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(RESEARCH ARTICLE)

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A new record of the African dwarf sawshark *Pristiophorus nancyae* (Chondrichthyes: Pristiophoridae) from the Indian Ocean dating back to the 1960s

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Abstract

The African dwarf sawshark (*Pristiophorus nancyae*) is a small representative of the sawshark family (Pristiophoridae). It was described in 2011 based on 8 individuals from Mozambique. In 2014 and 2020, these records were supplemented by 15 more specimens. Nevertheless, the African dwarf sawshark remains one of the least studied species in its already poor studied family. A new record of an aged juvenile specimen of the African dwarf sawshark allows us to expand the previously known knowledge about this shark species. In addition, the specimen examined represents the earliest known record of *P. nancyae*, as the individual in question was caught in the 1960s - approximately 50 years before the first description in 2011. The publication of new images is intended to supplement the previously known information about the appearance of the African dwarf sawshark and explicitly show the tooth morphology of this shark species.

Keywords: Chondrichthyes; African dwarf sawshark; *Pristiophorus nancyae*; Indian Ocean; Old specimen

1. Introduction

Sawsharks (Order Pristiophoriformes, family Pristiophoridae) are a small group of sharks currently consisting of 10 different species [1]. They are generally small sharks that do not exceed a total body length of 160 cm [2]. Despite their striking body shape and wide distribution, sawsharks have been little studied in recent years; in fact, they are the shark order with the least research efforts of all [3]. Evidence of the different species is usually based on a few finds or even just individual records. As a result, the data on morphology, behavior and conservation is very limited and every record of an individual animal can help to improve the data on sawsharks in the future.

The African dwarf sawshark, *Pristiophorus nancyae* Ebert and Cailliet, 2011 is a very rare small shark species that is only known from 23 specimens from the deep sea of the West Indian Ocean, the largest of which measured 70 cm [4]. It was first described in 2011 based on 8 specimens caught off the coast of Mozambique and can be found at a depth of at least 500 m [5].

Almost nothing is known about the life of the African dwarf sawshark. After the first description, 9 new specimens were scientifically documented in 2014 by Weigmann, Stehmann and Thiel from Kenya and off the Socotra Islands, including 4 juvenile animals [6]. In 2020, 6 additional records of the species were revealed [4]. This study scientifically publishes another 24th (and juvenile) specimen of *P. nancyae*. Photographic evidence of the specimen is provided to clearly demonstrate characteristic morphological features that verify the species identification. Since detailed information on the tooth structure of the species has not been published so far, this information is given in this study to enable more reliable identification of this species.

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2. Material and methods

To obtain details about the history and background of the specimen, the relatives of the previous owner and sailor were questioned. The information was collected and the time frame for catching the specimen was determined.

The species was identified using the identification key according to Ebert and Cailliet (2011): 1a: (1) "A double row of 4 to 5 conspicuous large pits on underside of snout in front of barbels." (2) "Larger rostral teeth with prominent transverse ridges on their bases" [5]. Other body characteristics could not be used for identification because the corresponding body parts are missing. However, the 2 rows of 4 pits in the rostrum are characteristic and unique to this species, so they are sufficient as an identification feature [7].

The specimen was measured with a caliper to half a millimeter. All data were compared with previously known measurements. The total length (TL) of the animal was calculated. All measurements and abbreviations follow the definitions of Ebert, Dando and Fowler 2021 [2] and Compagno 1984 [8].

The photos were taken with the following equipment and parameters: Sony DSC-TX30, no magnification (Figure 1), magnification mode "Lupe Plus" (Figure 2 A and 6) and Digital Microscope Model 1000, varying magnification (Figure 2 B, 3, 4, 5 and 7).

The terms right and left in the text refer to the dorsal view, except for the jaw, where the ventral view is used.

3. Results and discussion

3.1. Origin of the specimen

The specimen of *Pristiophorus nancyae* examined in this study is a dried head and was in the private collection of a German sailor who has died at the age of 90 before it was sold in 2022. The exact location and circumstances of the find can therefore no longer be determined, but it is likely that the specimen was brought to Germany from a trip to East Africa, since the sailor often traveled on trade routes in this region. The age of the specimen can be evaluated because it had been in the possession of the sailor and passionate taxidermist since the 1960s. An exact year or date could no longer be determined, so the testimony of his family was relied upon. The condition and amateurish preparation of the head confirm this time frame. An approximate age of 56 to 65 years in 2025 can therefore be concluded. It would be the oldest currently known and confirmed evidence of the African dwarf sawshark since all remaining 23 documented specimens were caught from 1975 onwards [4, 5, 6].

