

## Short Note

### Two Dolphin Species, *Delphinus delphis* and *Lissodelphis borealis*, from the North Pacific Ocean

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**Lien-Siang Chou, Andrea M. Bright, Shean-Ya Yeh and Chang Lin (1993)** Two dolphin species, *Delphinus delphis* and *Lissodelphis borealis*, from the North Pacific Ocean. *Bull. Inst. Zool., Academia Sinica* 32(4): 273-277. Nine dolphins incidentally killed in North Pacific driftnets between May and August, 1991 and September to November, 1992 were examined and their gonad weights measured. Testes, epididymis and ovaries were histologically examined to determine maturity. Ages were determined by Growth Layer Group (GLG) counts. The dolphins were identified as five female and two male *Delphinus delphis* and two male *Lissodelphis borealis*. Among the seven *D. delphis* specimens, one female (172 cm, 11 yrs) was pregnant, one male (188 cm, 12 yrs) was prepubescent, and the other four females and one male were under 160 cm in total body length and under four years of age. Both male *L. borealis* specimens (169 cm, 1-2 yrs.; 192 cm, 7 yrs.) were immature.

**Key words:** *Delphinus delphis*, *Lissodelphis borealis*, Age, Reproduction, North Pacific Ocean.

Since the late 1970's, Taiwan fishermen have used driftnets in the open ocean to catch tuna and squid. Driftnet gear also incidentally catches non-target marine animals; biologists have focused their attention on higher vertebrates such as dolphins, whales, porpoises, sea lions, seals, sea birds and sea turtles, since these creatures have low reproductive rates. Driftnet mortality may not be able to be compensated for by these sea animals, and continued population decreases may cause these sea creatures to become endangered, thereby causing unforeseeable changes in ocean ecology. The U.S. Driftnet Impact Monitoring Assessment and Control Act of 1987 called for international research, including a study of North Pacific driftnet fishing practices in Japan, Taiwan, and South Korea (Jones et al. 1990, Yeh et al. 1992). Therefore, the

purpose of this study was to describe various aspects of nine dolphin carcasses collected by observers in the North Pacific Ocean from May to August, 1991.

**Materials and Methods**—We identified the species of our specimens by external appearance (Leatherwood and Reeves 1983), then sexed the individuals and took morphological measurements (Robson 1984).

Teeth extracted from the lower middle jaw were decalcified with 5% nitric acid for 6-22 hours and sectioned (25 micrometers) longitudinally with a freezing microtome; tooth sections were stained with haematoxylin for 1/2-3 hrs and fixed with 5% ammonia water, after which the sections were wet-mounted in 100% glycerol (Perrin and Myrick 1980, Myrick 1983). These mounted sections were observed under a light microscope at 40X magnification. One dentinal GLG

(growth layer group) was assumed to consist of two opaque (dark) and two translucent (light) zones; one dentinal GLG was assumed to equal one year of age (Gurevich et al. 1980, Hohn 1990).

All right-side testes and epididymis of the male specimens were collected, fixed in 5-10% formalin, then measured (lengthwise), weighed, and examined histologically. Paraffin-embedded gonadal tissue was cut with a microtome into 4 micrometer sections and stained with haematoxylin and eosin. Descriptions of the histological stages of testes development from Collet and Saint Girons (1984) were used as a guide.

We collected both left- and right-side ovaries from five female specimens (although No. 7's was later lost). We measured their lengths, widths, depths, and weights. The ovaries were sliced into 1 mm serial sections, and the appearance of follicles, corpus luteum and corpora albicantia scars were examined under a dissecting microscope.

**Results and Discussion**—The dolphin carcasses were determined as being seven *D. delphis* and two *L. borealis*. Of the seven *D. delphis*, two were male and five female. Both *L. borealis* specimens were male. Morphological measurements are shown in Table 1.

The five *D. delphis* specimens shorter than 160 cm were aged at less than or equal to four years (Table 2). The fifth and sixth *D. delphis* (188 and 172 cm total body length) showed twelve and eleven dentinal GLGs (Table 2, Fig. 1). The two *L. borealis* specimens, with body lengths of 169 and 192 cm, were aged between 1-2 years and seven GLGs, respectively (Table 2, Fig. 2). Those dolphins reported as having between 1 and 2 GLGs had one complete GLG plus some dentine deposited on top of the first GLG; however, the teeth did not have definite boundaries marking the completion of a second GLG.

