

LEUCISTIC PIEBALD STRIPED PANRAY, *ZANOBATUS SCHOENLEINII*
(CHONDRICHTHYES: ZANOBATIDAE), FROM THE COAST OF SENEGAL
(EASTERN TROPICAL ATLANTIC)

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ABSTRACT

*In the present paper, a case of leucism/piebaldism is reported in a striped panray *Zanobatus schoenleinii* (Müller & Henle, 1841) captured at a low depth off the coast of Senegal (eastern tropical Atlantic). This is the second case recorded to date for this species. The specimen was sub-adult male with developed but flexible claspers, which measured 495 mm total length and 279 mm disc width, and weighed 751 g. Comments on albinism in fishes are provided in this paper, especially those reported in batoid species.*

Key words: morphology, colour, pigmentation, morphometric measurements, batoid species

ESEMPLARE LEUCISTICO DI *ZANOBATUS SCHOENLEINII* (CHONDRICHTHYES:
ZANOBATIDAE) AL LARGO DELLA COSTA DEL SENEGAL
(ATLANTICO TROPICALE ORIENTALE)

SINTESI

*L'articolo riporta un caso di leucismo/piebaldismo in un esemplare di *Zanobatus schoenleinii* (Müller & Henle, 1841), catturato in acque poco profonde al largo della costa del Senegal (Atlantico tropicale orientale). Si tratta del secondo caso di questo tipo registrato fino ad oggi per tale specie. L'esemplare era un maschio sub-adulto, con pterigopodi sviluppati ma flessibili, di lunghezza totale pari a 495 mm, larghezza del disco di 279 mm e 751 g di peso. Gli autori discutono i casi di albinismo nei pesci, in particolare quelli riportati per le specie batoidi.*

Parole chiave: morfologia, colore, pigmentazione, misure morfometriche, specie batoidi

INTRODUCTION

The striped panray, *Zanobatus schoenleinii* (Müller & Henle, 1841), is an endemic species known from the eastern tropical Atlantic, where it only occurs in the area between southern Morocco (Lloris & Rucabado 1998), Mauritania (Maurin & Bonnet, 1970), Senegal (Diatta *et al.*, 2013), Guinea-Bissau

(Sanches, 1991), and the Gulf of Guinea (Blache *et al.*, 1970).

Zanobatus schoenleinii is both commonly and abundantly captured in handicraft fishery throughout the coast of Senegal (Cadenat, 1951; Séret & Opic, 1990; Capapé *et al.*, 1995). The species inhabits shallow coastal waters not exceeding 50 m of depth (Capapé *et al.*, 1995). In the wake of a

