AGE DETERMINATION OF DOLPHINS ENTANGLED IN GILLNETS ALONG THE KERALA COAST[1]

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(With two plates)

Key words: *Stenella longirostris*, *Sousa chinensis*, *Tursiops truncatus*, *Neophocaena phocaenoides*, *Delphinus delphis*, *Pseudorca crassidens*, age determination

Age of the dolphins *Delphinus delphis* Linnaeus, *Stenella longirostris* (Gray), *Sousa chinensis* (Osbeck), *Tursiops truncatus* (Montagu), *Neophocaena phocaenoides* (Cuvier) and *Pseudorca crassidens* (Owen) found along the Kerala coast are determined based on the growth layers in the teeth. The teeth samples were collected from dolphins landed as by-catch in the gillnets. The growth layers offer reliable information on the age of dolphins. This is the first attempt in India to study the age of dolphins based on the growth layers.

INTRODUCTION

Growth layers in the teeth of marine mammals were observed by Owen (1840-45) and Eschricht (1845). But utility of it for age determination was recognised much later (Scheffer 1950 and Laws 1952). However, these studies were followed by Nishiwaki and Yagi (1953), Nishiwaki *et al.* (1958), Omura *et al.* (1962) and others. Though the early studies were made on sperm whales, the investigations were extended to other larger and smaller cetaceans. These growth layers are found to be annual in periodicity in *Tursiops truncatus* and in other cetaceans where the teeth of known age animals were examined (Sergeant 1959). The teeth of common dolphins, *Delphinus delphis* and the *Tursiops truncatus* of Canadian coast were found to have similar growth layers as in other delphinids.

Various techniques were developed to study the growth layers in teeth of cetaceans, (Klevezal 1980). Recently Scheffer and Myrick (1980) and Donovan (1985) reviewed the age determination in toothed whales. Information on the age composition is essential for rational management. Formerly this information on cetaceans was obtained from biological characteristics such as body length, eye lens, width and degree of closure of cranial sutures and number of *corpora albicantia* in ovaries. But it is observed that growth layers found in the teeth are reliable. Though there are many studies on the age determination of marine mammals from other countries, no information is available from India.

MATERIALS AND METHODS

Dolphins that got entangled in the gillnets at Calicut coast were taken for studies. After determining the species identity of the dolphins the details such as sex, length and weight and other important morphometric characters were noted. The head was boiled and the skull was cleaned. The teeth were cleaned by using Hydrogen peroxide solution for about 30 minutes, and preserved in a 70% ethanol for further study. Teeth should not be stored dry as they develop cracks. The commonly occurring

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species of dolphins *Stenella longirostris*, *Delphinus delphis*, *Tursiops truncatus*, *Sousa chinensis*, and *Pseudorca crassidens* were studied. Good and healthy teeth from the middle of upper and lower jaws were selected. Sections were made by grinding the teeth on a water proof No. 400 sand paper. The teeth were ground on both sides so as to get sections of 300 to 400 micron thick. While grinding, water was added to the grinding surface. After grinding to the required thickness the teeth were kept in 5% Formic acid for etching for 1 to 2 hours. After removing the teeth from the Formic acid, the sections were rinsed in water for about 2 hours and allowed to dry at the room temperature. The duration of etching depends on the thickness of the sections. When properly etched, the growth layers can be seen distinctly as valleys and ridges. The etched sections can be examined under microscope with the help of slanting reflected light. Growth layers can be seen more clearly if the surface of the teeth were rubbed with pencil. The growth layers can be studied in the stained sections of the teeth also. Here the sections are kept in Formic acid for about 6 to 8 hours and stained by Hematoxylin and destained by acid alcohol and cleared by xylol. The sections were mounted in DPX mounting media. But better results were obtained in the etched sections.

OBSERVATIONS

Delphinus delphis (Plate 1, Fig. 1) : The study material consist of 12 teeth and taken from female dolphins of length 1670 mm and 1700 mm. It was observed that there was one growth layer in a dolphin of length 1670 mm where as there were 4 growth layers in the specimen measuring 1700 mm. It may be observed that the length of maturity of the species was about 2000 mm.

Stenella longirostris (Plate 1, Fig. 2): Ten teeth from two dolphins of length 1560 mm (male) and 1630 mm (male) were studied. The teeth from the dolphin measuring 1560 mm were found to have 4 growth layers where as the dolphin of length 1630 mm had 7 growth layers. Dolphin of length 1560 mm was found to be immature and that of length 1630 mm was mature.