The three male specimens in this study with testis weights less than or equal to 30 g were considered immature. Immature seminiferous tubules had small

Table 1. Morphometric measurements of specimens of two dolphin species collected from the North Pacific Ocean (unit scale = cm)

specimen number	<i>D. delphis</i>							<i>L. borealis</i>	
	1	3	4	6	7	8	9	2	5
sex	m	f	f	m	f	f	f	m	m
total body length	99	139	129	188	160	158	172	169	192
rostrum to eye	20	26	25	33	28	28	31	30	32
rostrum to melon	6	9	10	13	10	14	14	4	5
rostrum to gape	16	22	22	28	20	25	26	19	23
rostrum to ear	22	30	31	37	35	34	35	28	34
eye to ear	4	4	5	5	7	5	5	4	1
rostrum to blowhole	15	24	21	32	28	26	29	24	29
rostrum to anterior flipper	27	36	9	45	39	40	43	47	56
rostrum to dorsal fin	65	83	61	119	94	94	104	na	na
rostrum to umbilical scar	51	66	62	88	74	81	83	94	118
rostrum to genital slit	67	94	86	119	104	111	108	115	140
rostrum to anus	76	98	90	134	110	114	124	126	155
flipper length from anterior insertion	16	22	22	30	25	26	28	29	25
flipper length from posterior insertion	12	16	15	23	19	28	20	17	19
dorsal fin width	17	24	20	32	19	25	27	na	na
fluke width	7	10	10	13	12	12	12	10	10
flipper width	6	7	7	10	7	8	9	7	9
fluke span	18	27	25	49	36	33	35	27	32
dorsal fin height	10	14	13	22	12	16	18	na	na
girth at flipper	58	77	71	100	83	84	76	80	87
girth at umbilical scar	60	79	80	108	87	92	96	84	89
girth at anus	30	44	40	70	47	45	53	37	36
upper tooth count	45	43	41	45	47	45	40	#	42
lower tooth count	49	45	42	44	46	45	42	#	43

na = not applicable; # = data not taken.

Table 2. Specimen number, species, sex, total body length, reproductive status, gonad weight, testis length, and estimated age in GLG's of nine dolphins collected from the North Pacific Ocean

Species	No.	Sex	Body length(cm)	Repro. status	Gonad weight(g)	Testis Length(g)	GLG (yrs)
<i>D. delphis</i>	1	m	99	immature	3	4	<1
	3	f	139	immature	2	na	2
	4	f	129	immature	2	na	1-2
	6	f	160	immature	#	na	4
	7	m	188	≥prepubescent	770	25	12
	8	f	158	immature	2	na	3
	9	f	172	pregnant	13	na	11
<i>L. borealis</i>	2	m	169	immature	6	14	1-2
	5	m	192	immature	30	19	7

