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STEPHEN SPOTTE, CHARLES W. RADCLIFFE and J. LAWRENCE DUNN

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Stephen Spotte[2], Charles W. Radcliffe[2] and J. Lawrence Dunn[2]

ABSTRACT

Four Commerson's dolphins (*Cephalorhynchus commersonii*) were seized by government agents in New York City for illegal entry into the United States. One female was dead on arrival. The other dolphins were taken to Mystic Marinelife Aquarium in Mystic, Connecticut, where a second female died shortly after arrival. A third female is still alive (September, 1979). It arrived with a marked lateral and ventral deviation of the spine, which did not respond to a single early treatment with diazepam. The condition has worsened with time. Radiographs revealed no bony changes. On the third day after arrival in Mystic, the two surviving dolphins (the other was a male) were treated for lungworms (*Skrjabinalius* sp.) with levamisole hydrochloride (9 mg per kg of body mass injected subcutaneously). The treatment apparently was successful, as necropsy of the male, which died eight days later, showed no lungworms but evidence of an immediate prior infestation. The male was given levamisole hydrochloride alone and reacted violently, whereas the female received diazepam at the same time (5 mg I. M.) for the spinal deviation and demonstrated no unusual response. Necropsy of the three dead specmens showed verminous pneumonia, gastroenteritis, gastric ulcers, and pancreatic fibrosis. No corpora lutea or corpora albicantia were found on the ovaries of the dead females and they were judged to be immature. Sperm in the testes of the male indicated that it was mature. Based on a daily average food consumption of 3.6 kg da^{-1}, energy requirements for an animal weighing 35 kg are 3300 kcal da^{-1} ($\bar{X}$ = 94 kcal per kg of body mass per day).

INTRODUCTION

Four Commerson's dolphins (*Cephalorhynchus commersonii*) were seized by National Marine Fisheries Service agents at John F. Kennedy International Airport in New York City on December 15, 1978. The animals had been consigned by a dealer in Argentina to a public aquarium in Japan and entered the United States without proper documentation. Mystic Marinelife Aquarium in Mystic, Connecticut, agreed to maintain the animals until their final disposition could be resolved. They subsequently were transported from New York to Mystic by covered truck, a distance of 160 km.

Commerson's dolphin is a small, strikingly-marked delphinid indigenous to waters off the tip of Chile (Aguayo, 1975; Parmenio, 1948), southern Argentina and the Falkland Islands (Carcelles, 1948; Dabbene, 1902; Hamilton, 1952; Moreno, 1892), and probably Kerguelen Island in the southern Indian Ocean (Paulian, 1953). Brownell and Praderi (mss., 1974) and Harmer (1922) reviewed the taxonomy of *Cephalorhynchus.* Four species are recognized, all confined to the southern hemisphere. The specimens described here were the first of the genus to be imported alive into North America.

Husbandry requirements for *Cephalorhynchus* are poorly known. Abel, Dobbins and Brown (1971) reported capture techniques for the pied dolphin (*C. hectori*) in New Zealand waters, in addition to blood values and body measurements for captive specimens,

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[1] Contribution Number 7, Sea Research Foundation, Inc.

[2] Sea Research Foundation Inc., Mystic Marinelife Aquarium, Mystic, Connecticut 06355

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lactic against bacterial infections.

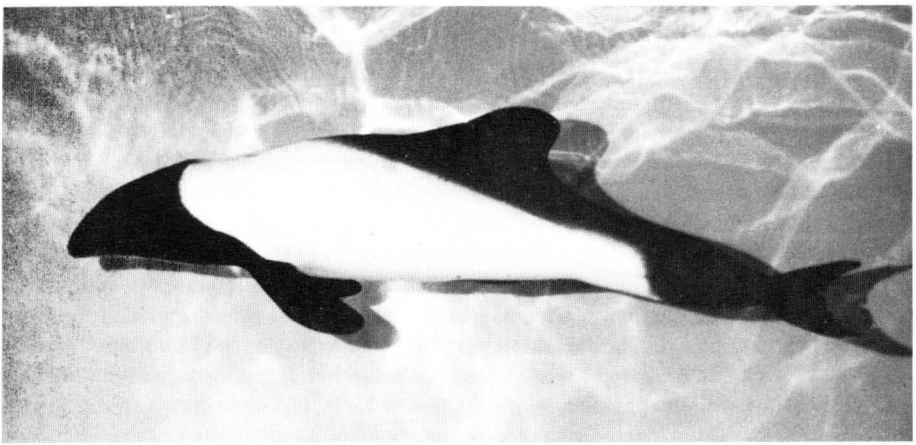

Figure 1. Male Commerson's dolphin shortly after arrival in Mystic. Note the depression on the dorsal surface posterior to the blowhole. This animal was obviously thin.