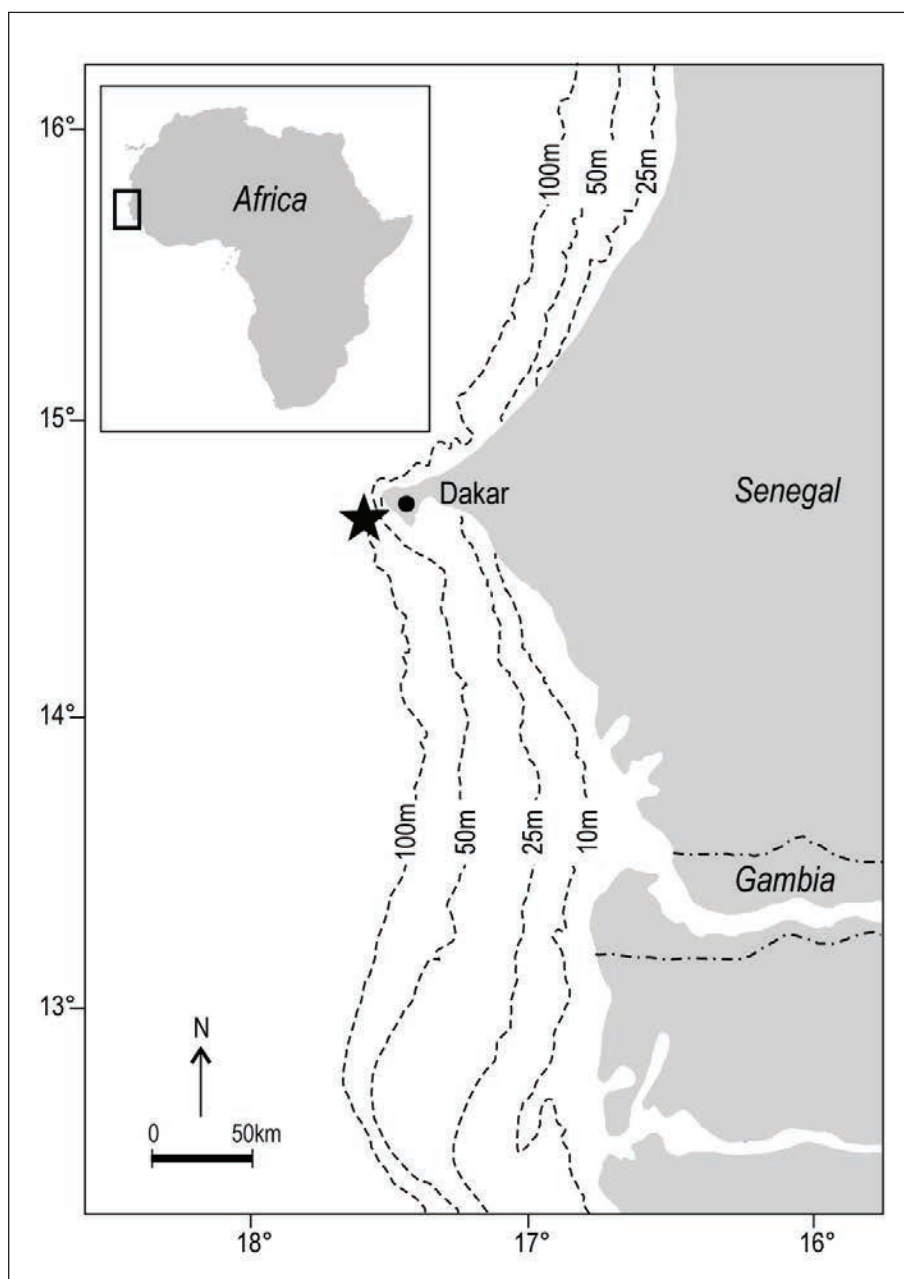


Fig. 1: Map of the Senegalese coast indicating the capture site of the leucistic specimen of *Zanobatus schoenleinii* (black star).

Sl. 1: Zemljevid senegalske obale z označeno lokaliteto, kjer je bil ujet belični primerek vrste *Zanobatus schoenleinii* (črna zvezdica).

collaboration with experienced fishermen, several *Z. schoenleinii* were collected in shallow coastal waters surrounding the touristic area of Dakar. All collected specimens were delivered to the laboratory for thorough examination, including the abnormal specimens described and commented in the present paper.

MATERIAL AND METHODS

A total of 105 specimens were captured on 25 May 2019 using trammel nets at a depth between 5 and 10 m on soft bottom, off Ouakam, a handicraft fishery site located 5 km north Dakar, in Cape Verde Peninsula, Senegal, at 14° 43' 26" N and 17° 29' 21" W (Fig. 1). Of these specimens, 104 were normal and one specimen abnormal, displaying non-pigmented areas on the dorsal surface.

All specimens were measured to the nearest millimetre and weighed to the nearest gram. The normal specimens ranged between 253 mm and 580 mm in total length (TL), 154 and 340 mm in disc width (DW), and weighed between 104 and 1433 g in total body weight (TBW). However, a sub-sample including 51 normal specimens and the single abnormal specimen was used in order to obtain a more visible view, allowing to clearly distinguish this abnormal specimen from the normal specimens. The subgroup ranged between 250 and 300 mm DW and weighed between 561 and 1346 g TBW.

