



Record of albinism in the Smooth Butterfly ray *Gymnura micrura* (Rajiformes, Gymnuridae) from the southeastern Gulf of Mexico

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Abstract. We report the presence of an albino specimen of Smooth Butterfly ray, *Gymnura micrura*, captured in the southeastern Gulf of Mexico. The specimen was a juvenile male with a disk width of 17.7 cm and a total weight of 37.3 g.

Key words: total albinism, elasmobranch, smooth butterfly ray, small-scale shrimp fishery.

Resumen: Registro de albinismo en la raya mariposa *Gymnura micrura* (Rajiformes: Gymnuridae) del sureste del Golfo de México. Se reporta la presencia de un espécimen albino de la raya mariposa, *Gymnura micrura*, capturado en el sureste del Golfo de México. El espécimen fue un macho juvenil con un ancho de disco de 17.7 cm y peso total de 37.3 g.

Palabras clave: albinismo total, elasmobranquio, raya mariposa, pesquería artesanal de camarón.

Albinism is a genetic anomaly characterized by the total or partial absence of pigmentation in the body of an organism, caused by the alteration of a recessive gene that affects the production of melanin (Li *et al.* 2017). There are two types of albinism, in the first, there is a total loss of integumentary and retinal pigmentation, and in the second, there is a partial loss of pigmentation where only the eyes or a part of the body has the natural pigmentation of the species. The latter is also known as partial albinism or leucism (Lutz 2001). The smooth butterfly ray is a benthic species that inhabits sandy and muddy bottoms of coastal waters (McEachran & de Carvalho 2002) within its geographic range. In cartilaginous fishes, pigmentation abnormalities have been reported in a wide variety of chimaeras, sharks and rays species (Bottaro *et al.* 2005, Reum *et al.* 2008, Saidi *et al.* 2006, Sancho-Vasquez 2015). The low frequency of cases of albinism in elasmobranchs may be due to the fact that they are relatively sparse subclass in nature (Bottaro *et al.* 2005). The frequency of reports of pigmentation

abnormalities in batoid fishes has increased (Table 3) in the last few years. The butterfly ray is categorized by the International Union for the Conservation of Nature (IUCN) as having “data deficient” therefore, any study that provides information on the species is essential to increasing knowledge of its natural state and implementation of measures for conservation (Grubbs & Ha 2006). The objective of the present study was to report the first record of total albinism in the Smooth Butterfly ray, *G. micrura*.

On March 8, 2018 the smooth butterfly ray specimen was captured by Atlantic Seabob shrimp fishermen from Ciudad del Carmen, Campeche (18° 63' N, 91° 83' W), using a bottom shrimp trawl net with mesh size of 2.54 cm, three kilometres offshore of Ciudad del Carmen at a depth of 9 m (Fig. 1). The *G. micrura* specimen was identified using the FAO species identification guide for fishing purposes (McEachran & Carvalho 2002). It was labeled and taken to the Fisheries Research Laboratory of the Regional Fishing Research Center



Figure 1. Catch site location (black star) and fishery landing locality (black circle) of albino specimen of *Gymnura micrura* in the southeastern Gulf of Mexico.

(CRIP), belonging to the National Institute of Fisheries and Aquaculture based in Ciudad del Carmen. In the laboratory, the phenotypic characteristics of the specimen with respect to its coloration were reviewed. Sex was determined by direct observation of the presence or absence of claspers and the ontogenic stage was established by the clasper conditions. Various morphometric measurements were made with a caliper (± 0.1 cm) and the total weight was obtained with a digital balance (± 0.01 g). After processing, the specimen was deposited in the Ichthyologic Collection of the Natural Science Faculty of the Universidad Autónoma del Carmen (FCN-UNACAR) with the code FCN-UNACAR-GMIC01.

The specimen was determined to be a juvenile male with immature sexual condition according to poor clasper development, with disc width (D_w) of 17.7 cm and total weight (W_T) of 37.3 g. Other morphometric measurements are reported in Table I.