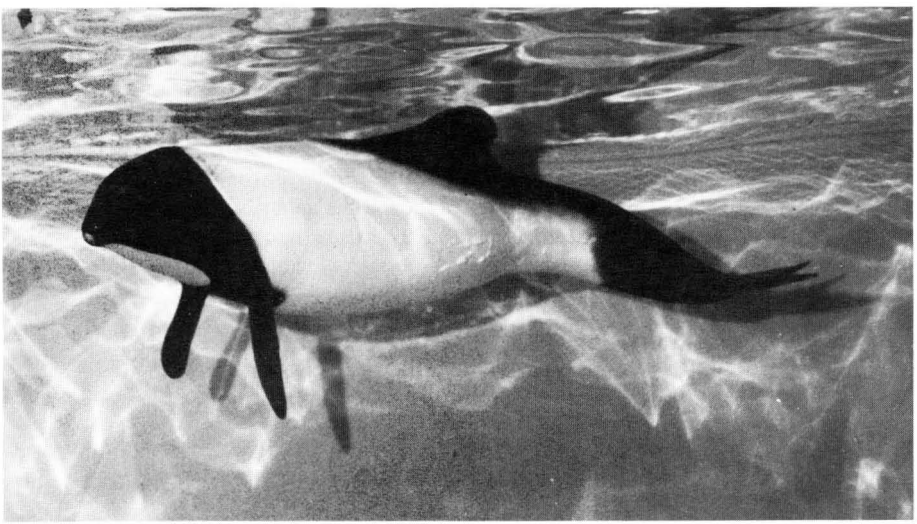

Figure 2. Female Commerson's dolphin shortly after arrival in Mystic. Note the more robust condition compared with the male, and the beginning of the ventral and lateral spinal deviation posterior to the dorsal fin. Sloughing skin can be seen at the midline.

SUBSEQUENT TREATMENT

On day 2 each dolphin was given 600,000 units of benzethine/procaine penicillin[5] as a continued prophylactic measure against bacterial infections, and 10 mg dexamethazone, both injected intramuscularly. Based on the heavy lungworm infestations found in the

[5] Flocillin, Bristol Laboratories, Syracuse, New York 13201

two dead animals, it was decided to treat the remaining dolphins with levamisole hydrochloride[6], an anthelminthic. This compound had been used previously on another species of small cetacean (*Phocoena phocoena*) with no adverse effects (Spotte, et al., 1978). At the same time, the female was to be treated with diazepam[7], a tranquilizer and muscle relaxant, in an attempt to reverse the spinal deviation, which was thought to have been caused by muscle cramping induced by the extended transport time.

On day 3 both dolphins were given 9 mg levamisole hydrochloride per kg of body mass injected subcutaneously. The female was given 5 mg diazepam I. M. at the same time. Within minutes the male began to dash about erratically, hitting the walls of the tank, and had to be restrained. An injection of diazepam (5 mg I. M.) was administered immediately. Within about 15 min the animal became calmer and respiration rate returned to normal. During this time, the female showed no unusual behavior. Diazepam failed to reverse the spinal condition in the female and the deviation became steadily more pronounced.

On days 4 and 6, the female was again given benzethine/procaine penicillin (900, 000 units I. M.); the male was administered 900, 000 units on day 4, but none on day 6. The male died on day 11. A necropsy revealed no living adult lungworms, but evidence of an immediate prior infestation, which attests to the efficacy of levamisole hydrochloride. Other findings nearly matched those of the dolphins that had died previously. The testes contained sperm, indicating sexual maturity.