The specimen is now in a private collection under the inventory number 000T-UNB-G.

3.2. Systematics and Identification

Order Pristiophoriformes Berg, 1958
Family Pristiophoridae Bleeker, 1859
Genus *Pristiophorus* Müller and Henle, 1837
Pristiophorus nancyae Ebert and Cailliet, 2011
000T-UNB-G: head of a juvenile specimen (124 mm), PG1 121 mm, sex unknown, dried, catch location unknown (probably Indian Ocean), catch depth unknown, collected between 1960 and 1969.

The identification of the Order, Family and Genus was based on the appearance of the head. It is clearly a Chondrichthyan with a saw-shaped rostrum. This description only applies to sawsharks (Pristiophoriformes) or sawfish (Pristiformes). Sawfish are very large, their rostrum is almost parallel and covered with broad, evenly sized teeth [2]. Barbels are absent [2]. Meanwhile, sawsharks are much smaller, have a rostrum shaped like an elongated isosceles triangle with a much broader base than tip, irregularly sized teeth and 2 barbels on the ventral side of the rostrum [2]. All the features of this individual are clearly characteristic of a sawshark (Order Pristiophoriformes, Family Pristiophoridae; Figure 1).

The species was determined based on the two features described above. In the present specimen, 4 pits in 2 rows can be seen on the ventral side of the rostrum in front of the barbels (Figure 1 B, 2 A). This corresponds to the identification feature (1) of Ebert and Cailliet [5]. Furthermore, the larger teeth of the rostrum have transverse ridges at their base (Figure 2 B) as described in feature (2) [5].

The present specimen can therefore be assigned to the African dwarf sawshark (*Pristiophorus nancyae*).

Figure 1 Dorsal (A) and ventral view (B) of the specimen's head showing the triangle-shaped rostrum, the irregularly large teeth and 2 barbels. The 2 rows of 4 pits in front of the barbels are also visible

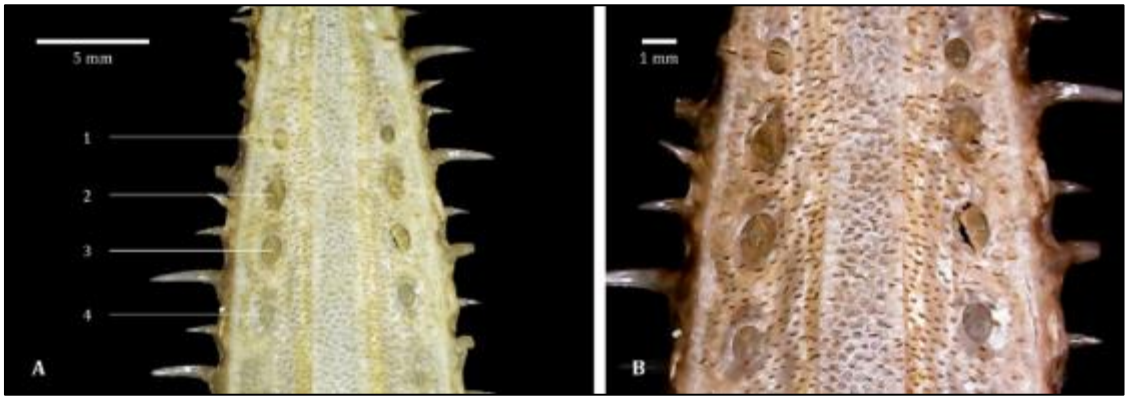

Figure 2 2 rows of 4 pits on the ventral side of the rostrum (A) and (B)

Figure 3 8th and 9th large rostral teeth (in order from the mouth) of the right lateral side in ventral view (A) and dorsal view (B). The transverse ridges are marked with arrows (B)

3.3. Measurements

The specimen was measured according to the standards described above and the results were compared with the already known specimens (Table 1). It should be noted that minor deviations from the actual data are to be expected, as this is a dried specimen and therefore different proportions than in a living or liquid preserved animal may occur. As the rostrum of saw sharks consists mostly of solid cartilage with probably a smaller loss on drying, measurements related to the rostrum are therefore likely closer to the living animal than the measured dimensions of the other proportions.