# indicates data unavailable; na = not applicable.

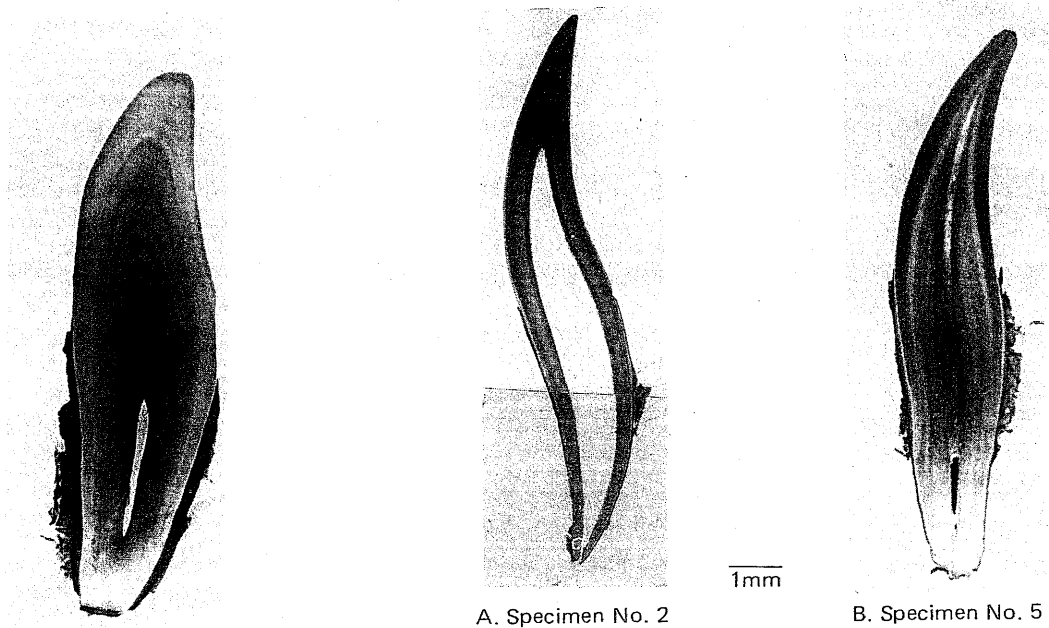


Fig. 1. Male *D. delphis* tooth section.

Fig. 2. Male *L. borealis* tooth sections.

diameters, and primary spermatocytes were found to be the most abundant type of spermatogenesis cell present. One 12-year-old male *D. delphis* (No.6) showed a mature testis weight of 770 g. The seminiferous tubules of this specimen were significantly larger than

those of the immature specimens, and more advanced spermatogenesis stages were found; however, we were unable to clearly differentiate the spermatocytes. This specimen's epididymis tissue showed signs of autolysis and was therefore not useful. Our best con-

clusion is that specimen No. 6 was at least pre-pubescent at the time of its death (Table 2).

Among the five female *D. delphis*, one specimen (No. 9) was found to be mature. A corpus luteum was found on this specimen's left ovary and an embryo (1 cm in length) was found in the left horn of the uterus. The other three ovaries observed lacked external or internal scars (corpora albicantia), and therefore were determined to be immature (Table 2).

A review of past *D. delphis* literature shows that we can only compare our data with those recorded on *D. delphis* collected outside the North Pacific Ocean. Our individual growth (length by age) data fits the range described by Hui (1973 1977), who collected specimens in the eastern tropical Pacific and off the Southern California coast.

Histologically, maturity is measured via the presence of spermatozoa in the lumina of the seminiferous tubules and the epididymis; however, there is controversy over whether or not *D. delphis* and other cetaceans have a resting phase within which spermatogenesis slows or stops (Collet and Saint Girons 1984). This makes it difficult to discern whether individuals are prepubescent or in a resting phase of maturity. Collet and Saint Girons did not find any spermatozoa in their specimens, but they considered those specimens longer than 200 cm as being in a resting phase due to both cellular conditions and combined minimal weights of histologically-mature left and right testes ranging between 150-350 g. The single testis weight of *D. delphis* specimen No.6 was already 770 g; this specimen would therefore be considered mature if combined testis weight was used as an indicator of sexual maturity.

Morphologically, the age at which gonad weight or length increases rapidly is considered an indicator of sexual maturity. *D. delphis* specimen No.6 fell into Hui's gray zone between immaturity and maturity (total body length between 175-190 cm and age between 7-12 GLGs). The length and age at which females first exhibit the presence of corpora albicantia on their ovaries is considered an indicator of female sexual maturity. All of our female *D. delphis* specimens were immature except for No.9, whose age was estimated as 11 years; the youngest mature North Pacific (southern California coast) female *D. delphis* previously reported was 8 years old (Hui 1977). The lengths of sexually mature females previously reported for all study areas with the exception of the Black Sea range from 170 to 190 cm (Perrin and Reilly 1984).

Very little information is available on *L. borealis* morphology or sexual maturity. Twenty-four specimens have previously been collected from the northeast Pacific Ocean—mostly near California and Baja California (Leatherwood and Walker 1979). Except for four males, the others were longer than 200 cm

in body length. The morphological measurements, expressed as a percentage of total body length, of these specimens were similar to those for our young dolphin specimens from the northern Pacific Ocean. This suggests the growth process of *L. borealis* may not change their body ratios no matter if their habitat is in northeast or northwest Pacific Ocean. Regarding the body length of sexual maturity, the lengths of our two immature male *L. borealis* specimens were within the range of no spermatogenic activity reported by Leatherwood and Walker (1979). Males are sexually mature at 9-10 years (210-225 cm) and females are sexually mature at 6-9 years (200-210 cm); mature combined testis weights are between 330-1300 g (Ferrero et al. in press).