The female did not eat on the morning of day 19, and had an increased white blood cell count (WBC). She also listed badly to one side and could not maintain an upright position without difficulty. The following components were injected intramuscularly: vitamin B_1[8] (1 g), vitamin B_{12}[9] (1000 μg), gentamycin[10] (75 mg), and stanozolol[11] (75 mg). Gentamycin was injected because there was some doubt as to whether the animal would start to eat again. Food subsequently was accepted in the afternoon and an oral antibiotic (cephalexin[12]) was substituted. Stanozolol is an anabolic steroid that is often used as an appetite stimulant; vitamins B_1 and B_{12} also stimulate appetite. Oral cephalexin (250 mg 3 x daily) and oral pancreatic enzymes[13] (1 tablet per 0.7 kg of food) were continued through days 33 and 34, respectively. All compounds given orally were inserted in a fish. Pancreatic enzymes were provided to supplement enzymes that are routinely produced by the pancreas. We suspected a pancreatic dysfunction, based on oily feces (see Food Consumption) and the fibrous pancreatic tissue observed in the three dead specimens.

On day 20 Fe(II) gluconate[14] (5 g daily through day 110) was administered to offset continued blood loss from gastric ulcers. An antacid[15] was also given to alleviate abdom-

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[6] Ripercol L, American Cyanamid Co., Princeton, New Jersey 08540

[7] Valium, Roche Laboratories, Nutley, New Jersey 07110

[8] Thiamine HCl, Spencer-Mead, Inc., Valley Stream, New York 11582

[9] Vitamin B_{12}, Interstate Drug Exchange, Plainville, New York 11803

[10] Gentocin, Shering Corp., Kenilworth, New Jersey 07033

[11] Winstrol-V, Winthrop Laboratories, New York, New York 10016

[12] Keflex, Eli Lilly & Co., Indianapolis, Indiana 46225

[13] Festal, National Laboratories, Hoechst-Roussel Pharmaceuticals, Inc., Sommerville, New Jersey 08876

[14] Ferrous Gluconate, Spencer-Mead, Inc., Valley Stream, New York 11582

[15] Maalox II, William H. Rorer, Inc., Fort Washington, Pennsylvania 19034

inal discomfort caused by the ulcers. Antacids became a daily dietary supplement that continued until May, 1979.

On day 30 blood was observed trickling from the mouth, and the WBC was 17, 300. The former condition was probably caused by bleeding ulcers. Three days later the following substances were injected intramuscularly: iron dextran[16] (40 mg) to compensate for blood loss, B_1 (1 g), B_{12} (1000 μg), vitamin E[17] (0.5 cc), and crude liver extract[18] (1 cc). The B vitamins were again used to stimulate appetite, as was the crude liver extract. Vitamin E was given to alleviate a possible deficiency.

The next day (day 34), a program of oral ampicillin[19] (500 mg 3 x daily) was initiated. On day 37 tetracycline hydrochloride[20] (250 mg 3 x daily) was started to supplement the ampicillin. Its use in this case was prompted by the rapid overgrowth of laboratory cultures of fecal material by an unidentified bacterium. The organism was later found to be *Escherichia coli*, a nonpathogen and normal member of the intestinal flora. Tetracycline is poorly absorbed by *Tursiops truncatus* (see Gilmartin, Gunnels and Sweeney, 1977), and the concurrent use of a calcium-containing antacid further prevents its absorption and keeps it bound up in the intestinal tract. Ampicillin and tetracycline therapy was continued through day 44. On day 72 the animal began acting strangely and showing signs of gastric distress. Ampicillin was started again (250 mg 4 x daily) and inadvertently continued through day 96.

FOOD CONSUMPTION

Both dolphins hand-fed from the first day, even though they were too stiff from travel to swim and had to be supported by divers for most of the first 30 hr. The Japanese agent who accompanied them in flight reported that all four animals had been eating during the acclimation period in South America, but we never learned what species of fishes were used or how much was fed.