The particular characteristics of albinism observed on the specimen were white coloration over the totality of its body, the absence of horizontal yellow stripes on the tail, white coloration of the eye sclera, mottled yellow spots on the dorsal region, all of which are unlike an organism with normal coloration caught in the same area (Fig. 2). The behaviour of albino fishes in their natural habitat has been described as solitary, which is

believed to increase vulnerability to predators and decrease participation in reproductive events (Hain & Leatherwood 1982, Sandoval-Castillo *et al.* 2006). This study is the second report of total

Table I. Meristics of juvenile albino male *Gymnura micrura*: Lengths are expressed as proportion of disc width (% D_w).

Disc width of the examined individual = 177 mm

Metric	% D_w
Disc length	57.1
Total length	76.3
Mouth length	12.4
Clasper length	4.0
Eye diameter	3.4
Interorbital length	10.7
Snout tip to eye	11.6
Snout tip to pelvic fin	54.2
Interspiracular width	10.2
Tail length	12.4
Gill slit length	2.0
Distance between gill slits	20.9
Pelvic fin length	7.1
Pelvic fin width	2.8

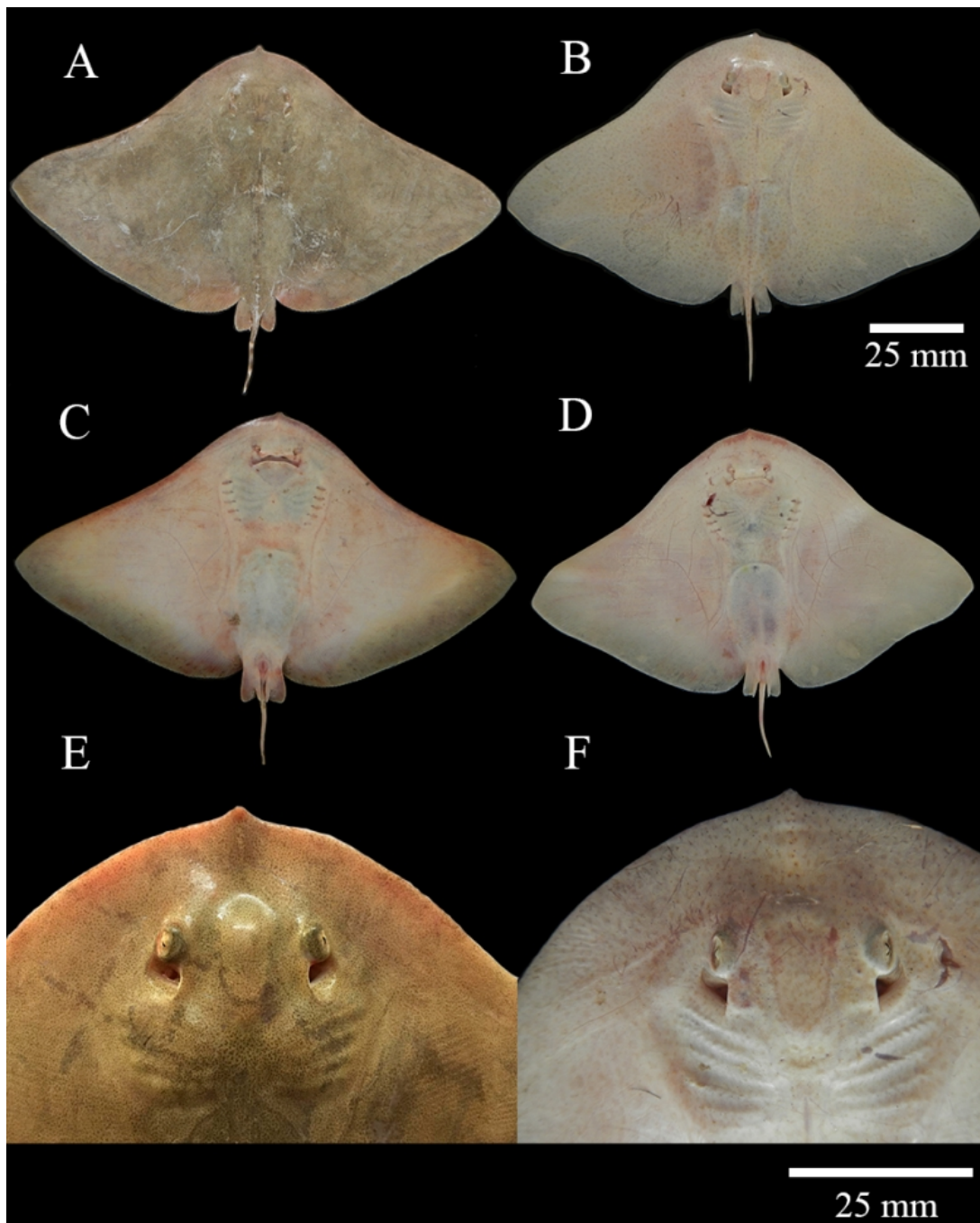


Figure 2. Dorsal, ventral and cephalic view of a normal (A, C, E) and albino specimens (B, D, F) of a juvenile male *G. micrura*, captured in the southeastern Gulf of Mexico.

albinism in the smooth butterfly ray globally, and the first report in the Gulf of Mexico. The original report was of a juvenile female captured off the State of Alagoas in Brazil (Reis *et al.* 2013). Compared to 28 normal female specimens, it was concluded that albinism may have minimal influence on feeding, growth and another aspects of life history, such as

reproduction (Mendoza-Carranza *et al.* 2016). The present report increases the number of described albino specimens with presence of similar phenotypic characteristics from southeast Gulf of Mexico and for other parts of the world where a review of the literature documents only 40 observed cases of albinism in batoid fishes (Table II). The

Table II. Records of abnormalities of body coloration in batoid fishes from around the world.