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## 北太平洋兩種海豚之研究

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1991年5月至8月間北太平洋台灣流刺網漁船搜集到九隻因意外罹網死亡之海豚。為鑑定性別成熟度，我們將生殖腺稱重，檢查睪丸、副睪及卵巢之組織切片。海豚年齡以GLG鑑定之，九隻海豚共分兩種，*Delphinus delphis* 5雌2雄，及*Lissodelphis borealis* 2雄。前者其中一隻雌豚（體長172cm，11歲）在懷孕期，一隻雄豚（體長188cm，12歲）至少為青春期，其他四條雌豚及一條雄豚之體長在160cm以下，其年齡應在四歲以下未成熟海豚。後者兩隻*L. borealis*(169cm，1-2歲；及192cm，7歲)皆為未成熟之雄海豚。

## Short Note

### First Record of the Poecilosclerid Sponge, *Rhaphidophlus schoenus* (De Laubenfels, 1936) (Poecilosclerida: Clathridae) from Taiwan

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**Yung-Hui Chen and Hin-Kiu Mok (1993)** First record of the poecilosclerid sponge, *Rhaphidophlus schoenus* (De Laubenfels, 1936) (Poecilosclerida: Clathridae) from Taiwan. Bull. Inst. Zool., Academia Sinica 32(4): 278-280. On December 13, 1990 a poecilosclerid *Rhaphidophlus schoenus* (De Laubenfels 1936) specimen was collected from a depth of 40 meters in Nan-wan Bay (N21° 56' E120° 45') at Kenting National Park, Taiwan. This is the first record of *R. schoenus* in Taiwan. This Note provides a species description according to the captured specimen.

**Key word:** *Rhaphidophlus schoenus*.

Most sponge species in Taiwan have been collected from intertidal areas or from artificial oyster beds (Sollas 1888, Takahashi 1933, Chen 1987, Shew 1989). No sublittoral area species from Taiwan has previously been reported and described. This note is the first description of a *R. schoenus* specimen collected from a sublittoral area in Taiwan. The specimen was removed from the sandy bottom with a remotely operated vehicle (Minirover MK II, Benthos, Inc. U.S.A.) articular.

Preservation and description of the specimen were done according to Rützler (1978) with minor modifications; the specimen was then placed in the Institute of Marine Biology, National Sun Yat-sen University, Kaohsiung 804, Taiwan, Republic of China (NSYSU POR 1).

***Rhaphidophlus schoenus* (De Laubenfels, 1936)**  
(Fig. 1k)

*Aulospongos schoenus* De Laubenfels, 1936: 100, Pl. 13, fig. 3.

*Microciona microchela* Hechtel, 1965: 41, fig. 7.

*Thalysias schoenus* Simpson, 1968: 56, Pls. 13-14, text-fig. 5.

*Rhaphidophlus schoenus* Van Soest, 1984: 112, Pls. 13, text-fig. 44.

**Diagnosis:**

**Shape, size, and color:** The specimen is orange and branched, with a tough and spongy consistency. The surface was smooth, fleshy and microscopically hispid (Fig. 1a).

**Ectosome:** Distinct brushes of thin styles are closely packed to form a cortex-like ectosomal skeleton (Figs. 1a, 2b).

**Choanosome:** Enveloped in the spongin are irregularly anastomosing spicule tracts (Fig. 1a). The tracts ending at the surface are crowned with a brush of thin styles. Choanosomal spicule tracts are composed of thick styles. Echination of tracts and fiber by short acanthostyles is rare.

**Spiculation (Max-Avg-Min):** Thick styles: 280-220-164 by 12-9.4-8  $\mu\text{m}$  (n=30) (Fig. 1c); thin styles: 308-259-168 by 4-4-4  $\mu\text{m}$  (n=30) (Fig. 1d); large thin styles with microspined head: 312-234-100 by 8-4.6-3.2  $\mu\text{m}$  (n=30) (Fig. 1e); short spined acanthostyles: 76-65.1-44 by 8-7.6-4  $\mu\text{m}$  (n=34) (Fig. 1f). Categorization of toxa: long sinuous raphidiform toxa: 200-134-72  $\mu\text{m}$  (n=30) (Fig. 1g); short normal toxa: 60-31.2-12  $\mu\text{m}$  (n=16) (Fig. 1h). Size categorization of palmate