |
| PG1, prebranchial length           | 101  | 17.4  |
| PDP, prespiracular length          |      | —     |
| POB, preorbital length             | 38   | 6.6   |
| PP1, prepectoral length            | 125  | 21.6  |
| PP2, prepelvic length              | 253  | 43.6  |
| SVL, snout—anterior vent length    | 265  | 45.7  |
| PAL, preanal fin length            | 315  | 53.3  |
| IDS, interdorsal space             | 119  | 20.5  |
| DCS, dorsal (D2)—caudal space      | 40   | 6.9   |
| PPS, pectoral—pelvic space         | 116  | 20.0  |
| PAS, pelvic—anal space             | 44   | 7.6   |
| ACS, anal—caudal space             | 34   | 5.9   |
| PCA, pelvic—caudal space           | 110  | 19.0  |
| VCL, anterior vent—caudal tip l.   | 318  | 54.8  |
| PRN, prenarial length              | 26   | 4.5   |
| POR, preoral length                | 39   | 6.7   |
| EYL, eye length                    | 13   | 2.2   |
| EYH, eye height                    | 11   | 1.9   |
| ING, intergill length 1st to last slit | 38 | 6.6   |
| GS1, 1st gill slit height (unspread) | 16 | 2.8   |
| GS2, 2nd gill slit height          | 19   | 3.3   |
| GS3, 3rd gill slit height          | 21   | 3.6   |
| GS4, 4th gill slit height          | 19.4 | 3.3   |
| GS5, 5th gill slit height          | 15   | 2.6   |
| P1A, pectoral anterior margin l.   | 73.5 | 12.7  |
| P1B, pectoral base length          | 32   | 5.5   |
| P1I, pectoral inner margin length  | 26   | 4.5   |
| P1P, pectoral posterior margin     | 46   | 7.9   |
| P1H, pectoral height (base to tip) | 60.5| 10.4  |
| P1L, pec. length (ant. base to post. tip) | 55 | 9.5   |
| SOD, subocular pocket depth        | 5    | 0.9   |
| CDM, dorsal caudal margin length   | 185  | 31.9  |
| CPV, prepectoral caudal margin     | 69.5 | 12.0  |
| CPU, upper postventral C margin l. | 122  | 21.0  |
| CPL, lower postventral C margin l. | 33.5 | 5.8   |
| CFW, caudal fork width             | 49   | 8.4   |
| CFL, caudal fork length            | 46   | 7.9   |
| CST, subterminal C margin length   | 16   | 2.8   |
| CSW, subterminal caudal width      | 13   | 2.2   |
| CTR, terminal caudal margin length | 25.5 | 4.4   |
| CTL, terminal caudal lobe length   | 34   | 5.9   |
| D1L, D1 total length               | 87   | 15.0  |

Table 5: Continued.

| Measurement                        | [mm] | [%TL] |
|------------------------------------|------|-------|
| D1A, D1 anterior margin length     | 99   | 17.1  |
| D1B, D1 base length                | 63   | 10.9  |
| D1H, D1 vertical height            | 68   | 11.7  |
| D1I, D1 inner margin length        | 23   | 4.0   |
| D1P, D1 posterior margin length    | 62   | 10.7  |
| D2L, D2 total length               | 51   | 8.8   |
| D2A, D2 anterior margin length     | 27   | 4.7   |
| D2B, D2 base length                | 22   | 3.8   |
| D2H, D2 vertical height            | 15   | 2.6   |
| D2I, D2 inner margin length        | 30   | 5.2   |
| D2P, D2 posterior margin length    | 31   | 5.3   |
| P2L, pelvic total length           | 47   | 8.1   |
| P2A, pelvic anterior margin length | 33   | 5.7   |
| P2B, pelvic base length            | 31   | 5.3   |
| P2H, pelvic height = max. width    | 29   | 5.0   |
| P2I, pelvic inner margin length    | 31   | 5.3   |
| P2P, pelvic posterior margin length| 34   | 5.9   |
| ANL, anal fin total length         | 54   | 9.3   |
| ANA, anal fin anterior margin length | 32 | 5.5   |
| ANB, anal fin base length          | 33   | 5.7   |
| ANH, anal fin base length          | 17   | 2.9   |
| ANI, anal fin inner margin length  | 23   | 4.0   |
| ANP, anal fin posterior margin l.  | 32   | 5.5   |
| HDH, head height at P origin       | 69   | 11.9  |
| TRH, trunk height at P base end    | 73   | 12.6  |
| ABH, abdomen height at D1B end     | 66.5 | 11.5  |
| TAH, tail height at pelvic base end| 59   | 10.2  |
| CPH, caudal peduncle height        | 28.5 | 4.9   |
| DPI, D1 midpoint—pectoral base end | 42   | 7.2   |
| DPO, pelvic origin                 | 72   | 12.4  |
| PDI, pelvic origin                 | 53   | 9.1   |
| PDO, pelvic midpoint—D2 origin     | 68   | 11.7  |
| DAO, D2 origin—anal fin origin     | 10   | 1.7   |
| DAI, D2 base-end—anal base end     | 3    | 0.5   |
| MOL, mouth length (arc radius)     | 20   | 3.4   |
| MOW, mouth width                   | 40   | 6.9   |
| ULA, upper labial furrow length    |      | —     |
| LLA, lower labial furrow length    | 1.5  | 0.3   |
| NOW, nostril width                 | 11.8 | 2.0   |
| INW, internarial width             | 109.5| 18.9  |
| ANF, anterior nasal flap length    |      | —     |
| INO, interorbital space, "bony"   | 147  | 25.3  |
| SPL, spiracle length               |      | —     |
| ESL, eye—spiracle space            |      | —     |
| HDW, head width at middle gill slits| 54 | 9.3   |
| TRW, trunk width at P base ends    | 55   | 9.5   |
| ABW, abdomen width at D1B end      | 48   | 8.3   |
| TAW, tail width at pelvic base ends| 40   | 6.9   |
| CPW, C peduncle width at C origin  | 17   | 2.9   |
| CLO, clasper outer margin length   |      | —     |
| CLI, clasper inner margin length   |      | —     |
| CLB, clasper base width            |      | —     |
| Barbel length                      |      | —     |
| Width of cephalofoil               | 153  | 26.4  |
Table 6: Measurements of *Sphyrna lewini*, ZMH 25680. Weight: 500 g, sex: female.