Accordingly, the pre-oral length (POR) was used to calculate the total length (TL) of the individual. For *P. nancyae* the POR is 27,0 to 29,6 % of the TL [5, 6]. The calculation was carried out using the lower and the upper limit.

This results in a TL of 341 to 374 mm, which evidenced that it is a juvenile specimen of *P. nancyae*. The total length given by Weigmann, Stehmann and Thiel [6] for 4 juvenile individuals is 283 to 374 mm. The present specimen is within these limits.

Table 1 Measured dimensions for the examined specimen of *P. nancyae*

Measurement	**Abbreviation***	**Measured length [mm]**	**Percentage of TL lower limit [%TL]** TL_{min} **= 341 mm**	**Percentage of TL upper limit [%TL]** TL_{max} **= 374 mm**
Pre-oral length	POR	101	29,6	27,0
Pre-barbel length	PBL**	63	18,5	16,8
Pre-narial length	PRN	90	26,4	24,1
Pre-orbital length	POB	95	27,9	25,4
Pre-spiracle length	PSP	109	32,0	29,1
Pre-gill length	PG1	121	35,5	32,4
Head width	HDW	21	6,2	5,6
Rostrum width at nostrils	RWN**	19	5,6	5,1
Rostrum width at barbels	RWB**	15	4,4	4,0
Diameter of the largest pit	DLP**	1,5	0,4	0,4
Eye length	EYL	13	3,8	3,5
Eye height	EYH	5	1,5	1,3
Inter-orbital space	IOS	8	2,3	2,1
Inter-barbel space	IBS**	11	3,2	2,9
Barbel length	BBL**	28	8,2	7,5
Barbel-nostril length	BNL**	27	7,9	7,2
Nostril width	NOW**	2	0,6	0,5
Internarial width	INW	10	2,9	2,7
Spiracle length	SPL	5	1,5	1,3
Eye-spiracle length	ESL	2	0,6	0,5
Mouth length	MOL	3	0,9	0,8
Mouth width	MOW	14	4,1	3,7
First gill slit height	GS1	6	1,8	1,6

* The abbreviations follow Ebert, Dando and Fowler [2] and Compagno [8]; ** The marked abbreviations are not mentioned by Ebert, Dando and Fowler [2] and Compagno [8].

3.4. Tooth count and description

The lateral saw teeth of the rostrum are long, pointed and slightly bent back towards the mouth. They have no serrations. There is a total of 20 larger teeth (approx. 3 mm each) on each side of the rostrum, 14 of which are anterior to the barbel origin and 6 posterior to the barbel origin. This is consistent with the information by Weigmann, Stehmann and Thiel [6], which stated 14 to 17 anterior-barbel teeth and 6 to 7 posterior-barbel teeth. However, it does not match the counts of the first description by Ebert and Cailliet [5], who determined a total tooth count of 21 to 32 and 15 to 22 large lateral rostral teeth anterior to barbels. Due to the better condition of the material provided and the fact that the deviation is only 1 tooth and lies within the counts given by Weigmann, Stehmann and Thiel [6], this deviation is not very conspicuous. The number of large lateral rostral teeth posterior to barbels in the examined specimen agrees also with the determination from the original description [5].