Colour Abnormality	Family	Species	Capture site	Reference
Partial albinism	Rajidae	<i>Raja clavata</i>	Yorkshire, UK (North Sea)	Clarke (1929)
Partial albinism	Rajidae	<i>Raja clavata</i>	Scotland	Traquair (1983)
Polychromatism	Rajidae	<i>Raja clavata</i>	Northern Tunisian coast.	Mnasri <i>et al.</i> (2009)
Partial albinism	Rajidae	<i>Raja clavata</i>	North Sea and English Channel.	Ball <i>et al.</i> (2013)
Total albinism	Rajidae	<i>Raja montagui</i>	North Sea and English Channel.	Ball <i>et al.</i> (2013)
Total albinism	Rajidae	<i>Raja brachyura</i>	North Sea and English Channel.	Ball <i>et al.</i> (2013)
Partial albinism	Rajidae	<i>Raja brachyura</i>	Ireland Sea	Quigley <i>et al.</i> (2018)
Total albinism	Rajidae	<i>Raja brachyura</i>	Ireland Sea	Quigley <i>et al.</i> (2018)
Partial albinism	Rajidae	<i>Leucoraja naevus</i>	Scotia	Wilson (1951)
Partial albinism	Rajidae	<i>Dipturus batis</i>	Scotia	Wilson (1951)
Partial albinism	Rajidae	<i>Okamejei kenojei</i>	Japan, Western Pacific	Ishihara <i>et al.</i> (2001)
Total albinism	Arhynchobatidae	<i>Bathyraja aleutica</i>	Alaska, USA	Bigman <i>et al.</i> (2015)
Partial albinism	Arhynchobatidae	<i>Bathyraja trachura</i>	Alaska, USA	Bigman <i>et al.</i> (2015)
Partial albinism	Platyrrhininae	<i>Zanobatus schoenleinii</i>	Peninsula, Senegal (NE Atlantic Ocean)	Diatta <i>et al.</i> (2013)
Total albinism	Urotrygonidae	<i>Urotrygon nana</i>	Pacific Ocean, Mexico	Anislado-Tolentino <i>et al.</i> (2016)
Total albinism	Torpedinidae	<i>Torpedo marmorata</i>	Trieste Gulf, north Adriatica	Lipej <i>et al.</i> (2011)
Total albinism	Torpedinidae	<i>Torpedo marmorata</i>	Tunissia	Ben Brahim <i>et al.</i> (1998)
Partial albinism	Narcinidae	<i>Narcine bancrofti</i>	Texas, USA (Gulf of Mexico)	Jones <i>et al.</i> (2016)
Partial albinism	Narcinidae	<i>Narcine entemedor</i>	Pacific Ocean, Mexico	Sandoval-Castillo <i>et al.</i> (2006)
Partial albinism	Mobulidae	<i>Manta alfredi</i>	Maldives, Indian Ocean	Marshall <i>et al.</i> (2009)
Partial albinism	Mobulidae	<i>Manta birostris</i>	Revillagigedo Archipelago (Mexico)	Marshall <i>et al.</i> (2009)
Total albinism	Myliobatidae	<i>Myliobatis californica</i>	California	De Jesús-Roldán (1990)
Total albinism	Rhinobatidae	<i>Glaucostegus halavi</i>	Gulf of Gabez	Ben Soussi <i>et al.</i> (2007)
Partial albinism	Rhinopteridae	<i>Rhinoptera bonasus</i>	Maryland	Schwartz (1959)
Partial albinism	Rhinopteridae	<i>Rhinoptera bonasus</i>	Chesapeake Bay	Joseph (1961)
Partial albinism	Dasyatidae	<i>Bathytoshia brevicaudata</i>	Whangaparoa Bay, Hauraki Gulf, New Zealand	Talent (1973)
Partial albinism	Dasyatidae		Pamlico sound, North Carolina, USA	Schwartz & Safrit Jr. (1977)
Total albinism	Dasyatidae	<i>Hypanus americanus</i>	Southern Gulf of Mexico	Wakida-Kusunoky (2015)
Policromatism	Dasyatidae	<i>Hypanus americanus</i>	Campeche Bank, Tabasco, Gulf of Mexico	Mendoza-Carranza <i>et al.</i> (2016)
Partial albinism	Gymnuridae	<i>Gymnura micrura</i>	Sao Miguel, Brazil	Reis <i>et al.</i> (2013)
Total albinism	Gymnuridae	<i>Gymnura micrura</i>	Sothern Gulf of Mexico	Present study

presence of other fish species with albinism in the southeast Gulf of Mexico has increased in recent years, with reports of the gafftopsail sea catfish, *Bagre marinus* (Wakida-Kusunoki & Amador-del-

Ángel 2013); southern stingray, *Hypanus americanus* (Wakida-Kusunoki 2015, Mendoza-Carranza *et al.* 2016); and the hardhead catfish,

Ariopsis felis (Guerra-Jiménez & Lara-Mendoza 2018).