| Measurement | [mm] | [%TL] |
|-------------|------|-------|
| TL, total length | 513  | 100.0 |
| FOR, fork length | 384  | 74.9  |
| PRC, precaudal length | 345  | 67.3  |
| PD2, pre-D2-length | 300  | 58.5  |
| PD1, pre-D1-length | 140  | 27.3  |
| HDL, head length | 118  | 23.0  |
| PG1, prebranchial length | 91   | 17.7  |
| PDP, prespiracular length | —    | —     |
| POB, preorbital length | 30   | 5.8   |
| PP1, prepectoral length | 112  | 21.8  |
| PP2, prepelvic length | 230  | 44.8  |
| SVL, snout—anterior vent length | 240  | 46.8  |
| PAL, preanal fin length | 285  | 55.6  |
| IDS, interdorsal space | 115  | 22.4  |
| DCS, dorsal (D2)—caudal space | 37   | 7.2   |
| PPS, pectoral—pelvic space | 98   | 19.1  |
| PAS, pelvic—anal space | 33   | 6.4   |
| ACS, anal—caudal space | 31   | 6.0   |
| PCA, pelvic—caudal space | 87   | 17.0  |
| VCL, anterior vent—caudal tip l. | 271  | 52.8  |
| PRN, prenarial length | 23   | 4.5   |
| POR, preoral length | 36   | 7.0   |
| EYL, eye length | 11.5 | 2.2   |
| EYH, eye height | 12.5 | 2.4   |
| ING, intergill length 1st to last slit | 29   | 5.7   |
| GS1, 1st gill slit height (unspread) | 14   | 2.7   |
| GS2, 2nd gill slit height | 15   | 2.9   |
| GS3, 3rd gill slit height | 17   | 3.3   |
| GS4, 4th gill slit height | 15   | 2.9   |
| GS5, 5th gill slit height | 13   | 2.5   |
| P1A, pectoral anterior margin l. | 63   | 12.3  |
| P1B, pectoral base length | 25   | 4.9   |
| P1I, pectoral inner margin length | 21   | 4.1   |
| P1P, pectoral posterior margin length | 39   | 7.6   |
| P1H, pectoral height (base end to tip) | 52   | 10.1  |
| P1L, pec. length (ant. base to post. tip) | 44   | 8.6   |
| SOD, subocular pocket depth | 3    | 0.6   |
| CDM, dorsal caudal margin length | 164  | 32.0  |
| CPV, preanal caudal margin length | 60   | 11.7  |
| CPU, upper postventral C margin l. | 99   | 19.3  |
| CPL, lower postventral C margin l. | 22   | 4.3   |
| CFW, caudal fork width | 39   | 7.6   |
| CFL, caudal fork length | 40   | 7.8   |
| CST, subterminal C margin length | 15   | 2.9   |
| CSW, subterminal caudal width | 12.5 | 2.4   |
| CTR, terminal caudal margin length | 21.5 | 4.2   |
| CTL, terminal caudal lobe length | 30   | 5.8   |
| D1L, D1 total length | 73   | 14.2  |

Table 6: Continued.