Morphometric measurements recorded on one of the normal specimens and the abnormal specimens are presented in Table 1, following Diatta *et al.* (2013). Both specimens were fixed in 10% buffered formaldehyde, preserved in 75 % ethanol and deposited in the Ichthyological Collection of the Institut Supérieur d'Aquaculture et de Pêche of Bizerte (Tunisia), receiving catalogue numbers, ISPAB-Zan-sch-01 for the normal specimen and ISPAB-Zan-sch-02 for the abnormal specimen.

The relation between DW and TBW was used as a complement following Froese *et al.* (2011), including all specimens, normal and abnormal, to show if this latter would have been able to develop in the wild like normal specimens. This relation, $TBW = aDW^b$, was converted into its linear regression, expressed in decimal logarithmic coordinates, and

correlations were assessed by least-squares regression as: $\log TBW = \log a + b \log DW$. Significance of constant b differences was assessed according to the hypothesis of isometric growth if $b = 3$, positive allometry if $b > 3$, negative isometry if $b < 3$ (Pauly, 1983). These two latter tests were performed by using logistic model STAT VIEW 5.0.

RESULTS AND DISCUSSION

All normal specimens were identified as *Zanobatus schoenleinii* following the combination of main



Fig. 2: Normal specimen of *Zanobatus schoenleinii* (Ref. ISPAB- Zan-sch-01), from the coast of Senegal. Dorsal surface, scale bar = 100 mm.

Sl. 2: Normalni primerek vrste *Zanobatus schoenleinii* (Ref. ISPAB- Zan-sch-01) iz senegalske obale. Hrbtna stran, merilo = 100 mm.

morphological characters: disc sub-circular, wider than long; snout blunt, angle nearly 120° in front; nostrils narrow, anterior valves connected across the internarial space; mouth straight; teeth small; spiracles large without folds; dorsal and caudal fins small and rounded; covered by a rigid skin, unlike and minute scales, a medial row of thorns in disk and tail, and three rows arranged in an arc of circle on each shoulder; back brown with dark cross bands with white spots in between near the pectoral edges (Tab. 1; Fig. 2). Such description is in total agreement with Garman (1913), Cadenat (1951), Blache *et al.* (1970), and Séret & Opic (1990).

The abnormal specimen was a sub-adult male of *Zanobatus schoenleinii*, with developed but flexible claspers, measuring 495 mm TL, 279 mm DW and 751 g TBW (Tab. 1; Fig. 3). The central part of the disc was brown with dark spots externally larger and abundant on the central part of the disc, conversely, dark cross bands were totally lacking. An area surrounding eyes and spiracles was clear and whitish. The edges of both pectorals were largely clear, both dorsal fins and caudal fin whitish, belly entirely beige. The eye colour was black, which confirmed that the specimen was simultaneously leucistic and

piebald and not a true albino (*sensu* Quigley *et al.* (2019)). It is the second case reported for *Z. schoenleinii*, a similar specimen was previously collected from the coast of Senegal (Diatta *et al.*, 2013).

Quigley *et al.* (2019) noted that albinism is a disorder controlled by different genes in which the pigment melanin is absent or non-functional. Additionally, leucism is a partial lack of pigmentation of the skin controlled by a single recessive allele (Jones *et al.*, 2016). The term partial albinism or pseudo-albinism was previously used, but is now considered obsolete (Van Grouw, 2006). Lipej *et al.* (2011) showed that large albino specimens of marbled torpedo *Torpedo marmorata* Risso, 1810 could also be captured in the wild and that, consequently, total or partial albinism does not compromise life and development. Similar patterns were also reported for the striped panray (Diatta *et al.*, 2013). The relationship $\log DW$ versus $\log TBW$ is $\log TBW = -6.97 + 4.07 * \log DW$; $r = 0.94$, $n = 52$. It appears a positive allometry but the leucistic piebald specimen which clearly displays a TBW lower than this of the other specimens (Fig. 4). Following the opinion of Quigley *et al.* (2019), such pattern suggests that this abnormal specimen did not develop like other normal specimens in the wild due to being

