



Observations of morphological deformities in bluespotted stingray, *Neotrygon kuhlii* (Muller & Henle, 1841) from Thoothukudi coast of India



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Introduction

- Instance of abnormalities have been reported in small number in chondrichthyan than in osteichthyan species, the same being less qualitatively represented (Hoenig & Walsh, 1983).
- Abnormalities frequently results in erroneous interpretation of its taxonomy; and often deceived as new species (Day, 1878; Bigelow & Schroeder, 1953; Devadoss, 1983).
- Morphological abnormalities in elasmobranchs especially in skates and rays have been reported in the past decades (Templeman, 1965; Riberio-Parado et al., 2008). Reports on abnormal features from the Indian seas have been made by Luther (1961), Bennet (1964), Chhapgar (1964), Easwaran (1967), Nair & Chellam (1971), Devadoss (1983), Ramaiyan & Sivakumar (1988) and Suresh & Raffi (2012).
- Several forms of abnormal development has been reported in skates & rays, though most of these reported abnormalities relate to specimens where the pectoral fins are not fully fused to the head during embryonic development (Castillo et al., 2006; Bornatowski & Abilhoa, 2008; Sanchez et al., 2008). Other types of abnormality that have been observed include two-headed embryos, extra snouts, blunt-snouted, caudal spinal deformities, albinism, abnormal dentition, spinulose skin and intersexuality & hermaphroditism (Ellis, 2005)
- More number of available reports on the pectorals non-adherent to head but comprehensive X-radiograph with anatomical description is scarce. Moreover, these deformities was documented in few species of Dasyatids & Gymnurids but present report on *Neotrygon kuhlii* is for the first time from India and elsewhere in the world.

Materials and Methods

- Percentage deformities in the long line fishery were done by simple random sampling.
- Specimen identification was carried out as per standard taxonomic keys and specimen was photographed in fresh and preserved condition; was analyzed for radiography and anatomical studies.
- Measurements, counts and main morphological characters were taken as per Matsubara (1955) and Lindberg and Legeza (1959) & abnormal morphometrics was done as per Gudger (1933).
- The teratogenic cases of rays were collected from published literatures.

Results

- Deformed sting ray was caught from long line fishery at a depth of 30 m (08° 28'51"N, 78°09'24"E) at Amalinagar fish landing centre of Thoothukudi, southeast coast of India (Figure 1).
- Identified specimen was an immature male bluespotted stingray *Neotrygon kuhlii* (Muller & Henle, 1841) of the family Daysitidae. Measurement characteristics of body parts coincide well with the keys and descriptions and Legeza (1959), except the abnormal portions.
- Pectoral fin anomaly was observed in which the anterior lobes of the pectorals was not fused with the head and found to be separated from the head by deep and wide notches. They were found to be tapering forward and inward in the form of a pair of horns but otherwise morphological characters are found to be normal (Figure 2).
- Morphometric measurements, % abnormalities & review on abnormal cases are given in table 1, 2 & 3.

Figure 1: Maps showing the occurrence of abnormal (pectoral was not fused with the head) of *Neotrygon kuhlii* other rays from different marine areas