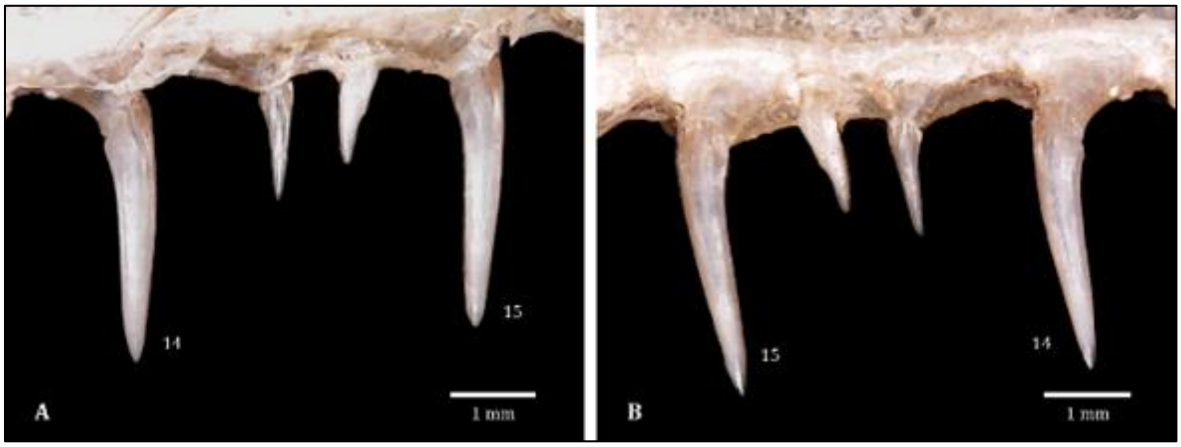

Figure 4 14th and 15th large rostral teeth (in order from the mouth) of the left lateral side in ventral view (A) and dorsal view (B). There are two smaller rostral teeth between the larger ones

Prominent transverse ridges are visible at the base of the large rostral teeth, on which the identification above was based (Figure 3). Between these larger teeth there are 1 to 2 smaller teeth, which do not exceed 1 mm in size (Figure 3 and 4). The lateral rostral teeth extend up to 18 mm (1,4 times the EYL) behind the nostrils. There is a total of 75 (left lateral side) and 76 teeth (right lateral side) along the rostrum (41/41 anterior to barbel origin and 55/56 teeth anterior to nostrils, consistent with Weigmann, Stehmann and Thiel [6]), although it should be noted that the count may vary slightly due to some missing teeth.

In addition to the lateral rostral teeth, there are also ventral rostral spines (up to 1 mm each; Figure 5 B). 20 of these are anterior to the nostrils and 14 are anterior to the barbel origin. These numbers also agree with Weigmann, Stehmann and Thiel [6] and Ebert and Cailliet [5], which stated 20 to 23 (18 to 25) and 14 to 16 (13 to 18) teeth respectively.

There is one additional ventral rostral spine directly in front of the nostrils. This spine measures 0,5 mm (Figure 5 A).

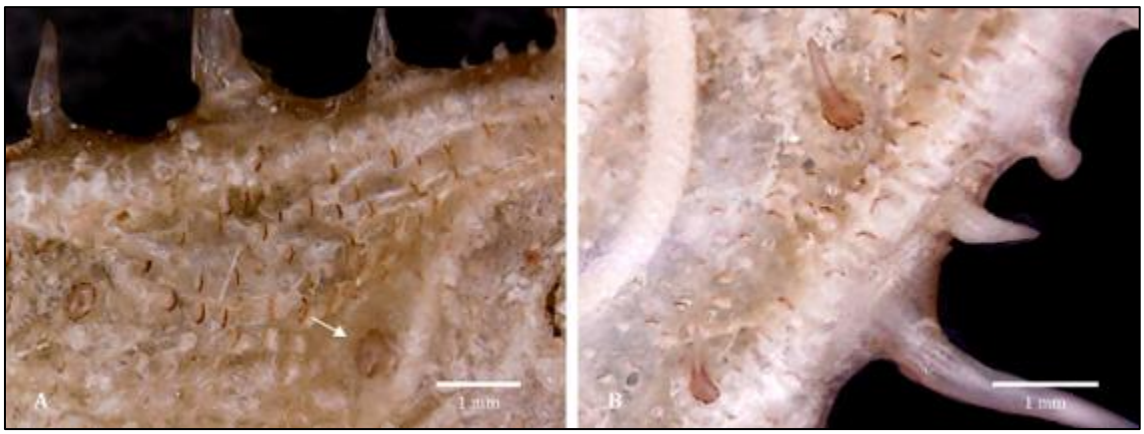

Figure 5 Ventral rostral spine in front of the left nostril (marked with an arrow; A) and ventral rostral spines 1 and 2 (in order from the mouth) on the right side of the rostrum (B)

Table 2 Comparison of the rostral tooth counts of the examined specimen of *P. nancyae*, the specimens from Weigmann, Stehmann and Thiel [6] and the holo- and paratype specimens from Ebert and Cailliet [5]. Table modified after Weigmann, Stehmann and Thiel [6]. Abbreviations: l… left side of the rostrum, r… right side of the rostrum

Tooth count specification	Examined specimen	Specimens from Weigmann, Stehmann and Thiel [6]	Type specimens from Ebert and Cailliet [5]
Total lateral rostral teeth anterior to mouth angles (approx.) l./r.	75/76	53-109	Not specified
Total lateral rostral teeth anterior to barbel origin l./r.	41/41	29-69	Not specified
Total lateral rostral teeth anterior to nostrils l./r.	55/56	40-93	Not specified
Total large lateral rostral teeth l./r.	20/20	20-23	21-32
Large lateral rostral teeth anterior to barbels l./r.	14/14	14-17	15-22
Large lateral rostral teeth posterior to barbels l./r.	6/6	6-7	6-10
Ventral rostral spines anterior to nostrils l./r. *	20/20	20-23	18-25
Ventral rostral spines anterior to barbel origin l./r.	14/14	14-16	13-18

* This count includes the count given under "Ventral rostral spines anterior to barbel origin l./r."