| Measurement | [mm] | [%TL] |
|-------------|------|-------|
| D1A, D1 anterior margin length | 88   | 17.2  |
| D1B, D1 base length | 57.5 | 11.2  |
| D1H, D1 vertical height | 56   | 10.9  |
| D1I, D1 inner margin length | 18   | 3.5   |
| D1P, D1 posterior margin length | 45   | 8.8   |
| D2L, D2 total length | 46   | 9.0   |
| D2A, D2 anterior margin length | 24   | 4.7   |
| D2B, D2 base length | 21   | 4.1   |
| D2H, D2 vertical height | 11.5 | 2.2   |
| D2I, D2 inner margin length | 25   | 4.9   |
| D2P, D2 posterior margin length | 25   | 4.9   |
| P2L, pelvic total length | 42   | 8.2   |
| P2A, pelvic anterior margin length | 33   | 6.4   |
| P2B, pelvic base length | 27   | 5.3   |
| P2H, pelvic height = max. width | 25.5 | 5.0   |
| P2I, pelvic inner margin length | 16.5 | 3.2   |
| P2P, pelvic posterior margin length | 25   | 4.9   |
| ANL, anal fin total length | 49   | 9.6   |
| ANA, anal fin anterior margin length | 31   | 6.0   |
| ANB, anal fin base length | 29.5 | 5.8   |
| ANH, anal fin vertical height | 18   | 3.5   |
| ANI, anal fin inner margin length | 21   | 4.1   |
| ANP, anal fin posterior margin l. | 24   | 4.7   |
| HDH, head height at P origin | 52   | 10.1  |
| THH, trunk height at P base end | 60   | 11.7  |
| ABH, abdomen height at D1B end | 67   | 13.1  |
| TAH, tail height at pelvic base end | 49   | 9.6   |
| CPH, caudal peduncle height | 23   | 4.5   |
| DPI, D1 midpoint—pectoral base end | 20   | 3.9   |
| DPO, D1 midpoint—pelvic origin | 58   | 11.3  |
| PDI, pelvic midpoint—D1 base end | 47   | 9.2   |
| PDO, pelvic midpoint—D2 origin | 57   | 11.1  |
| DAO, D2 origin—anal fin origin | 14   | 2.7   |
| DAI, D2 base end—anal base end | 2    | 0.4   |
| MOL, mouth length (arc radius) | 17   | 3.3   |
| MOW, mouth width | 31.5 | 6.1   |
| ULA, upper labial furrow length | —    | —     |
| LLA, lower labial furrow length | 2    | 0.4   |
| NOW, nostril width | 11   | 2.1   |
| INW, internarial width | 93   | 18.1  |
| ANF, anterior nasal flap length | —    | —     |
| INO, interorbital space, “bony” | 125  | 24.4  |
| SPL, spiracle length | —    | —     |
| ESL, eye—spiracle space | —    | —     |
| HDW, head width at middle gill slits | 43   | 8.4   |
| TRW, trunk width at P base ends | 47   | 9.2   |
| ABW, abdomen width at D1B end | 38   | 7.4   |
| TAW, tail width at pelvic base ends | 33   | 6.4   |
| CPW, C peduncle width at C origin | 17   | 3.3   |
| CLO, clasper outer margin length | —    | —     |
| CLI, clasper inner margin length | —    | —     |
| CLB, clasper base width | —    | —     |
| Barbel length | —    | —     |
| Width of cephalofoil | 132  | 25.7  |
Table 7: Measurements of *Chiloscyllium griseum*, ZMH 25675. Weight: 704 g, sex: female.

| Measurement                        | [mm] | [%TL] |
|------------------------------------|------|-------|
| TL, total length                   | 560  | 100.0 |
| FOR, fork length                   |      |       |
| PRC, precaudal length              | 425  | 75.9  |
| PD2, pre-D2-length                 | 320  | 57.1  |
| PD1, pre-D1-length                 | 220  | 39.3  |
| HDL, head length                   | 125  | 22.3  |
| PG1, prebranchial length           | 90   | 16.1  |
| PDP, prespiracular length          | 51.5 | 9.2   |
| POB, preoral length                | 43.5 | 7.8   |
| PP1, prepectoral length            | 97   | 17.3  |
| PP2, prepelvic length              | 205  | 36.6  |
| SVL, snout—anterio vent length     | 211  | 37.7  |
| PAL, preanal fin length             | 400  | 71.4  |
| IDS, interdorsal space             | 41   | 7.3   |
| DCS, dorsal (D2)—caudal space      | 52   | 9.3   |
| PPS, pectoral—pelvic space         | 67   | 12.0  |
| PAS, pelvic—anal space             | 160.5| 28.7  |
| ACS, anal—caudal space             | 0    | 0.0   |
| PCA, pelvic—caudal space            | 214.5| 38.3  |
| VCL, anterior vent—caudal tip l.   | 353  | 63.0  |
| PRN, prenarial length              | 13.3 | 2.4   |
| POR, preoral length                | 27   | 4.8   |
| EYL, eye length                    | 11.4 | 2.0   |
| EYH, eye height                    | 6    | 1.1   |
| ING, intergill length 1st to last slit | 34.5 | 6.2   |
| GS1, 1st gill slit height (unspread) | 12.5 | 2.2   |
| GS2, 2nd gill slit height          | 14.5 | 2.6   |
| GS3, 3rd gill slit height          | 15.7 | 2.8   |
| GS4, 4th gill slit height          | 13.5 | 2.4   |
| GS5, 5th gill slit height          | 14   | 2.5   |
| P1A, pectoral anterior margin l.    | 77.5 | 13.8  |
| P1B, pectoral base length          | 40   | 7.1   |
| P1I, pectoral inner margin length  | 37   | 6.6   |
| P1P, pectoral posterior margin     | 55   | 9.8   |
| P1H, pectoral height (base to tip) | 67   | 12.0  |
| P1L, pec. length (ant. to post. tip) | 74.5 | 13.3  |
| SOD, subocular pocket depth        |      |       |
| CDM, dorsal caudal margin length   | 136  | 24.3  |
| CPV, preventral caudal margin length |      |       |
| CPU, upper postventral C margin l. |      |       |
| CPL, lower postventral C margin l. |      |       |
| CFW, caudal fork width             |      |       |
| CFL, caudal fork length             |      |       |
| CST, subterminal C margin length   | 20   | 3.6   |
| CSW, subterminal caudal width      | 17   | 3.0   |
| CTR, terminal caudal width         | 23   | 4.1   |
| CTL, terminal caudal margin length | 31   | 5.5   |
| D1L, D1 total length               | 66.5 | 11.9  |

Table 7: Continued.

