

New records of albinism in two elasmobranchs: the tiger shark *Galeocerdo cuvier* and the giant electric ray *Narcine entemedor*

by

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RÉSUMÉ. - Deux nouveaux cas d'albinisme chez des élasmobranchés : le requin-tigre commun *Galeocerdo cuvier* et la raie électrique géante *Narcine entemedor*.

Un embryon de requin tigre *Galeocerdo cuvier*, complètement albinos, a été trouvé dans l'utérus d'une femelle capturée au large des îles Revillagigedo (océan Pacifique, Mexique). L'embryon albinos était un mâle de 62 cm de longueur totale. Une raie électrique géante (*Narcine entemedor*), partiellement albinos, a été capturée dans la baie Almejas (Baja California Sur, Mexique). Le spécimen était une femelle mature de 69 cm de longueur totale. C'est le premier cas d'albinisme signalé chez *N. entemedor* et le second chez *G. cuvier*.

Key words. - Elasmobranch - *Galeocerdo cuvier* - *Narcine entemedor* - ISE - Mexico - Bahía Almejas - Revillagigedo Is. - Albinism - Leucism.

Albinism is a genetic anomaly that produces a reduction in melanin pigment biosynthesis. There are two kinds of albinism: (1) complete albinism is the total absence of integumentary and retinal pigmentation and (2) partial albinism or leucism is the partial or complete loss of integumentary pigments, but with retinal pigments present (Goto *et al.*, 2004). Albinism appears to be more common in bony fishes than in elasmobranchs, in which it has been reported in at least sixteen shark and eleven ray species (Tab. I).

In April 1996, during a shark survey at the Revillagigedo Islands (Pacific Ocean, México), a 4 m total length (TL) pregnant female tiger shark (*G. cuvier* Péron & LeSueur, 1822), was caught at Socorro Island (18°49'N, 110°53'W). A total of 48 prenatal youngs were found in this female, and one 62 cm TL male foetus, morphologically similar to the other embryos, lacked skin and retinal melanin pigmentation (Fig. 1). Instead of the normal grey fins and body, with vertical dark bars on the body, this individual was totally cream coloured. The absence of all integumentary and retinal pigments indicated that the foetus was a complete albino.

In August 1998, in Bahía Almejas (24°24'N, 111°35'W), South Baja California, México, a local fisherman caught a 69 cm TL mature male electric ray (*N. entemedor* Jordan & Starks, 1895). This morphologically normal specimen showed a reduced body skin coloration (Fig. 1). *N. entemedor* exhibits much variation in colour, but a dark dorsal background colour is typical of this species. In contrast, this specimen is cream-coloured dorsally. Reduced body coloration and the normal retinal coloration confirmed this ray as a partial albino.

Both specimens were preserved in 10% formalin and were deposited in the collection of the elasmobranchs Laboratory at Baja California Sur University (No Gc0496 and Ne0898, respectively).

Recessive albinism mutations have been reported for many

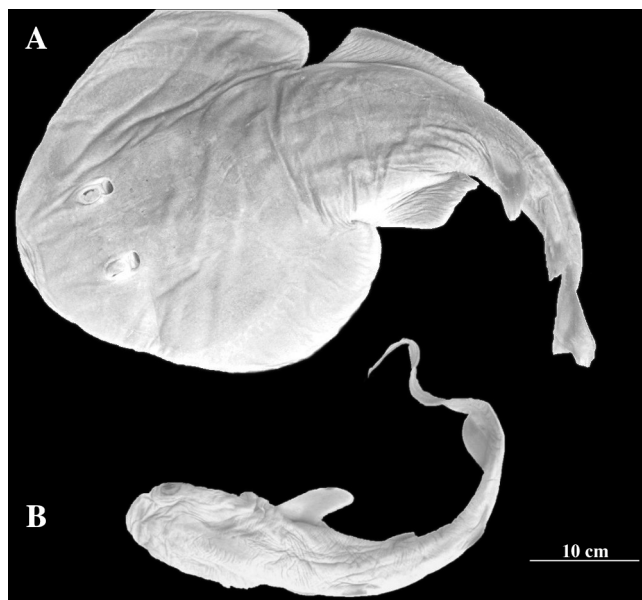


Figure 1. - **A**: *Narcine entemedor*, adult female partial albino of 69 cm TL. **B**: *Galeocerdo cuvier*, complete albino male foetus of 62 cm TL. [A : *Narcine entemedor*, femelle adulte partiellement albinos. B : *Galeocerdo cuvier*, embryon mâle complètement albinos.]

genes in some other organisms including bony fishes (Rothbard and Wohlfarth, 1993). The single albino embryo in the tiger shark litter indicates that albinism in this shark is produced in homozygous organisms at the albino mutations, and these are recessive alleles. The capture of an albino bat ray in a school of normally coloured individuals (De Jesus-Roldan, 1990), the record of an albino cownose ray pregnant with a normally coloured foetus (Joseph, 1961), shark litters composed of both albino and normally pigmented foetuses from normally pigmented mothers (Talent, 1973; Iwamasa and Okano, 1980), and the report of albino newborns from both normally pigmented parents (Clark, 2002) reinforced the recessive albino allele theory in elasmobranchs. However, heterozygosis in albinism mutation has been found in partial and total albino humans (Goto *et al.*, 2004). Genetic analyses of albino elasmobranchs are necessary.