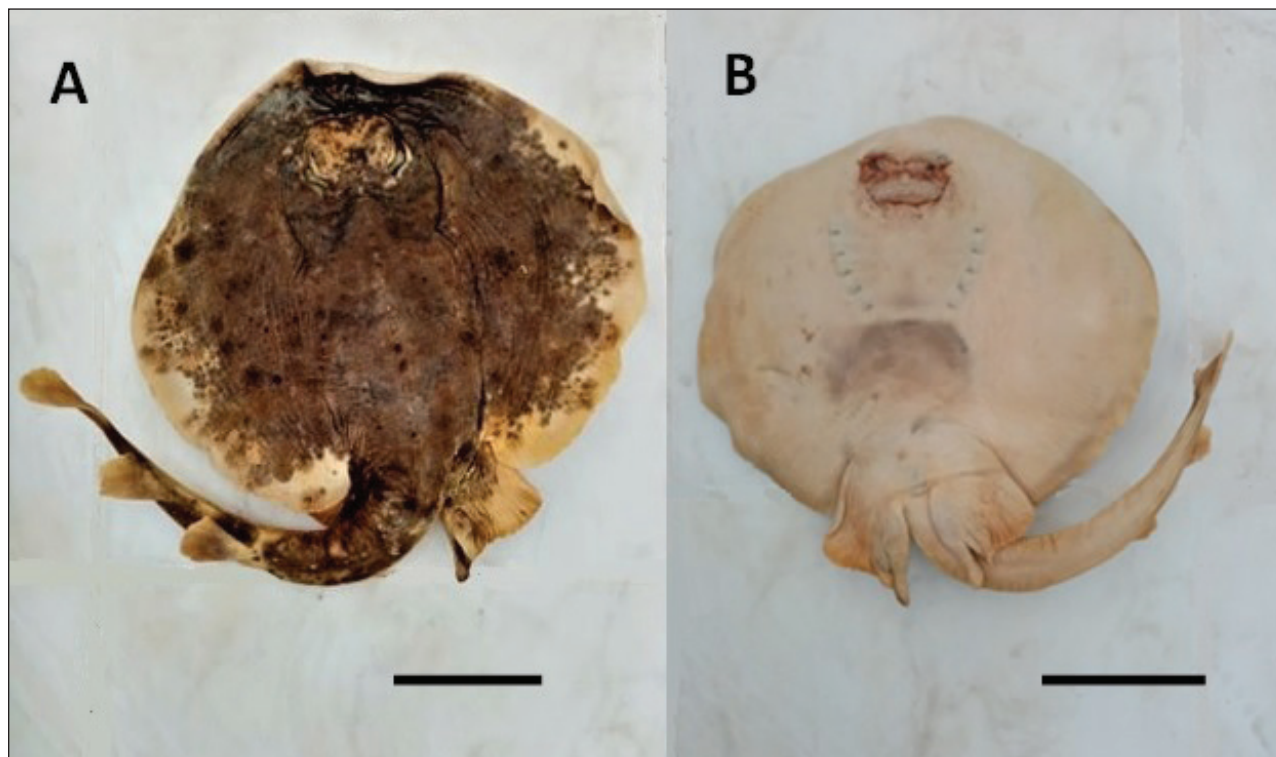


Fig. 3: Leucistic piebald specimen of *Zanobatus schoenleinii* (Ref. ISPAB- Zan-sch-01) from the coast of Senegal. A. Dorsal surface, scale bar = 80 mm. B. Ventral surface, scale bar = 100 mm.

Sl. 3: Belični piebaldistični primerek vrste *Zanobatus schoenleinii* (Ref. ISPAB- Zan-sch-01) iz senegalske obale. A. Hrbtna stran, merilo = 80 mm. B. Trebušna stran, merilo = 100 mm.