Tursiops truncatus (Plate 1, Fig. 3): One specimen (male) of length 2050 mm was studied. The teeth were found to have one growth layer. A specimen 1710 mm in length had sprouting teeth characterised by the absence of dentine. Mohan (1982) observed foetus in two specimens 2350 mm and 2390 mm of length.

Sousa chinensis (Plate 2, Fig. 4): 12 teeth from 5 specimens ranging from 2020-3070 mm were studied. Teeth from the dolphin measuring 2020 mm had 4 growth layers and it was an immature female, with no *Corpora luteum* or *Corpora albicans* in the ovary. In the case of the dolphins measuring 2300 (male) and 2370 mm (male) 6 growth layers were observed in the teeth. In another specimen of length 2580 mm (female) the teeth had 8 growth layers. There were 11 growth layers in a specimen of length 3070 mm (male).

Neophocaena phocaenoides (Plate 2, Fig. 5): 3 teeth from a *Neophocaena phocaenoides* (male) of length 1350 mm were studied. There were 2 growth layers in the teeth.

Pseudorca crassidens (Plate 2, Fig. 6): A female *Pseudorca crassidens* of length 4230 mm had 14 growth layers.

DISCUSSION

The growth layers in teeth of *Delphinus delphis* of Indian coast are similar to that found in other areas. Kleinenberg and Klevezal (1962) examined the teeth of 33 dolphins from Black