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References

- Anislado-Tolentino, V., Medina-Lerma M. G. & Del Moral-Flores, L. F. 2016. Primer registro de albinismo en la raya redonda enana, *Urotrygon nana* (Urotrygonidae: Elasmobranchii), en el Pacífico oriental. **Revista de Ciencias Marinas y Costeras**, 8 (2): 93-100.
- Ball, R. E., Jones, C. S., Lynghammar A., Noble, L. R & Griffiths, A. M. 2013. The first confirmed cases of full albinism in rajid species. **Journal of Fish Biology**, 82: 1433–1440.
- Ben Brahim R., Seck A. & Capapé, C. 1998. Albinisme chez une torpille ocellée, *Torpedo (torpedo) torpedo*. **Cybium**, 22 (1): 83-86.
- Ben Souissi, J., Golani, D., Mejri, H., Ben Salem M., & Cacapé, C. 2007. First confirmed record of the Halave's Guitarfish, *Rhinobatos halavi* (Forsskal, 1775) (Chondrichthyes: Rhinobatidae) in the Mediterranean Sea with the description of a case of albinism in Elasmobranchs. **Cahiers de Biologie Marine**, (48) 1:67–75.
- Bigman, J. S., Jnuckey, J. D. S. & Ebert, D. A. 2015. Color aberrations in Chondrichthyan fishes: first records in the genus *Bathyraja* (Chondrichthyes: Rajiformes: Arhynchobathidae). **Marine Biodiversity**, 46 (3):579-587.
- Bottaro, M., Ferrando, S., Gallus, L., Girosi, L. & Vacchi, M. 2008. First record of albinism in the deep-water shark *Dalatias licha*. **Marine Biodiversity Record**, 1, E10.
- Capapé C. & Pantoustier, G. 1975. Anomalies Chez quelques sélaciens des côtes tunisiennes. **Les Archives de L'Institut Pasteur Tunis**, 52 (3): 251-262.
- Clarke, W. J. 1929. White variety of the Thornback Ray at Scarborough. **The Naturalist**, 54: 392.
- De Jesús-Roldán, M. 1990. An albino bat ray, *Myliobatis californica*, from the pacific coast of Baja California Sur, Mexico. **California Fish and Game**, 76 (2): 126– 127.
- Diatta Y., Reynaud C. & Capapé, C. 2013. First case of albinism recorded in striped panray *Zanobatus schoenleinii* (Chondrichthyes: Platyrhinidae) from the coast of Senegal (eastern tropical Atlantic). **Journal of Ichthyology**, 53 (11): 1007–1012.
- Guerra-Jiménez, L. A. & Lara-Mendoza, R. E. 2018. Primer registro de albinismo en el bagre boca chica *Ariopsis felis* (Siluriformes: Ariidae) del sureste del Golfo de México. **Revista de Ciencias Marinas y Costeras**, 10(1): 39-46.
- Grubbs, R. D. & Ha, D. S. 2006. *Gymnura micrura*. The IUCN Red List of Threatened Species 2006: e.T60115A12305055. <http://dx.doi.org/10.2305/IUCN.UK.2006.RLTS.T60115A12305055.en>. Downloaded on 14 May 2019.
- Ishihara, H., Homma, K., & Nakamura, R. 2001. The occurrence of albinism in individuals of the Manta Ray and Japanese Common Skate Found in the Western Pacific, *IOP. Diving News*, 12 (7): 6–20.
- Jones, C. M., Hoffmayer, E. R. & Gropp, R. P. 2016. First record of a leucistic *Narcine bancrofti* (Elasmobranchii, Narcinidae) from the northern Gulf of México. **Cybium**, 40 (3), 249-251
- Joseph E. B. 1961. An albino cownose ray, *Rhinoptera bonasus* (Mitchill), from Chesapeake Bay. **Copeia**, (4): 482-483.
- Li, Y., Geng, X., Bao, L., Elasmwad, A., Huggins, W. K., Dunham, R. & Liu, Z. 2017. A deletion in the Hermansky-Pudlak syndrome 4 ($H_{ps}4$) gene appears to be responsible for albinism in channel catfish. **Molecular Genetics and Genomics**, 292(3): 663-670.
- Lipej, L., Mavric, B., Ziza, V. & Capapé, C. 2011. First cases of albinism recorded in the marble electric ray *Torpedo marmorata* (Chondrichthyes: Torpedinidae). **Cahiers de Biologie Marine**, 52 (3): 261-267.
- Lutz, C. G. 2001. Practical Genetics for Aquaculture. Blackwell Science, Oxford. 256 pp.