| Measurement                        | [mm] | [%TL] |
|------------------------------------|------|-------|
| D1A, D1 anterior margin length     | 63   | 11.3  |
| D1B, D1 base length                | 50.5 | 9.0   |
| D1H, D1 vertical height            | 43.5 | 7.8   |
| D1I, D1 inner margin length        | 20   | 3.6   |
| D1P, D1 posterior margin length    | 34.5 | 6.2   |
| D2L, D2 total length               | 69   | 12.3  |
| D2A, D2 anterior margin length     | 64   | 11.4  |
| D2B, D2 base length                | 51   | 9.1   |
| D2H, D2 vertical height            | 35.5 | 6.3   |
| D2I, D2 inner margin length        | 17   | 3.0   |
| D2P, D2 posterior margin length    | 29.5 | 5.3   |
| P2L, pelvic total length           | 70.5 | 12.6  |
| P2A, pelvic anterior margin length | 54   | 9.6   |
| P2B, pelvic base length            | 28   | 5.0   |
| P2H, pelvic height = max. width    | 44.5 | 7.9   |
| P2I, pelvic inner margin length    | 24   | 4.3   |
| P2P, pelvic posterior margin length| 42   | 7.5   |
| ANL, anal fin total length         | 59   | 10.5  |
| ANA, anal fin anterior margin length| —    | —     |
| ANB, anal fin base length          | 54.5 | 9.7   |
| ANH, anal fin vertical height      | 14.5 | 2.6   |
| ANI, anal fin inner margin length  | 6.5  | 1.2   |
| ANP, anal fin posterior margin l.  |      |       |
| HDH, head height at P origin       | 59   | 10.5  |
| TRH, trunk height at P base end    | 64   | 11.4  |
| ABH, abdomen height at D1B end     | 35.5 | 6.3   |
| TAH, tail height at pelvic base end| 39   | 7.0   |
| CPH, caudal peduncle height        | 17   | 3.0   |
| DPI, D1 midpoint—pectoral base end | 117  | 20.9  |
| DPO, D1 midpoint—pelvic origin     | 50   | 8.9   |
| PDI, pelvic midpoint—D1 base end   | 48   | 8.6   |
| PDO, pelvic midpoint—D2 origin     | 94.5 | 16.9  |
| DAO, D2 origin—anal fin origin     | 85   | 15.2  |
| DAI, D2 base end—anal base end     | 87   | 15.5  |
| MOL, mouth length (arc radius)     |      |       |
| MOW, mouth width                   | 35.5 | 6.3   |
| ULA, upper labial furrow length    | 12   | 2.1   |
| LLA, lower labial furrow length    | 8    | 1.4   |
| NOW, nostril width                 | 3    | 0.5   |
| INW, internarial width             | 22.5 | 4.0   |
| ANF, anterior nasal flap length    |      |       |
| INO, interorbital space, "bony"   | 25   | 4.5   |
| SPL, spiral length                 | 9.5  | 1.7   |
| ESL, eye—spiral space              |      |       |
| HDW, head width at middle gill slits| 74   | 13.2  |
| TRW, trunk width at P base ends    | 68   | 12.1  |
| ABW, abdomen width at D1B end      | 32   | 5.7   |
| TAW, tail width at pelvic base ends| 36   | 6.4   |
| CPW, C peduncle width at C origin  | 13   | 2.3   |
| CLO, clasper outer margin length   |      |       |
| CLI, clasper inner margin length   |      |       |
| CLB, clasper base width            |      |       |
| Barbel length                      | 13   | 2.3   |
| Width of cephalofoil               |      |       |
Table 8: Measurements of *Chiloscyllium griseum*, ZMH 25676. Weight: 774 g, sex: female.

| Measurement                  | [mm] | [%TL] |
|------------------------------|------|-------|
| TL, total length             | 595  | 100.0 |
| FOR, fork length             | —    | —     |
| PRC, precaudal length        | 450  | 75.6  |
| PD2, pre-D2-length           | 340  | 57.1  |
| PD1, pre-D1-length           | 225  | 37.8  |
| HDL, head length             | 130  | 21.8  |
| PG1, prebranchial length     | 94.5 | 15.9  |
| PDP, prespiracular length    | 52   | 8.7   |
| POB, preoral length          | 44   | 7.4   |
| PP1, prepectoral length      | 109  | 18.3  |
| PP2, prepelvic length        | 220  | 37.0  |
| SVL, snout—anterior vent length | 232 | 39.0  |
| PAL, preanal fin length      | 420  | 70.6  |
| IDS, interdorsal space       | 47   | 7.9   |
| DCS, dorsal (D2)—caudal space | 58 | 9.7   |
| PPS, pectoral—pelvic space   | 80   | 13.4  |
| PAS, pelvic—anal space       | 171  | 28.7  |
| ACS, anal—caudal space       | 0    | 0.0   |
| PCA, pelvic—caudal space     | 245  | 41.2  |
| VCL, anterior vent—caudal tip l. | 380 | 63.9  |
| PRN, prenarial length        | 14.5 | 2.4   |
| POR, preoral length          | 27   | 4.5   |
| EYL, eye length              | 11   | 1.8   |
| EYH, eye height              | 6.6  | 1.1   |
| ING, intergill length 1st to last slit | 38 | 6.4   |
| GS1, 1st gill slit height (unspread) | 14.3 | 2.4   |
| GS2, 2nd gill slit height    | 15   | 2.5   |
| GS3, 3rd gill slit height    | 16   | 2.7   |
| GS4, 4th gill slit height    | 14   | 2.4   |
| GS5, 5th gill slit height    | 14   | 2.4   |
| P1A, pectoral anterior margin l. | 81.5 | 13.7  |
| P1B, pectoral base length    | 41.5 | 7.0   |
| P1I, pectoral inner margin length | 37 | 6.2   |
| P1P, pectoral margin length  | 59   | 9.9   |
| P1H, pectoral height (base end to tip) | 69 | 11.6  |
| P1L, pec. length (ant. base to post. tip) | 76 | 12.8  |
| SOD, subocular pocket depth  | —    | —     |
| CDM, dorsal caudal margin length | 145 | 24.4  |
| CPV, preventral caudal margin length | — | —     |
| CPU, upper postventral C margin l. | — | —     |
| CPL, lower postventral C margin l. | — | —     |
| CFW, caudal fork width       | —    | —     |
| CFL, caudal fork length      | —    | —     |
| CST, subterminal C margin length | 18 | 3.0   |
| CSW, subterminal caudal width | 16   | 2.7   |
| CTR, terminal caudal margin length | 21 | 3.5   |
| CTL, terminal caudal lobe length | 22.5 | 3.8   |
| D1L, D1 total length         | 74.5 | 12.5  |