Tab. 1: The morphometric measurements (in mm and as % DW) and total body weight recorded in the leucistic piebald specimen of *Zanobatus schoenleinii* (ISPAB-Zan-sch-02) and compared to a normal specimen (ISPAB-Zan-sch-01), both from the coast of Senegal.

Tab. 1: Morfometrične meritve (v mm in kot % DW) in celotna telesna masa pri beličnem piebaldističnem primerku vrste *Zanobatus schoenleinii* (ISPAB-Zan-sch-02) v primerjavi z normalnim primerkom (ISPAB-Zan-sch-01). Oba sta bila ujeta ob senegalski obali.

References	ISPAB-Zan-sch-01		ISPAB-Zan-sch-02	
	MM	% DW	MM	% DW
Total length	559	194.8	495	177.4
Disc length	313	94.8	255	91.4
Disc width	330	100.0	279	100.0
Disc depth	44	13.3	34	12.2
Eyeball length	17	5.2	18	6.5
Pre-orbital length	70	21.2	59	21.2
Inter-orbital length	26	7.9	28	10.0
Spiracle diameter	23	6.7	19	6.8
Interspiracular width	33	10.0	30	10.8
Space between eye and spiracle	13	3.9	11	3.9
Pre-oral length	72	21.2	60	21.5
Mouth width	43	13.0	43	15.4
First gill-slit	8	2.5	9	3.2
Fifth gill-slit	7	2.4	7	2.5
Width between first gill-slit	82	24.8	69	24.7
Width between fifth gill-slit	51	15.5	43	15.4
Snout tip to eye	81	24.3	68	24.4
Snout tip to mouth	81	24.3	68	24.4
Snout tip to first gill-slit	106	32.1	102	36.6
Snout tip to fifth gill-slit	150	45.5	132	47.3
Snout tip to vent	270	81.8	225	80.7
Pectoral fin anterior margin	205	71.4	185	66.3
Pectoral fin posterior margin	184	62.1	143	51.3
Pelvic fin anterior margin	50	15.2	48	17.2
Pelvic fin posterior margin	77	23.3	55	19.7
Second dorsal inneredge	10	3.0	11	3.9
Interdorsal distance	30	9.1	32	11.5
Second dorsal to caudal birth	28	8.6	35	12.5
Total body weight	1507		751	

maladapted. But it could also explain why of the 633 batoid species known to date worldwide, only 22 cases of albinism, leucism and piebaldism had been reported (Quigley *et al.*, 2018), 23 including the present specimen.

Talent (1973) noted that lack of pigmentation could be considered as disadvantage for sharks and rays, calling the attention of possible predators to their presence in the wild. Generally, abnormal specimens are considered of lower value than normal specimens among fishermen and are sometimes discarded at sea; this could also explain their scarcity in fish landings. Unfavourable environmental conditions, such as large exposure to pollutants, could also play a role in the lack of pigmentation, especially in species living a benthic zones, such as *Zanobatus schoenleinii*. Such phenomenon was particularly observed in batoids, which generally inhabit sandy-muddy bottoms (Ribeiro-Prado *et al.*, 2008; Diatta *et al.*, 2013). The fact that albinos, leucistic and piebald specimens are more sensitive to pollutants than normal specimens remains a valid hypothesis, which should, however, be validated by further studies. Since Diop *et al.* (2012) and Bonnin *et al.* (2016) report that the coast of Senegal, especially around the touristic area of Dakar, has been, for decades, increasingly

exposed to pollutants in the wild and their impact on the local biodiversity cannot be totally ruled out, the presently studied case could be a good instance of that.