Due to the contrast with substrate coloration, albinism was considered more disadvantageous and less common for benthonic than for pelagic elasmobranchs (De Jesus-Roldan, 1990). However, albinism reported in 18 elasmobranchs families with different anatomical and ecological features (Tab. I), demonstrates that albinism is not

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Table I. - Albinism reports in elasmobranchs. ⁽¹⁾: in Clark, 2002; ⁽²⁾: in Ishihara *et al.*, 2001. [Signalements d'albinisme chez les élasmobranches.]

Family	Species	Reference
Hexanchidae	<i>Notorynchus cepedianus</i> (Péron, 1807)	Herald 1953 ⁽¹⁾
Carcharhinidae	<i>Carcharhinus amboinensis</i> (Müller & Henle, 1839)	McKey and Beinsen 1987 ⁽¹⁾
	<i>Galeocerdo cuvier</i> (Péron & Lesueur, 1822)	Rider <i>et al.</i> 2002; present work
Triakidae	<i>Triakis semifasciata</i> Girard, 1854	Follett 1976 ⁽¹⁾
	<i>Mustelus californicus</i> Gill 1864	Herald <i>et al.</i> 1960 ⁽¹⁾ ; Cohen 1973 ⁽¹⁾ ; Talent 1973
	<i>Mustelus schmitti</i> Springer 1939	Ferreira and Goes 2002
	<i>Hemistriakis japanica</i> (Müller & Henle, 1839)	Furuta 1985 ⁽²⁾
Sphyrnidae	<i>Sphyrna lewini</i> (Griffith & Smith, 1834)	McKenzie 1970 ⁽¹⁾
Orectolobidae	<i>Orectolobus japonicus</i> Regan, 1906	Iwamasa and Okano 1980
Ginglymostomatidae	<i>Nebrius ferrugineus</i> (Lesson, 1831)	Taniuchi and Yanagisawa 1987 ⁽²⁾
Stegostomatidae	<i>Stegostoma fasciatum</i> (Hermann, 1783)	Nakaya 1973 ⁽²⁾
Hemiscylliidae	<i>Chiloscyllium plagiosum</i> (Anonymous [Bennett], 1830)	Clark 2002
Lamnidae	<i>Lamna nasus</i> (Bonnaterre, 1788)	Frøiland 1975 ⁽²⁾
	<i>Carcharodon carcharias</i> (Linnaeus, 1758)	Smale and Heemstra 1997 ⁽¹⁾
Cetorhinidae	<i>Cetorhinus maximus</i> (Gunnerus, 1765)	Frøiland 1975 ⁽²⁾
Squalidae	<i>Squalus acanthias</i> Linnaeus, 1758	Frøiland 1975 ⁽²⁾ ; Coad and Gilhen 2002
Rajidae	<i>Raja clavata</i> Linnaeus, 1758	Traquair 1893 ⁽¹⁾
	<i>Raja naevus</i> Müller & Henle 1841	Wilson 1951 ⁽²⁾
	<i>Raja batis</i> Linnaeus, 1758	Wilson 1951 ⁽²⁾
	<i>Okamejei kenoei</i> (Müller & Henle, 1841)	Ishihara <i>et al.</i> 2001
Rhinopteridae	<i>Rhinoptera bonasus</i> (Mitchill, 1815)	Schwartz 1959 ⁽¹⁾ ; Joseph 1961
Dasyatidae	<i>Dasyatis americana</i> Hildebrand & Schroeder, 1928	Schwartz and Safrin 1977 ⁽¹⁾
	<i>Dasyatis pastinaca</i> (Linnaeus, 1758)	Capapé and Pantoustier 1975 ⁽¹⁾
Myliobatidae	<i>Myliobatis californica</i> Gill, 1865	De Jesus-Roldan 1990
Mobulidae	<i>Manta birostris</i> (Walbaum, 1792)	Ishihara <i>et al.</i> 2001
Torpedinidae	<i>Torpedo torpedo</i> (Linnaeus, 1758)	Ben-Brahim <i>et al.</i> 1998
Narcinidae	<i>Narcine entemedor</i> Jordan & Starks, 1895	Present work

exclusive to some ecological or taxonomical group. Moreover, although the lack of coloration could be disadvantageous in making organisms more conspicuous to predators or less attractive for reproduction, the record of the adult albino electric ray as well as albino elasmobranchs of considerable size (Ishihara *et al.*, 2001) and the report of a pregnant albino elasmobranch (Joseph, 1961), allow us to suppose that albinism in elasmobranchs is not determinant in the survival and reproductive capacity of the organism.

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