Table 8: Continued.

| Measurement                  | [mm] | [%TL] |
|------------------------------|------|-------|
| D1A, D1 anterior margin length | 70  | 11.8  |
| D1B, D1 base length           | 55   | 9.2   |
| D1H, D1 vertical height       | 43   | 7.2   |
| D1I, D1 inner margin length   | 19   | 3.2   |
| D1P, D1 posterior margin length | 37 | 6.2   |
| D2L, D2 total length          | 70.5 | 11.8  |
| D2A, D2 anterior margin length | 66  | 11.1  |
| D2B, D2 base length           | 55   | 9.2   |
| D2H, D2 vertical height       | 36   | 6.1   |
| D2I, D2 inner margin length   | 17   | 2.9   |
| D2P, D2 posterior margin length | 33  | 5.5   |
| P2L, pelvic total length      | 70   | 11.8  |
| P2A, pelvic anterior margin length | 56 | 9.4   |
| P2B, pelvic base length       | 27   | 4.5   |
| P2H, pelvic height = max. width | 45  | 7.6   |
| P2I, pelvic inner margin length | 29  | 4.9   |
| P2P, pelvic posterior margin length | 40 | 6.7   |
| ANL, anal fin total length    | 66   | 11.1  |
| ANA, anal fin anterior margin length | — | —     |
| ANB, anal fin base length     | 61   | 10.3  |
| ANH, anal fin vertical height | 14   | 2.4   |
| ANI, anal fin inner margin length | 5.4 | 0.9   |
| ANP, anal fin posterior margin l. | — | —     |
| HDH, head height at P origin  | 58   | 9.7   |
| TRH, trunk height at P base end | 70  | 11.8  |
| ABH, abdomen height at D1B end | 37.5 | 6.3  |
| TAH, tail height at pelvic base end | 38  | 6.4   |
| CPH, caudal peduncle height   | 16.5 | 2.8   |
| DPI, D1 midpoint—pectoral base end | 125 | 21.0  |
| DPO, D1 midpoint—pelvic origin | 59  | 9.9   |
| PDI, pelvic midpoint—D1 base end | 52  | 8.7   |
| PDO, pelvic midpoint—D2 origin | 103 | 17.3  |
| DAO, D2 origin—anal fin origin | 90  | 15.1  |
| DAI, D2 base end—anal base end | 99  | 16.6  |
| MOL, mouth length (arc radius) | —    | —     |
| MOW, mouth width              | 38   | 6.4   |
| ULA, upper labial furrow length | 12  | 2.0   |
| LLA, lower labial furrow length | 9   | 1.5   |
| NOW, nostril width            | 2.5  | 0.4   |
| INW, internarial width        | 24   | 4.0   |
| ANF, anterior nasal flap length | —   | —     |
| INO, interorbital space, “bony” | 20.5 | 3.4  |
| SPL, spiralce length          | 7.5  | 1.3   |
| ESL, eye—spiraclce space      | —    | —     |
| HDW, head width at middle gill slits | 73  | 12.3  |
| TRW, trunk width at P base ends | 70  | 11.8  |
| ABW, abdomen width at D1B end | 35   | 5.9   |
| TAW, tail width at pelvic base ends | 40  | 6.7   |
| CPW, C peduncle width at C origin | 12.5 | 2.1  |
| CLO, clasper outer margin length | —   | —     |
| CLI, clasper inner margin length | —   | —     |
| CLB, clasper base width       | —    | —     |
| Barbel length                 | 13   | 2.2   |
| Width of cephalofoil          | —    | —     |
Table 9: Measurements of *Chiloscyllium punctatum*, ZMH 25677. Weight: 599 g, sex: female.