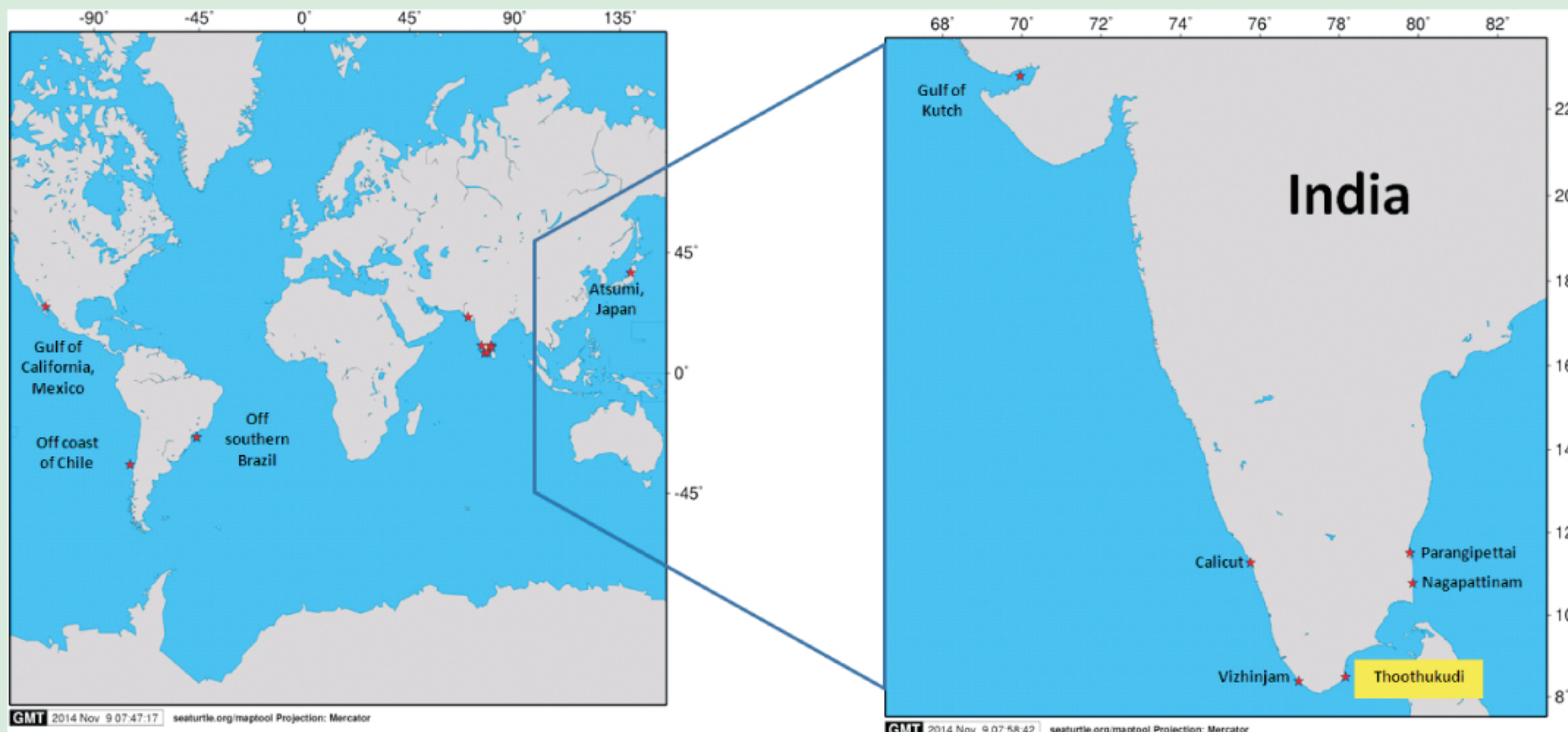


Table 1. Measurements of abnormal *Neotrygon kuhlii*

Morphometric characters	mm
Disc length (from deformed snout tip)	185
Length snout to hinder edge vent	139
Preoral (from lower jaw) length	32
Length snout tip to midpoint of line joining notches	16
Length right horn of pectoral to base of cleft	26
Length left horn of pectoral to base of cleft	22
Width head at bottom shallow cleft	32
Width tip to tip horns of pectorals	44
Depth snout to base right notch	12
Depth snout to base left notch	8

Table 2. % abnormal species recorded in the present study (since June, 2014),

<i>Neotrygon kuhlii</i>	
Total observed	160
Abnormal specimen	1
% of abnormal	0.625

*X-ray of the specimen showing the upper jaw or platyosteal (Pal), lower jaw or Meckel's cartilage (Mec), pectoral radials (Per), branchial arches (Bra), pectoral girdle (Pec), vertebral column (Ver), proterygium (Pro), mesopterygium (Mes) and metapterygium (Met) and with the approximate position of extension of pectorals (black line).

Figure 2: Dorsal (a), ventral (b) and close-up (c) view of deformed *Neotrygon kuhlii* with anterior lobes of the pectorals was not fused with the head from Thoothukudi, southeast coast of India.