- Marshall, A. D., Compagno, L. V. & Bennett, M. B. 2009. Redescription of the genus *Manta* with resurrection of *Manta alfredi* (Krefft, 1868) (Chondrichthyes: Myliobatoidei: Mobulidae). **Zootaxa**, 2301, 1-28
- McEachran, J. D. & Carvalho, M. R. 2002. Batoid Fishes. In: Carpenter, K.E. (Ed.) The living marine resources of the Western Central Atlantic. Vol. 1. Introduction, molluscs, crustaceans, hagfishes, sharks, batoidfishes and chimaeras. **FAO Species Identification Guide for Fishery Purposes and American Society of Ichthyologists and Herpetologists Special Publication No. 5**. pp. 507-589.
- Mendoza-Carranza, M., Santiago-Alarcón, D., Pérez-Jiménez, J. C. & Hernández-Lazo, C. C. 2016. Eyeless morphotype in the southern stingray (*Dasyatis americana*): a non lethal and frequent abnormality from the southern Gulf of Mexico. **Latin American Journal of Aquatic Research**, 44(3): 460-469.
- Mnasri, N., Boumaïza, M., Ben Amor Mohamed, M. & Capapé, C. 2009. Polychromatism in the thornback ray, *Raja clavata* (Chondrichthyes: Rajidae) off northern Tunisian coast (central Mediterranean). **Panamerican Journal of Aquatic Science**, 4(4): 572-579
- Quigley, D. T. G., de Carlos, A., Barros-Garcia, D. & MacGabhann, D. 2018. Albinism and leucism in blonde rays (*Raja brachyura* Lafont, 1871) (Elasmobranchii: Batoidea) from the Irish Sea. **Bulletin of the European Association of Fish Pathologist**, 38 (2): 79.
- Reis, M., Grande, H., Macedo, M. M. & Batista, V. S. 2013. Albinism in the smooth butterfly ray *Gymnura micrura* (Elasmobranchii: Gymnuridae): first record and morphometric comparisons. **Cybium**, 37(3): 217-219.
- Reum, J. C. P., Paulsen C. E., Pietsch, T. & Parker-Stetter, S. L. 2008. First record of an albino chimaeriform fish, *Hydrolagus colliei*. **Northwestern Naturalist**, 89 (1): 60.
- Saidi B., Bradai M. N., Marouani S., Guelorget O. & Capape, C. 2006. Atypical characteristics of an albino embryo of *Carcharhinus plumbeus* (Chondrichthyes: Carcharhinidae) from the Gulf of Gabes (southern Tunisia, central Mediterranean). **Acta Adriatica**, 47 (2): 167-174.
- Sancho-Vázquez E., Del Moral-Flores, L. F. & Mendoza-Vargas, O. U. 2015. Albinismo parcial en un embrión de tiburón puntas negras, *Carcharhinus limbatus* (Carcharhinidae: Chondrichthyes) del Pacífico oriental. **Latin American Journal of Aquatic Reserch**, 43(1): 274-276.
- Sandoval-Castillo, J., Mariano-Meléndez, E. & Villavicencio-Garayzar, C. 2006. New records of albinism in two elasmobranchs: the tiger shark *Galeocerdo cuvier* and the giant electric ray *Narcine entemedor*. **Cybium**, 30 (2): 191-192.
- Schwartz, F. J. 1959. White Cownose Ray, *Rhinoptera bonasus*, from Tangier Sound, Maryland Tidewat. **News**, 15: 12.
- Schwartz, F. J. & Safrit Jr, G. W. 1977. A white southern stingray, *Dasyatis americana*, (Pisces, Dasyatidae), from Pamlico Sound, North Carolina. **Chesapeake Science**, 18 (1): 83-84.
- Talent, L. G. 1973. Albinism in embryo gray smoothhound sharks, *Mustelus californicus*, from Elkhorn Slough, Monterrey Bay, California. **Copeia**, (3): 595-597.
- Traquair, R. H. 1893. An unusually coloured example of the thornback, (*Raja clavata*, Linn.). **The Annals of Scottish Natural History**, (25).
- Wakida-Kusunoki, A. T. & Amador-del-Ángel, L. E. 2013. First record of albinism in gafftopsail catfish *Bagre marinus* (Pisces: Ariidae) from southeast México. **Revista de Biología Marina y Oceanografía**, 48 (1): 203-206.
- Wakida-Kusunoki, A. T. 2015. First record of total albinism in southern stingray *Dasyatis americana*. **Revista de Biología Marina y Oceanografía**, 50 (1): 135-139.
- Wilson, E. 1951. Colour deficiency in skate (Rajidae). **Proceedings of the Zoological Society of London**, 121 (3): 557-559.

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