| Measurement                        | [mm] | [%TL] |
|------------------------------------|------|-------|
| TL, total length                   | 560  | 100.0 |
| FOR, fork length                   |      |       |
| PRC, precaudal length              | 422  | 75.4  |
| PD2, pre-D2-length                 | 310  | 55.4  |
| PD1, pre-D1-length                 | 210  | 37.5  |
| HDL, head length                   | 115  | 20.5  |
| PG1, prebranchial length           | 85   | 15.2  |
| PDP, prespiracular length          | 49   | 8.8   |
| POB, preorbital length             | 43   | 7.7   |
| PP1, prepectoral length            | 89   | 15.9  |
| PP2, prepelvic length              | 183  | 32.7  |
| SVL, snout—anterior vent length    | 195  | 34.8  |
| PAL, preanal fin length            | 395  | 70.5  |
| ID5, interdorsal space             | 57   | 10.2  |
| DCS, dorsal (D2)—caudal space      | 57   | 10.2  |
| PPS, pectoral—pelvic space         | 64   | 11.4  |
| PAS, pelvic—anal space             | 172  | 30.7  |
| ACS, anal—caudal space             | 0    | 0.0   |
| PCA, pelvic—caudal space           | 230  | 41.1  |
| VCL, anterior vent—caudal tip l.   | 363  | 64.8  |
| PRN, prenarial length              | 7    | 1.3   |
| POR, preoral length                | 19   | 3.4   |
| EYL, eye length                    | 10   | 1.8   |
| EYH, eye height                    | 4    | 0.7   |
| ING, intergill length 1st to last slit | 27 | 4.8 |
| GS1, 1st gill slit height (unspread) | 13 | 2.3 |
| GS2, 2nd gill slit height          | 15   | 2.7   |
| GS3, 3rd gill slit height          | 16   | 2.9   |
| GS4, 4th gill slit height          | 16   | 2.9   |
| GS5, 5th gill slit height          | 13.5 | 2.4   |
| P1A, pectoral anterior margin l.   | 73   | 13.0  |
| P1B, pectoral base length          | 30   | 5.4   |
| P1I, pectoral inner margin length  | 35   | 6.3   |
| P1P, pectoral posterior margin l.  | 40   | 7.1   |
| P1H, pectoral height (base to tip) | 64  | 11.4  |
| P1L, pectoral length (ant. to post. tip) | 61 | 10.9 |
| SOD, subocular pocket depth        |      |       |
| CDM, dorsal caudal margin length   | 113  | 20.2  |
| CPV, preventral caudal margin      |      |       |
| CPU, upper postventral C margin l. |      |       |
| CPL, lower postventral C margin l. |      |       |
| CFW, caudal fork width             |      |       |
| CFL, caudal fork length            |      |       |
| CST, subterminal C margin length   | 19   | 3.4   |
| CSW, subterminal caudal width      | 15   | 2.7   |
| CTR, terminal caudal margin length | 25   | 4.5   |
| CTL, terminal caudal lobe length   | 30   | 5.4   |
| D1L, D1 total length               | 79   | 14.1  |

Table 9: Continued.

| Measurement                        | [mm] | [%TL] |
|------------------------------------|------|-------|
| D1A, D1 anterior margin length     | 74   | 13.2  |
| D1B, D1 base length                | 54   | 9.6   |
| D1H, D1 vertical height            | 47   | 8.4   |
| D1I, D1 inner margin length        | 24.5 | 4.4   |
| D1P, D1 posterior margin length    | 48   | 8.6   |
| D2L, D2 total length               | 79.5 | 14.2  |
| D2A, D2 anterior margin length     | 69   | 12.3  |
| D2B, D2 base length                | 62   | 11.1  |
| D2H, D2 vertical height            | 39.5 | 7.1   |
| D2I, D2 inner margin length        | 20   | 3.6   |
| D2P, D2 posterior margin length    | 42   | 7.5   |
| P2L, pelvic total length           | 57   | 10.2  |
| P2A, pelvic anterior margin length | 55   | 9.8   |
| P2B, pelvic base length            | 23   | 4.1   |
| P2H, pelvic height = max. width    | 37   | 6.6   |
| P2I, pelvic inner margin length    | 22   | 3.9   |
| P2P, pelvic posterior margin length| 35   | 6.3   |
| ANL, anal fin total length         | 59   | 10.5  |
| ANA, anal fin anterior margin length| —   | —     |
| ANB, anal fin base length          | 53   | 9.5   |
| ANH, anal fin vertical height      | 15.5 | 2.8   |
| ANI, anal fin inner margin length  | 9    | 1.6   |
| ANP, anal fin posterior margin l.  |      | —     |
| HDH, head height at P origin       | 55.5 | 9.9   |
| TRH, trunk height at P base end    | 62.5 | 11.2  |
| ABH, abdomen height at D1B end     | 42   | 7.5   |
| TAH, tail height at pelvic base end| 42   | 7.5   |
| CPH, caudal peduncle height        | 20.5 | 3.7   |
| DPI, D1 midpoint—pectoral base end | 110 | 19.6  |
| DPO, D1 midpoint—pelvic origin     | 45   | 8.0   |
| PDI, pelvic midpoint—D1 end        | 44   | 7.9   |
| PDO, pelvic midpoint—D2 origin     | 88   | 15.7  |
| DAO, D2 origin—anal fin origin     | 79   | 14.1  |
| DAI, D2 base end—anal base end     | 75   | 13.4  |
| MOL, mouth length (arc radius)     |      | —     |
| MOW, mouth width                   | 34   | 6.1   |
| ULA, upper labial furrow length    | 9    | 1.6   |
| LLA, lower labial furrow length    | 6    | 1.1   |
| NOW, nostril width                 | 2    | 0.4   |
| INW, internarial width             | 21   | 3.8   |
| ANF, anterior nasal flap length    |      | —     |
| INO, interorbital space, "bony"   | 22   | 3.9   |
| SPL, spiracle length               | 8    | 1.4   |
| ESL, eye—spiracle space            |      | —     |
| HDW, head width at middle gill slits | 62 | 11.1 |
| TRW, trunk width at P base ends    | 65   | 11.6  |
| ABW, abdomen width at D1B end      | 35.5 | 6.3   |
| TAW, tail width at pelvic base ends| 39   | 7.0   |
| CPW, C peduncle width at C origin  | 14   | 2.5   |
| CLO, clasper outer margin length   |      | —     |
| CLI, clasper inner margin length   |      | —     |
| CLB, clasper base width            |      | —     |
| Barbel length                      | 11   | 2.0   |
| Width of cephalofoil               |      | —     |
Table 10: Measurements of *Chiloscyllium punctatum*, ZMH 25678. Weight: 670 g, sex: male.