From the start, both animals received one multivitamin capsule[21] and one 250-mg vitamin B_1 tablet as dietary supplements. For the first 3 days a variety of foods was accepted: Atlantic herring (*Clupea harengus*), rainbow smelt (*Osmerus mordax*), capelin (*Mallotus villosus*), and squid (*Loligo pealeii*). Herring was always preferred. On day 4 both dolphins were placed on a diet of whole herring exclusively, because of its high caloric value. Afterward the feces became excessively oily and stuck to the bottom of the pool instead of dissipating in semi-solid form, as is normal for odontocete cetaceans. In an attempt to remedy this, the amount of herring was reduced and the difference made up with squid. The change had no effect and both animals continued to have oily feces, the male until its death and the female to the time the final draft of this manuscript was returned to the publisher (day 276). Squid remained in the diet until day 18, when the female refused it. From that point on, the female refused all foods but herring.

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[16] Imferon, Lakeside Laboratories, Inc., Milwaukee, Wisconsin 53201

[17] d1 Alpha Tocopherol Acetate, Bel-Mar Laboratories, Inc., Inwood, New York 11696

[18] Crude Liver Extract, Spencer-Mead, Inc., Valley Stream, New York 11582

[19] Amcill, Park-Davis, Warner-Lambert Co., Morris Plains, New Jersey 07950

[20] Tetracycline Hydrochloride, Spencer Mead, Inc., Valley Stream, New York 11582