The teeth in the upper and lower jaw are very small (smaller than 0,3 mm in height), symmetrical and have only a single, centrally located cusp. This cusp becomes smaller and flatter from the teeth of the symphysis to the posterior teeth. The base of the teeth is rounded. In general, the teeth in the upper and lower jaw hardly differ, but the cusps of the upper jaw teeth are somewhat more pointed. There are no serrations on the tooth edges.

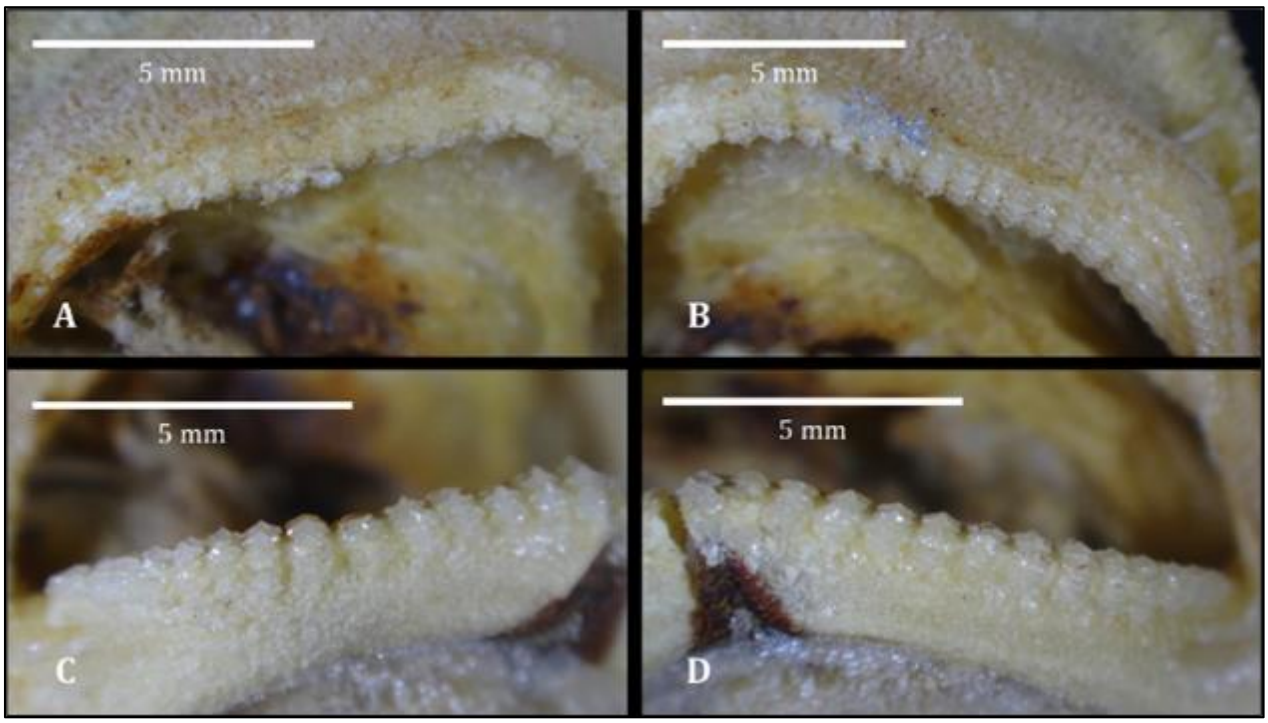

Figure 6 View of the teeth of the jaw. Left upper jaw (A), right upper jaw (B), left lower jaw (C) and right lower jaw (D)