| Measurement                     | [mm]  | [%TL] |
|---------------------------------|-------|-------|
| TL, total length                | 617   | 100.0 |
| FOR, fork length                | —     | —     |
| PRC, precaudal length           | 495   | 80.2  |
| PD2, pre-D2-length              | 352   | 57.1  |
| PD1, pre-D1-length              | 225   | 36.5  |
| HDL, head length                | 121   | 19.6  |
| PG1, prebranchial length        | 91    | 14.7  |
| PDP, prespiracular length       | 52    | 8.4   |
| POB, preorbital length          | 45    | 7.3   |
| PP1, prepectoral length         | 108   | 17.5  |
| PP2, prepelvic length           | 210   | 34.0  |
| SVL, snout—anterior vent length | 220   | 35.7  |
| PAL, preanal fin length         | 440   | 71.3  |
| ID6, interdorsal space          | 71    | 11.5  |
| DCS, dorsal (D2)—caudal space  | 58    | 9.4   |
| PPS, pectoral—pelvic space      | 68    | 11.0  |
| PAS, pelvic—anal space          | 200   | 32.4  |
| ACS, anal—caudal space          | 0     | 0.0   |
| PCA, pelvic—caudal space        | 255   | 41.3  |
| VCL, anterior vent—caudal tip l.| 399   | 64.7  |
| PRN, prenarial length           | 12    | 1.9   |
| POR, preoral length             | 23    | 3.7   |
| EYL, eye length                 | 11.5  | 1.9   |
| EYH, eye height                 | 5     | 0.8   |
| ING, intergill length 1st to last slit | 31 | 5.0 |
| GS1, 1st gill slit height (unspread) | 14.3 | 2.3 |
| GS2, 2nd gill slit height       | 16.4  | 2.7   |
| GS3, 3rd gill slit height       | 17.2  | 2.8   |
| GS4, 4th gill slit height       | 16.8  | 2.7   |
| GS5, 5th gill slit height       | 17    | 2.8   |
| P1A, pectoral anterior margin l.| 81    | 13.1  |
| P1B, pectoral base length       | 28    | 4.5   |
| P1I, pectoral inner margin length | 40  | 6.5  |
| P1P, pectoral posterior margin length | 46  | 7.5  |
| P1H, pectoral height (base to tip) | 70  | 11.3  |
| P1L, pec. length (ant. to post. tip) | 64  | 10.4  |
| SOD, subocular pocket depth     | —     | —     |
| CDM, dorsal caudal margin length | 140  | 22.7  |
| CPV, preventral caudal margin length | —  | —     |
| CPU, upper postventral C margin l. | —  | —     |
| CPL, lower postventral C margin l. | —  | —     |
| CFW, caudal fork width          | —     | —     |
| CFL, caudal fork length         | —     | —     |
| CST, subterminal C margin length | 17  | 2.8   |
| CSW, subterminal caudal width   | 17    | 2.8   |
| CTR, terminal caudal width      | 20.5  | 3.3   |
| CTL, terminal caudal lobe length | 28  | 4.5   |
| D1L, D1 total length            | 89    | 14.4  |

| Measurement                     | [mm]  | [%TL] |
|---------------------------------|-------|-------|
| D1A, D1 anterior margin l.      | 89    | 14.4  |
| D1B, D1 base length             | 65    | 10.5  |
| D1H, D1 vertical height         | 44    | 7.1   |
| D1I, D1 inner margin length     | 23.5  | 3.8   |
| D1P, D1 posterior margin length | 50    | 8.1   |
| D2L, D2 total length            | 76    | 12.3  |
| D2A, D2 anterior margin length  | 73    | 11.8  |
| D2B, D2 base length             | 59    | 9.6   |
| D2H, D2 vertical height         | 40    | 6.5   |
| D2I, D2 inner margin length     | 18.5  | 3.0   |
| D2P, D2 posterior margin length | 39    | 6.3   |
| P2L, pelvic total length        | 62    | 10.0  |
| P2A, pelvic anterior margin length | 62   | 10.0  |
| P2B, pelvic base length         | 45    | 7.3   |
| P2H, pelvic height = max. width  | 38    | 6.2   |
| P2I, pelvic inner margin length | 19    | 3.1   |
| P2P, pelvic posterior margin length | 39  | 6.3   |
| ANL, anal fin total length      | 65    | 10.5  |
| ANA, anal fin anterior margin length | —  | —     |
| ANB, anal fin base length       | 55    | 8.9   |
| ANH, anal fin vertical height   | 17    | 2.8   |
| ANI, anal fin inner margin length | 9     | 1.5   |
| ANP, anal fin posterior margin l. | —  | —     |
| HDH, head height at P origin    | 54    | 8.8   |
| TRH, trunk height at P base end | 58    | 9.4   |
| ABH, abdomen height at D1B end  | 40    | 6.5   |
| TAH, tail height at pelvic base end | 40  | 6.5   |
| CPH, caudal peduncle height     | 17    | 2.8   |
| DPI, D1 midpoint—pectoral base end | 132  | 21.4  |
| DPO, D1 midpoint—pelvic origin  | 48    | 7.8   |
| PDI, pelvic midpoint—D1 base end | 61   | 9.9   |
| PDO, pelvic midpoint—D2 origin  | 123   | 19.9  |
| DAO, D2 origin—anal fin origin  | 88    | 14.3  |
| DAI, D2 base end—anal base end  | 78    | 12.6  |
| MOL, mouth length (arc radius)  | —     | —     |
| MOW, mouth width                | 28    | 4.5   |
| ULA, upper labial furrow length | 9.7   | 1.6   |
| LLA, lower labial furrow length | 4.5   | 0.7   |
| NOW, nostril width              | 2.5   | 0.4   |
| INW, internarial width          | 22    | 3.6   |
| ANF, anterior nasal flap length | —     | —     |
| I NO, interorbital space, "bony" | 22  | 3.6   |
| SPL, spiral length              | 9     | 1.5   |
| ESL, eye—spiral space           | —     | —     |
| HDW, head width at middle gill slits | 62  | 10.0  |
| TRW, trunk width at P base ends | 61    | 9.9   |
| ABW, abdomen width at D1B end   | 29.5  | 4.8   |
| TAW, tail width at pelvic base ends | 36   | 5.8   |
| CPW, C peduncle width at C origin | 13.5 | 2.2   |
| CLO, clasper outer margin length | 15   | 2.4   |
| CLI, clasper inner margin length | 27   | 4.4   |
| CLB, clasper base width         | 5     | 0.8   |
| Barbel length                   | 13    | 2.1   |