[21] Theramead, Spencer-Mead, Valley Stream, New York 11580

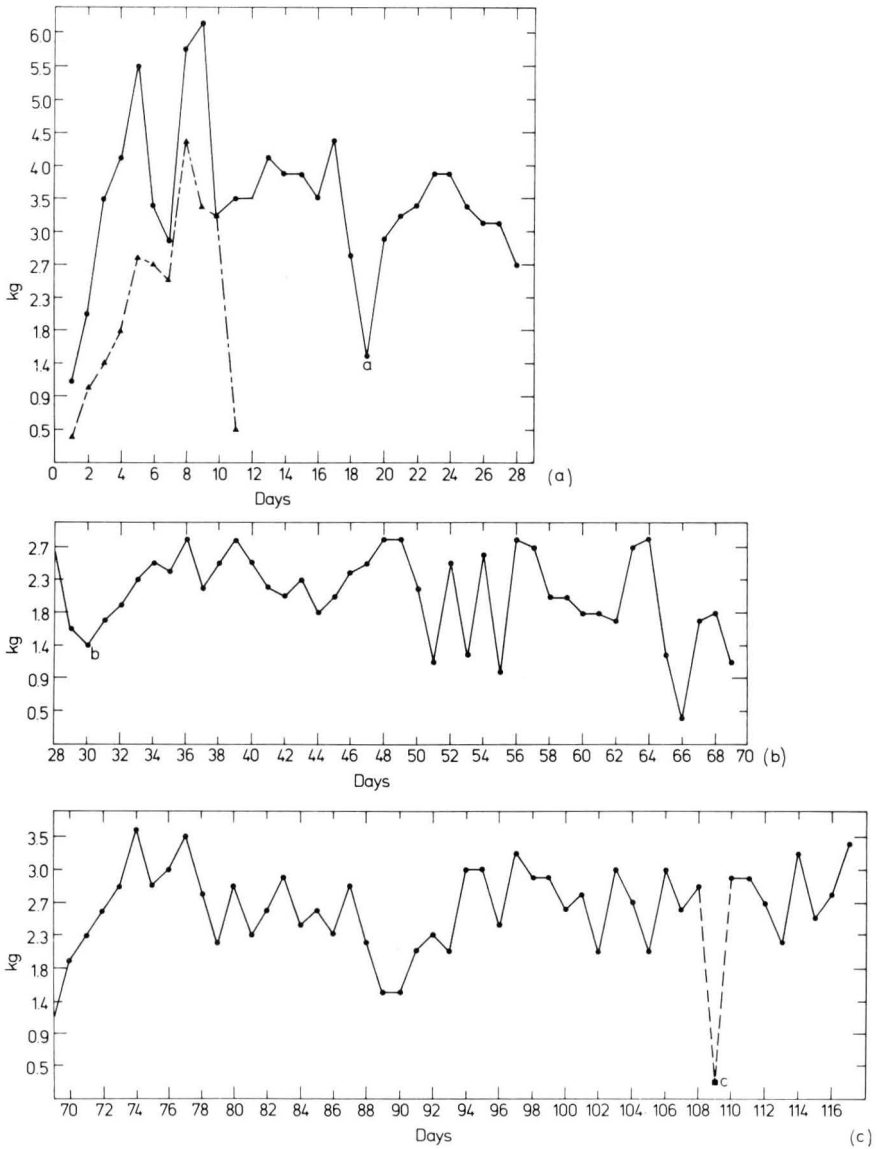

Figure 3. Food intake for two captive Commerson's dolphins. (a) Food consumption in Period 1 (days 1 through 28) for the male (broken line) and female (solid line). The reduced intake of the female at point *a* occurred when the pool was drained; the male died on day 11. (b) Food consumption in Period 2 (days 29 through 69) for the surviving female. At point *b* the animal bled from the mouth and feeding was discontinued until the next day. (c) Food consumption in Period 3 (days 70 through 116). At point *c* the dolphin escaped from the holding pool and did not resume normal feeding until returned.

The early feeding record for the surviving female divides naturally into three periods, each marked by significant differences in food consumption (Fig. 3). The first 28 days encompassed a period of high average food intake (3.6 kg daily), as shown in Figure 3a. The second period (Fig. 3b) started with a sharp decline in food intake and by blood being released from the mouth immediately after feeding (day 30), probably from bleeding gastric ulcers. This period was characterized by irregular food intake and generally reduced food consumption, and by the dolphin's apparent physical distress, perhaps caused by the ulcers. Food intake averaged 2.1 kg per day from days 29 through 69. Near the end of the second period (day 64), the animal was moved to another holding pool that was identical to the first, but which contained two adult female Atlantic bottlenosed dolphins (*Tursiops truncatus*). The presence of these larger, more aggressive animals had an intimidating effect, reflected by the reduced food intake from days 65 through 69. At the same time, the Commerson's dolphin developed a stereotyped swimming pattern and began to utilize only a small portion of the pool. This change in behavior was prompted by attempts to avoid the aggressive attentions of the bottlenosed dolphins, which made frequent threat gestures (e. g., jaw-snapping). Stereotyped swimming persisted for several days after the smaller dolphin was returned to its original pool on day 70. The aggressive actions of the bottlenosed dolphins diminished with time, and it later became possible to keep them in the same pool with the Commerson's dolphin.

Period 3 (Fig. 3c) started with an upswing in food intake. From days 70 through 117, food consumption averaged 2.6 kg per day. This period was marked by a general absence of health problems, except for gradual worsening of the spinal deviation, and patches of skin that continued to slough. The only obvious effect of the first condition was to limit mobility. Radiographic examination during the second period revealed no bony changes. Perhaps lack of inervation to the muscles on one side led to muscle atrophy and deviation of the trunk toward the opposite side.

On day 132 there was another increase in food consumption and from that time until the present (day 276), food intake has been remarkably constant, varying only between 3.2 kg and 4.0 kg. The upper value is a limit imposed by the staff. The daily average for days 118 through 276 is 3.6 kg. In our opinion, this may be more typical of the normal daily food requirements of a Commerson's dolphin in captivity.

CONCLUSIONS

The use of levamisole hydrochloride to treat lungworm infestations is effective in Commerson's dolphin at a dosage rate of 9 mg per kg of body mass injected subcutaneously. It may be necessary to use the drug in combination with diazepam or an equivalent compound. We have no other explanation for the violent reaction shown by the male when administered levamisole hydrochloride alone. The female, which was given both durgs simultaneously, demonstrated no unusual behavior. The single diazepam treatment (5 mg I. M.) had no beneficial effect on the spinal deviation in the surviving female, and the etiology of the condition is unknown.

Examination of the reproductive organs of the three necropsied dolphins showed that males of 136 cm are already mature, but that females of 144 cm may still be immature.

Whole herring has a caloric value of 912 kcal kg^{-1} (Watt and Merrill, 1963). If the daily feeding rate of 3.6 kg can be considered normal for a 35-kg Commerson's dolphin, the caloric requirements in captivity are approximately 3300 kcal da^{-1} ($\bar{X}$ = 94 kcal per kg of

body mass per day).

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