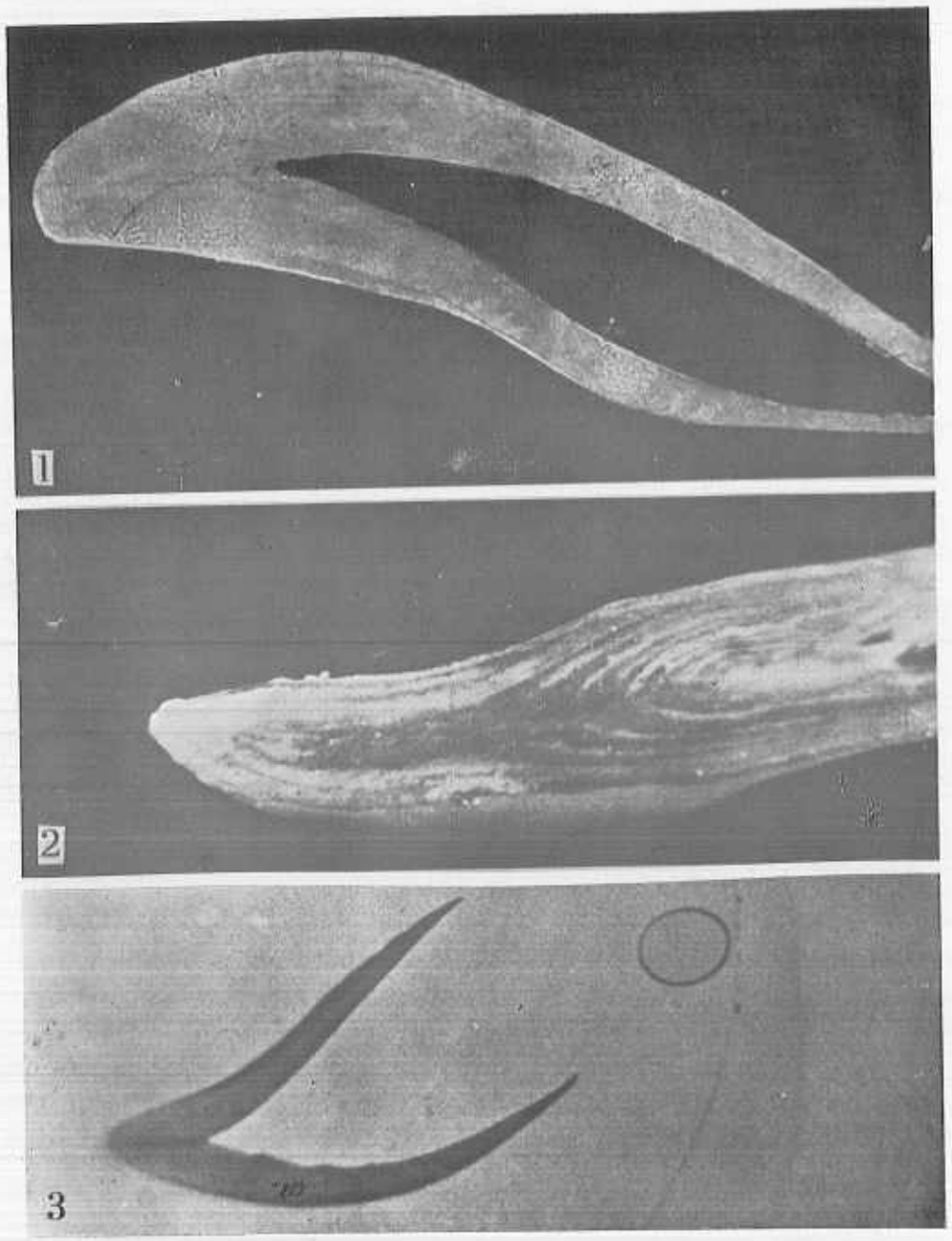
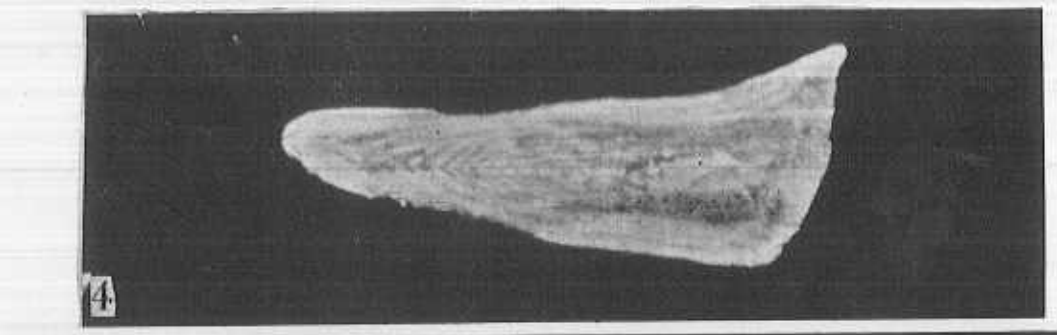
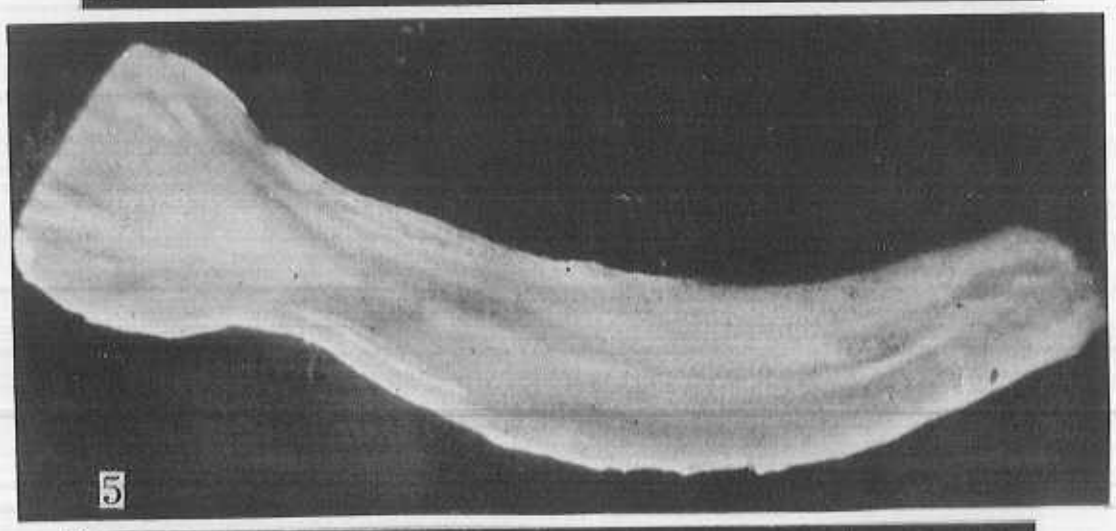


Fig. 1. Tooth section of *Delphinus delphis*; 1670 mm x 8; Fig. 2. Tooth section of *Stenella longirostris*; 1630 mm x 6; Fig. 3. Tooth section of *Tursiops truncatus*; 2050 mm x 6.





