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REPORTED CAUSES OF DEATH OF CAPTIVE KILLER WHALES (*Orcinus orca*)[□]

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Abstract: Inquiries were made to all oceanaria that maintain killer whales in North America. Causes of death determined at necropsy included mediastinal abscesses, pyometra, pneumonia, influenza, salmonellosis, nephritis, Chediak-Higashi syndrome, fungus infection, ruptured aorta, cerebral hemorrhage and a perforated post-pyloric ulcer. Captive females appear to have a higher rate of mortality than males. Growth rates for whales that died were greater than for those that survived.

INTRODUCTION

Over 30 killer whales (*Orcinus orca*) have been captured for public display in major North American oceanaria since 1965. The oceanaria have done a public service by making it possible for large numbers of people, who otherwise would never have the opportunity, to see these magnificent animals. In addition, opportunities for research that could not otherwise be done have been provided.

Although over 50 killer whales from the waters of the State of Washington and British Columbia have been taken for oceanaria around the world,^{1,2} many of the facilities receiving whales were inadequate. Most of the exported whales have died. This survey was limited to six major North American oceanaria that have adequate facilities and standards of care. A previous survey completed in 1976 focused on the rates of mortality,³ but did not consider causes of death in detail nor were growth rates subjected to analysis. Very little information is available on disease in wild killer whales. Therefore, it seemed useful to update the previous survey and examine in more detail the causes of death and growth rates in these extremely valuable display animals.

MATERIALS AND METHODS

Inquiries were made of the six major oceanaria in North America where killer whales are kept to determine sex, date of capture or acquisition,[□] length and weight at acquisition, date of death, length and weight at death or the nearest recorded figures to March, 1978, and cause of death. Acquisition data was double checked by telephone calls to Mr. Bob Wright of Victoria, B.C., Canada, or Mr. Don Goldsberry of Seattle, Washington, who were involved in most of the killer whale captures and kept records of the capture and disposition of each whale.

RESULTS

The results of this survey are presented in Tables 1 and 2.

Two of the whales were taken in a sick and apparently dying condition from beaches in the Pacific northwest. One of these whales was found stranded on a beach near Seattle, Washington, in March, 1973. It was successfully treated for mandibular abscess (pers. comm., Dr. T. Gornall) and was maintained by Sea World, Inc., San Diego, California. Another emaciated female that had suffered a gunshot wound was recovered on

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[□] Two of these whales were stranded specimens.

TABLE 1. Pacific killer whales that have died in captivity since 1965.

Sex	Date Acquired or Captured	Original Size		Size at Death		Avg Yearly Growth		Total Growth		Date of Death	Cause of Death
		length (cm)	weight (kg)	length (cm)	weight (kg)	length (cm)	weight (kg)	length (cm)	weight (kg)		
♀	Oct 65	410	..	544	..	23	..	134	..	Aug 71	Pyometra/Septicemia
♂	Jul 67	427	..	512	..	43	..	85	..	Jul 69	Pneumonia (Influenza?)
♀	Feb 67	312	..	442	..	30	..	130	..	Jun 71	Liver Necrosis and Pneumonia
♀	Apr 68	401	..	501	..	37	..	100	..	Dec 70	Mediastinal Abscess
♀	May 68	549	..	..	..	..	..	..	..	Jul 68	Stillbirth
♀	Dec 69	411	..	483	..	30	..	72	..	May 72	Pneumonia
♀	Dec 69	287	..	365	..	47	..	78	..	Aug 71	Salmonellosis
♀	Mar 70	351	..	427	..	29	..	76	..	Nov 72	Chediak-Higashi Syndrome
♀	Aug 71	323	864	508	..	48	..	185	..	Jun 75	Uremia-Nephritis
♀	Aug 71	434	..	582	2409	25	..	148	..	Sep 77	Mediastinal Abscess
♂	Mar 72	290	..	419	..	44	..	122	..	Dec 74	Containing Bullet Anemia and Fungus (<i>Candida</i>) Infection
♀	Aug 73	579	..	579	..	..	..	..	..	May 74	Ruptured Aorta
♂	Oct 73	594	..	594	..	..	..	..	..	Jan 74	Pneumonia (Influenza?)
♀	Oct 73	540	1818	540	..	..	..	..	..	Nov 73	Pneumonia
♀	Mar 73	488	..	579	3182	20	..	91	..	Oct 77	Cerebral Hemorrhage
♀	Aug 75	381	864	394	1040	17	235	13	176	May 76	Perforated Post-Pyloric Ulcer
♂	+ Feb 77	..	..	228	148	..	..	..	..	Mar 77	Pneumonia, Bowel Stasis, Cerebral Edema
Average		423		497		32		102			

+Calf born in captivity not included in average length data.