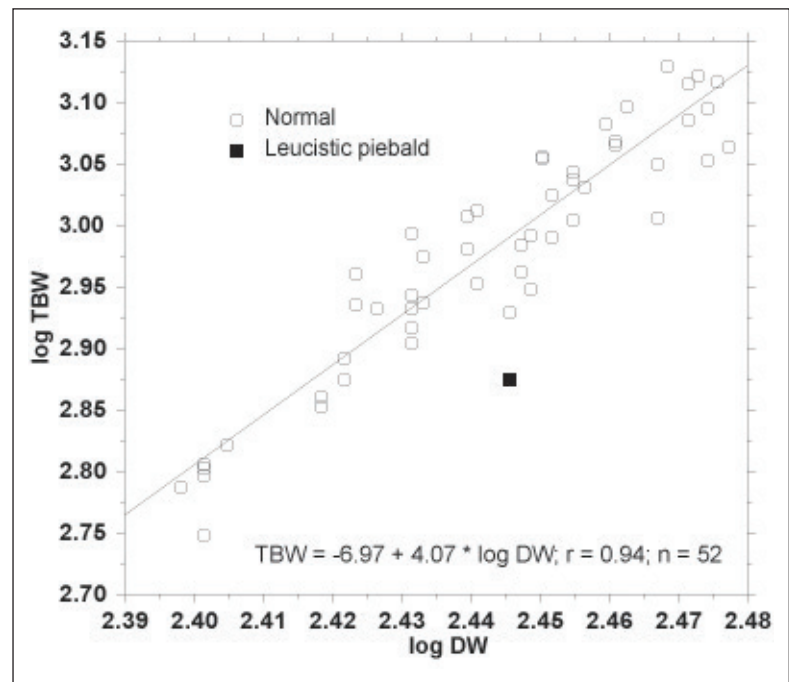


Fig. 4: Total body mass (TBM) versus disc width (DW) relationship expressed in logarithmic co-ordinates for normal and leucistic piebald specimens of *Zanobatus schoenleinii* collected from the coast of Senegal. Sl. 4: Odnos med celotno telesno maso (TBM) in širino diska (DW), izražen v logaritmični skali pri normalnih in leucističnih piebaldističnih primerkih vrste *Zanobatus schoenleinii*, ujetih ob senegalski obali.

BELIČNI PRIMEREK VRSTE *ZANOBATUS SCHOENLEINII* (CHONDRICHTHYES: ZANOBATIDAE) IZ SENEGALSKE OBALE (VZHODNI TROPSKI ATLANTIK)

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ABSTRACT

V pričujočem prispevku avtorji poročajo o primeru beličnosti/piebaldizma pri vrsti skata *Zanobatus schoenleinii* (Müller & Henle, 1841), ujetega v plitvini ob obali Senegala (tropski vzhodni Atlantik). Gre za drugi primer pojava te anomalije pri tej vrsti. Primerek je bil subadultni samec, ki je meril 495 mm v dolžino, 279 mm v premeru diska in tehtal 751 g, ter imel razvita, a še vedno prožna klasperja. Avtorji nadalje razpravljajo o primerih albinizma, še posebej tistih pri skatih.