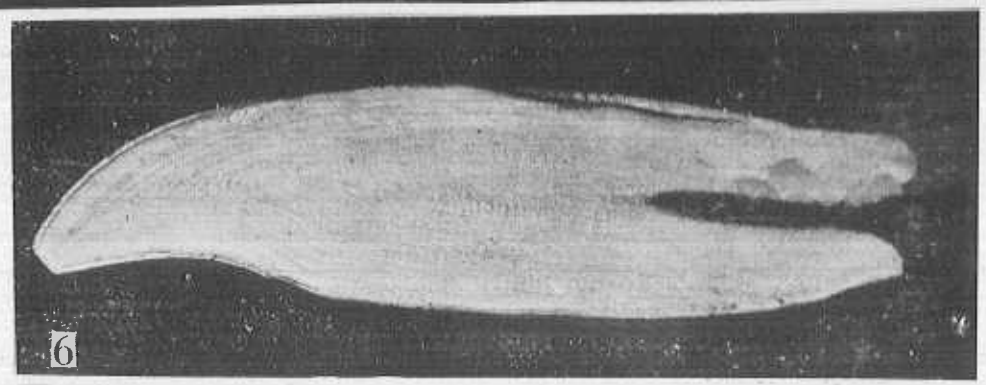


Fig. 4. Tooth section of *Sousa chinensis*; 2370 mm x 5; Fig. 5. Tooth section of *Neophocaena phocaenoides*; 1350 mm x 14; Fig. 6. Tooth section of *Pseudorca crassidens*; 4230 mm x 1.6.

sea and concluded that two light and two dark layers were laid down in each year. A specimen with 22 growth layers was considered to be 11 year old. Gurevich *et al.* (1980) also observed that two layers were formed annually in the species when the age was determined by Tetracycline markings. From the Indian coast one of the specimens measuring 1700 mm had 4 growth layers, and the specimen of length 1670 mm had only one layer. But as we do not have any data on the known-age, we cannot compare the growth layers.

Stenella longirostris (Spinner dolphin) is one of the well studied species. Perrin *et al.* (1977) observed that 1 or 1.5 growth layers were formed annually and that the length at maturity was 1700 mm at the age of 6 years with 6.4 growth layers in the teeth. It was further observed by Perrin and Henderson (1984) that the white bellied spinner dolphin of Pacific mature at about 6 years of age. The present observation also agrees with that of Perrin and Henderson (1984). The specimen of length 1560 mm having 4 growth layers had immature testis weighing 100 gm. It may be about 4 years of age. The specimen of length 1630 mm was probably about 7 years old. Its mature testis weighed 1250 gm.

Very little information is available on the age and other biological parameters of *Sousa chinensis* of India. The teeth of a dolphin of length 2370 mm had 6 growth layers whereas an immature specimen of length 2020 mm had 4 growth layers.

The age of *Tursiops truncatus* (bottlenose dolphin) was studied by Sergeant (1959). Klevezal and Kleinenberg (1967), Scheffer and Myrick Jr. (1980). They found that though in younger dolphins the growth layers were in close agreement with the age in years, in older animals there was no close relationship. However, the growth layers per year was observed in the teeth of known age animals and indicated that one growth layer was formed in a year. In the present observation also the teeth started sprouting in the specimen of length of 1710 mm and one growth layer was seen in a specimen measuring 2050 mm indicating that it was one year old. It should be maturing before 2390 mm as a 256 mm foetus was recovered from a dolphin of length 2390 mm (Mohan 1982). Kasuya *et al.* (1986) suggested, that 50% of female of the species matured at an age of 7 years in the Pacific Ocean. There is very little information available on the age of *Neophocaena phocaenoides*. Kasuya *et al.* (1986) estimated 80 cm as the neonatal length of the species and found that the growth layers were of annual periodicity. The mean body length at one year was considered to be 1200-1300 mm. The specimen examined from the Calicut coast measured 1380 mm and was found to have two growth layers. This observation agrees with that of Kasuya *et al.* (1986) and the specimen examined was 2 years old. The male *Pseudorca crassidens* of length 4230 mm may be 14 years old as its teeth section had 14 growth layers. Pierce and Kajimura (1980) found the growth layers in a *Pseudorca crassidens* and estimated its age to 14 years.

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