Width of cephalofoil — —
Additionally, due to the many newly described species, data about similar, earlier described species have to be revalidated because they might include not only the intended, but also the newly described species.

More knowledge deficits become apparent in the not exactly known or patchy distribution areas of some species as well as the fact that the known distribution area for *Paragaleus randalli* could be extended eastwards significantly due to the examined Thai specimen. A similar extension could be found recently for another elasmobranch species, *Rhinobatos formosensis* Norman [41], the Taiwan Guitarfish [25].

Important information about distribution areas could eventually be provided by the observations of fishermen, but as mentioned before they are often not able to determine the exact species and simply declare most of their catches as “diverse Elasmobranchii” or “small sharks” [5, 15]. Easy- and fast-to-use identification keys like those by White et al. [3] or Daley et al. [42] could be very helpful for the determination. However, the exact determination of species from genera with many superficially similar species like, for example, most reef shark species (family Carcharhinidae) would still remain very difficult and time-consuming for nonscientists.

Additionally to the comments on literature in the results chapter of this paper, the author suggests to use another distinguishing feature for the differentiation of Carcharhinidae and Hemigaleidae in identification keys: Compagno [18] uses only the folding of the intestinal valve for the differentiation. However, the author suggests using the presence or absence of spiracles instead or additionally as distinctive feature for identification keys because the folding of the intestinal valve is difficult to check. The presence or absence of spiracles, in contrast, can easily be used because all Carcharhinidae with the exception of the unmistakable Tiger Shark *Galeocerdo cuvier* (Péron & Lesueur) [43] lack spiracles, whereas all Hemigaleidae do have spiracles.

When determining juvenile sharks, caution is advised in matters of possible ontogenetic changes in morphology or morphometrics. In this study the well-known morphological changes in the Hemiscyllidae species *Chiloscyllium griseum* and *C. punctatum* were found. However, some deviations from literature that were found in this study might result from ontogenetic changes, also. In an extreme case, ontogenetic changes can even lead to describing a different stage of life of a known species accidentally as a new species. This happened due to strong differences in terms of color in the Zebra Shark *Stegostoma fasciatum* (Hermann) [44]; Seba [45] described the banded juvenile stage of this species as *Squalus varius* and Gmelin [46] described the spotted adult form as *Squalus longicaudatus*.

The results indicate that differences in tooth morphology, which have commonly been used for the distinction of *Paragaleus randalli* and *P. tengu*, are probably based on imprecise or inaccurate drawings in Compagno et al. [31] and Chen [32], respectively. Actually, both species have a very similar tooth morphology. Due to these new results, *Paragaleus randalli* and *P. tengu* should not be differentiated by means of their teeth only.

In *Chiloscyllium griseum*, variability in the size of the dorsal ridges between different references and the examined specimens was detected. Unfortunately there is no information about the dorsal ridges in the original description of *Chiloscyllium griseum* [14], but only a drawing in which no dorsal ridges are shown. This drawing is probably simply inexact or not generally appropriate as Müller and Henle [14] only examined seven individuals. It might be possible that Compagno [19, 24] and Compagno et al. [17] refer to this drawing in their description of the dorsal ridges. However, the drawing in Müller and Henle [14] actually shows a specimen of *Chiloscyllium punctatum* and not *C. griseum*, which is evidenced by the pronounced concave posterior margins and elongated free rear tips of the dorsal fins. Dingerkus and DeFino [37] guess that the specimen drawn by Müller and Henle [14] is the *Chiloscyllium punctatum* specimen RMNH 4178 due to similarities in body proportions and color pattern. In Compagno et al. [17] a similar mistake was made in the black and white drawing of *Chiloscyllium griseum* because its dorsal fins were erroneously drawn with concave posterior margins and elongated free rear tips like those of *C. punctatum*. However, the corresponding textual description is correct and describes straight to convex posterior margins as well as not elongated free rear tips. The color painting of *Chiloscyllium griseum* in Compagno et al. [17] is correct, also.

Altogether, it remains unclear if the size of the dorsal ridges is very variable in this species from not present to prominent or if some sources are imprecise about this character. Generally, *Chiloscyllium griseum* is considered a taxonomically complex species and the differentiation of several species of *Chiloscyllium* remains difficult due to strong ontogenetic changes and a high margin of variation in some morphometric ratios [19, 47].

In the future the pit organs might possibly be used in support of the determination of sharks, because the abundance and distribution of these free neuromasts vary widely among species according to Budker [48], Tester and Nelson [49] and Peach [50]. However, further research including the examination of more species is needed to verify if there are species-specific patterns of pit organs and, if so, to characterize the different typal patterns.

Due to the flourishing fin trade, further research is also desirable on the identification of shark species by means of their fins. Although good progress has been made in recent years, for example, by Clarke et al. [51] and Wong et al. [52] related to the genetic and by Deynat [53] regarding the morphological distinguishing, further research is still needed.

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