Ključne besede: morfologija, barva, pigmentacija, morfometrične meritve, skati

REFERENCES

- Blache J., J. Cadenat & J. Stauch (1970):** Clés de détermination des poissons de mer signalés dans l'Atlantique oriental tropical (entre le 20^{ème} parallèle N. et le 15^{ème} parallèle S. Faune trop. ORSTOM, 18, 1-479.
- Bonnin, M., I. Ly, B. Queffelec & M. Ngaido (2016):** Droit de l'environnement marin et côtier au Sénégal, IRD, PRCM, Dakar, Sénégal, 532 pp.
- Cadenat, J. (1951):** Poissons de mer du Sénégal. Init. Afr. Inst. Fr. Afr. Noire, Dakar, 3, 1-345.
- Capapé, C., M. N'Dao & M. Diop (1995):** Données sur la biologie de la reproduction de quatorze espèces de Sélaciens batoïdes capturés dans la région marine de Dakar-Ouakam (Sénégal, Atlantique oriental tropical). Bull. Inst. fond. Afr. noire Cheikh Anta Diop, Dakar, sér. A, 48, 89-102.
- Diatta, Y., C. Reynaud & C. Capapé (2013):** First case of albinism recorded in striped panray, *Zanobatus schoenleinii* (Chondrichthyes: Platyrrhinidae) from the coast of Senegal (Eastern Tropical Atlantic). J. Ichthyol., 53(11), 1007-1012.
- Diop, C., D. Dewaele, A. Toure, M. Cabral, F. Cazier, M. Fall, B. Ouddane & A. Diouf (2012):** Study of sediment contamination by trace metals at wastewater discharge points in Dakar (Senegal). J. Wat. Sci., 25(3), 185-299.
- Froese, R., A.C. Tsikliras & K.I. Stergiou (2011):** Editorial note on weight-length relations of fishes. Acta Ichthyol. Piscat., 41(4), 261-263.
- Garman, S. (1913):** The Plagiostoma (Sharks, Skates, and Rays). Mem. Mus. Comp. Zool. Harvard Univ., 36(2), 1-515.
- Jones, C.M., E.R. Hoffmayer & R.P. Gropp (2016):** First record of a leucistic *Narcine bancrofti* (Elasmobranchii, Narcinidae) from the northern Gulf of Mexico. Cybium, 40(3), 249-251.
- Lipej, L., B. Mavrič, V. Žiža & C. Capapé (2011):** First cases of albinism recorded in the marble electric ray *Torpedo marmorata* (Chondrichthyes: Torpedinidae). Cah. Biol. Mar., 52(3), 261-267.
- Lloris, D. & J. Rucabado (1998):** Guide FAO d'identification des espèces pour les besoins de la pêche. Guide d'identification des ressources marines vivantes pour le Maroc. FAO, Rome, 263pp.
- Maurin, C. & M. Bonnet (1970):** Poissons des côtes nord-ouest africaines (Campagnes de la «Thalassa», 1962 et 1968). Rev. Trav.Inst. scient. Tech. Pêch. marit., 34, 125-170.
- Pauly, D. (1983):** Some simple methods for assessment of tropical fishes. FAO Fish. Techn. Pap., 234: 3-10.

Quigley, D.T.G., A. de Carlos, D. Barros-Garcia & D. McGabhann (2018): Albinism and leucism in blonde ray (*Raja brachyura* Lafont, 1871) (Elasmobranchii: Batoidea) from the Irish Sea. *Bull. Eur. Ass. Fish Pathol.*, 38(2), 79-88.

Quigley, D.T.G., A. de Carlos, D. Barros-Garcia & D. McGabhann (2019): Leucistic piebald Cuckoo ray (*Leucoraja naevus*) (Müller and Henle) from the Irish Sea. *Irish Natur.J.*, 36(2), 159-162.

Ribeiro-Prado, C.C., M.C. Oddone, M.M. Bueno Gonzalez, A. Ferreira de Amorim & C. Capapé (2008): Morphological Abnormalities in Skates and Rays (Chondrichthyes) from off Southeastern Brazil. *Arq. Cienc. Mar. Fortaleza*, 41(2), 21-28.

Sanches, J.G. (1991): Catálogo dos principais peixes marinhos da República da Guiné-Bissau. Publicações avulsas do Instituto Nacional de Investigação das Pescas, Lisboa, 16, 1-429.

Séret, B. & P. Opic (1990): Poissons de mer de l'ouest Africain tropical. Initiations-Documentations Techniques, ORSTOM: Paris, 450 pp.

Talent, L.G. (1973): Albinism in embryo gray smoothhound sharks, *Mustelus californicus*, from Elkhorn Slough, Monterey Bay, California. *Copeia*, 3, 595-597.

Van Grouw, H. (2006): Not every white is an albino: sense and nonsense about colour aberration in birds. *Dutch Birding*, 28(3), 79-89.