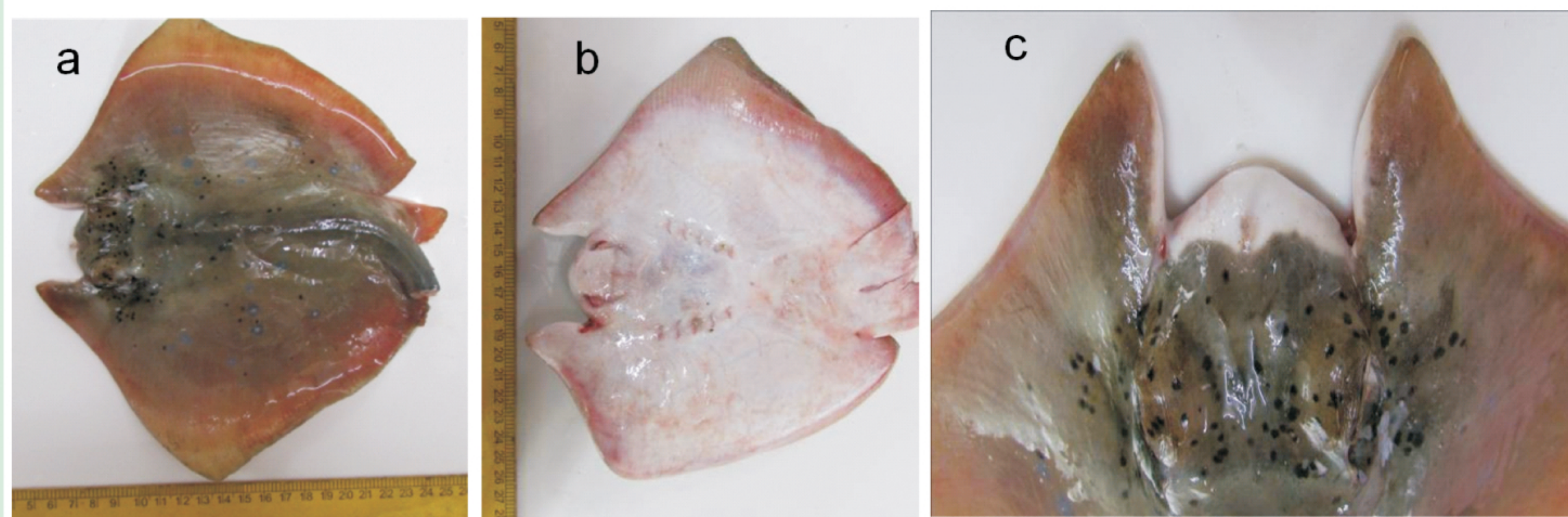


Figure 3: Radiographic image* of the abnormal (a) and normal (b) *Neotrygon kuhlii*