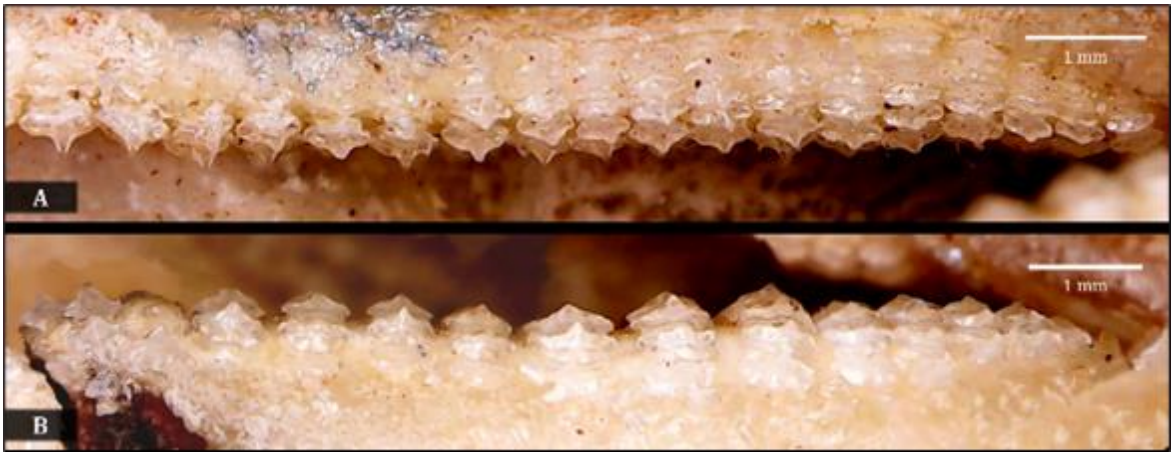

Figure 7 Composite and straightened image of the teeth in the right upper jaw (tooth 1 to 18; A) and right lower jaw (tooth 1 to 15; B)

The tooth formula of the present specimen is 18-0-18 (36) / 15-0-15 (30). There are 4 functional rows of teeth in the upper and the lower jaw. The tooth formula for the upper jaw agrees with Weigmann, Stehmann and Thiel [6] and Ebert and Cailliet [5], for the lower jaw only with Ebert and Cailliet [5]. However, the deviation from Weigmann, Stehmann and Thiel [6] is only one tooth (Table 3) and is not surprising given the small total number of specimens examined.

Table 3 Comparison of the jaw tooth counts of the examined specimen of *P. nancyae*, the specimens from Weigmann, Stehmann and Thiel [6] and the holo- and paratype specimens from Ebert and Cailliet [5]. Table modified after Weigmann, Stehmann and Thiel [6]

Tooth count specification	Examined specimen	Specimens from Weigmann, Stehmann and Thiel [6]	Type specimens from Ebert and Cailliet [5]
Tooth rows, upper jaw	36	34-44	31-36
Tooth rows, lower jaw	30	31-41	29-34

The teeth are characteristic of the family Pristiophoridae and resemble the teeth of *Pristiophorus lanae* Ebert and Wilms, 2013 [9, 10].

It is assumed that *P. nancyae* feeds on shrimplike crustaceans and decapods [5], for which the morphology of its teeth is well suited to crack their shells.

4. Conclusion

This study shows another record of the rare African dwarf sawshark (*Pristiophorus nancyae*) and represents an important addition to the morphology data of the existing literature. It was also shown that the examined individual is the oldest scientifically documented specimen of this shark species to date.

The aim of this work is to be a small building block in increasing knowledge about the poorly documented order of sawsharks and reminding for further research efforts in this area. Especially in times of global, climate and natural changes, it is important to preserve our knowledge of nature, the fragile marine ecosystem and its inhabitants in order to protect our planet.

Compliance with ethical standards

Acknowledgements

I would like to thank everyone who helped me complete this study, especially my friends and family. A very special thank you goes to my grandfather, Peter Seifert, for his tireless emotional and financial support.

Disclosure of conflict of interest

The Author declares that there is no conflict of interest.

Statement of ethical approval

This study complies with all regulations of the German Animal Welfare Act (TierSchG). The shark species is not protected and is listed as "Least Concern" by the IUCN [11].

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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Author's short biography

Jesco Seifert

Jesco Seifert is a German individual shark researcher since 2019. His goal is to build a large reference collection of shark teeth and jaws to better understand and research the tooth morphology of individual sharks and contribute to a more reliable identification of different species.

He collaborates with the Bibliography Database Shark References and the marine conservation organization Elasm Ocean.