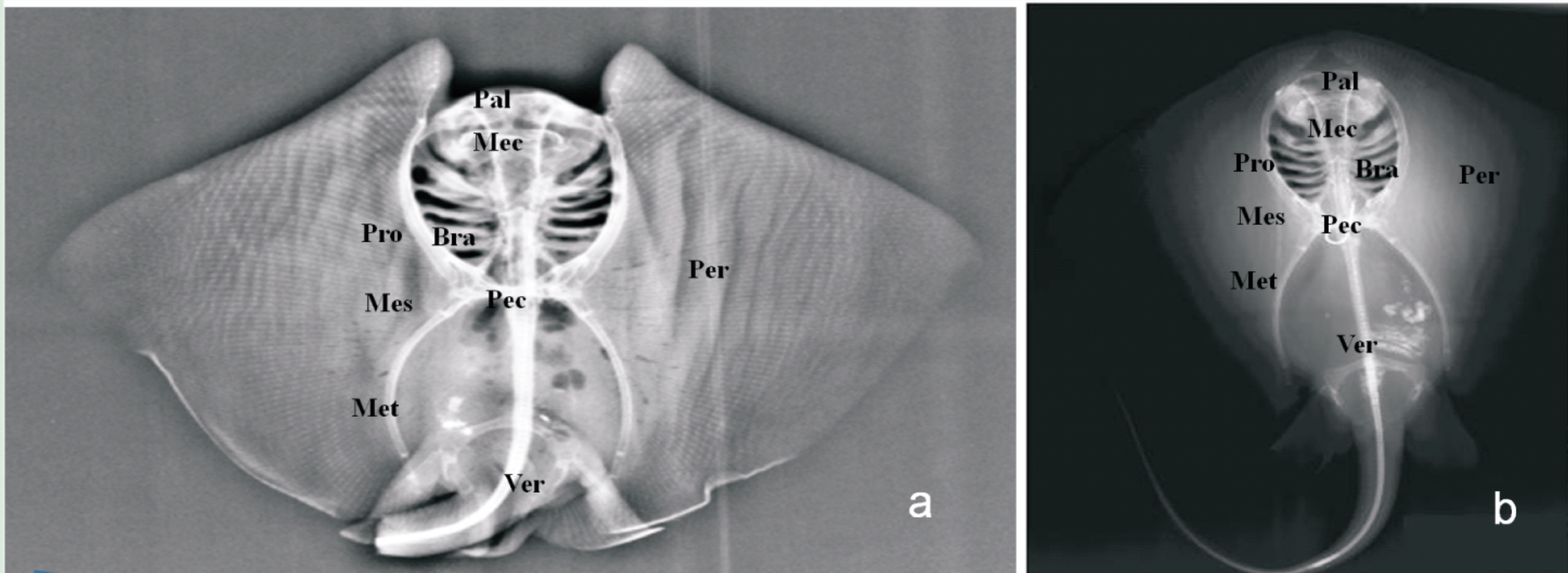


Table 3. Review of pectoral non adherent to the head

Author	Location	Observed species
Day (1878)	India	<i>Gymnura poecilura</i>
Bennet (1964)	Vizhinjam coast, India	<i>Gymnura poecilura</i>
Chhapgar (1964)	-	<i>Aetobatis narinari</i>
Eswaran (1967)	Gulf of Kutch, India	<i>Gymnura</i> sp.
Nair and Chellam (1971)	Calicut coast, India	<i>Himantura uarnak</i>
Devadoss (1963)	Porta Novo coast, India	<i>Himantura jenkinsii</i>
Honma and Sugihara (1971)	Atsumi coast, Japan	<i>Dasyatis akajei</i>
Lamilla et al. (1995)	Off coast of Chile	<i>Dasyatis brevis</i>
Sanchez et al. (2008)	Gulf of California, Mexico	<i>Dasyatis longa</i>
Riberio-Parado et al (2008)	Off southern Brazil	<i>Pteroplatytrygon violacea</i>
Riberio-Parado et al (2008)	Off southern Brazil	<i>Himantura uarnak</i>
Suresh and Raffi (2012)	Nagapattinam coast, India	<i>Gymnura poecilura</i>
Ranjith et al. (2014)	Thoothukudi coast, India	<i>Neotrygon kuhlii</i>

Discussion

- Casarini et al. (1996), reported that of 192 skate, *Raja agassizi* collected off Santos, 11 were abnormal, the percentage of 5.7 was considerably higher than the present observation where the percentage abnormality was only 0.625 % of the observed 160 number (Table 2).
- Abnormalities are mostly observed in oviparous species like skates than rays as most of them are viviparous including *N. kuhlii* where the embryos are protected during development by mother's uteri.
- Radiography revealed that the deformed specimen of *N. kuhlii* (Figure 3) shows all the anatomical structures similar to that of the normal specimens whereas the pectoral radials (Per) was not fully developed/fused anteriorly.
- Radcuffe (1928) & Rosa et al. (1996) revealed that abnormalities may be due to the disturbance in the initial stages of ontogeny i.e., "shark stage", where the embryo still have the fins separated from the head, resembling a shark embryo.
- Rosa et al. (1996) revealed that adult rays with this kind of abnormality occur alive and in seemingly good condition which indicates that this deformity would not interfere in the biological activities, mainly feeding.

Conclusions

- Percentage of abnormalities estimated is not representative of the real number because in all cases samples came from a particular type of fishery, where the total capture is uncertain.
- Inference based on the single specimen occurrence is an insufficient data to suggest cause of the anomaly. In order to obtain a more accurate percentage, samples from scientific surveys should be considered. Moreover, it is difficult to assess the causes of the abnormalities in few specimens as the cause of malformation might be due to genetic aberration in embryonic development, unfavourable environmental conditions triggered by pollution, ecosystem alterations or some hidden factors.
- However, we believe that the observations presented here may be the base of future research on this unexplored area.

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