Vancouver Island in August, 1977. The animal was successfully treated and has apparently regained health (pers. comm., Dr. A. Hoey, Victoria, B.C.).

The average yearly growth rate for twelve of the whales that died was 32 cm per year. Sixteen of the living whales had an average yearly increase in length of only 24 cm. The average increase in length was slightly greater for males (29 cm/year) than for females in the study, averaging 26 cm per year. Living males averaged a 26 cm yearly increase in length while living females averaged 18 cm. In comparison the females that died showed a yearly increase in length of 31 cm while the two dead males for which data are available grew at yearly rates of 43 and 44 cm, respectively.

DISCUSSION

Of the 13 females that died, three were diagnosed as having disorders of the urogenital system (Table 1). One whale that died after a stillbirth was apparently pregnant at capture. Another female that died of pyometra and septicemia was pregnant at death (pers. comm., Dr. D. Kenney).

Two whales were diagnosed as having influenza that resulted in death. No viruses were isolated. The diagnosis was based on a history of acute fibrinous pneumonia from which no pathogenic bacteria could be isolated (pers. comm., Dr. L. Cornell). Influenza of viral origin must be regarded as still unproven in killer whales but those doing necropsies on such animals should be aware of the possibilities and attempt the appropriate cultures.

Since atherosclerosis has been reported from wild killer whales⁶ it is not surprising that two of the larger, and possibly older, females died from hemorrhages associated with vascular lesions. One of these whales died of a cerebral hemorrhage and another from a ruptured aorta associated with atherosclerotic lesions.

Four whales had pneumonia at necropsy (in addition to the influenza cases already mentioned). One of these animals died within a month of capture and the pneumonia was suspected to have been the result of transport. A two-week-old killer whale, the first ever conceived in captivity, was born at Marineland of the Pacific in February, 1977. This whale was born after a prolonged and apparently difficult labor period. During 16 days of life the calf was unresponsive to its mother and seldom nursed (pers. comm., Mr. T. Otten). Necropsy revealed sub-acute focal pneumonia, acute adrenal hemorrhage, bowel stasis (pers. comm., Dr. J. Sweeney) and cerebral edema.

A "white" killer whale kept at a Canadian oceanarium was observed to have the faint ghost of the usual markings or body coloration which is seen in some species with Chediak-Higashi syndrome, an inherited autosomal recessive trait. A blood smear confirmed that the animal was positive for the syndrome.⁷ Humans and animals with this trait are highly susceptible to infection⁵ and usually die at an early age. This whale died not long after the diagnosis. Although white whales might make attractive display specimens, any such animals should have blood smears examined for this disease before a decision is made to keep them for display.

Two whales died of mediastinal abscesses. In one of these a metal object that appeared to be a large caliber rifle bullet was found at the core of the abscess (pers. comm., Dr. L. Cornell). The whale probably was shot long before capture. Based on appearance, the abscess probably developed sporadically during the six years the animal lived in captivity.

A young male had an anemia and fungus infection (*Candida albicans*) that apparently resulted in its death, while a smaller female died from a perforated post-pyloric ulcer.

TABLE 2. Living pacific killer whales in oceanaria (winter 1978).

Sex	Date Acquired or Captured	Original Size		Winter 1978		Avg Yearly Growth		Total Growth	
		length (cm)	wt (kg)	length (cm)	wt (kg)	length (cm)	wt (kg)	length (cm)	wt (kg)
♂	Feb. 67	290	--	549	2500	24	--	259	--
♂	Feb 67	406	--	625	--	20	--	219	--
♀	Feb 67	427	--	594	--	15	--	167	--
♂	Feb 68	399	900	716	4091**	32	409**	315	3191**
♂	Mar 68	290	--	599	--	31	--	309	--
♂	Apr 68	511	--	732	--	22	--	221	--
♀	May 68	549	3000*	615	3636*	7	66*	66	636*
♂	Oct 68	427	--	671	--	25	--	244	--
♀	Dec 69	366	--	610	--	27	--	244	--
♀	Dec 69	320	682	457	1590	15	101	137	908
♂	Dec 69	366	1136*	564	2500*	22	170*	198	1364*
♀	Mar 70	411	--	610*	--	25*	--	199*	--
♀	Aug 70	430	909	622	3800**	26	385**	192	2891**
♂	Aug 70	406	--	627	--	29	--	221	--
♂	Nov 71	396	818	549 ⁺	2045 ⁺	31 ⁺	273 ⁺	153	1227 ⁺
♂	Sep 75	427	1364	--	--	--	--	--	--
♀	Aug 77	305	364	320	590	26	--	15	--
Average		395		591		24		197	

*estimate

**estimate based upon girth measurement

+most recent data-Spring 1976

Bigg and Wolman,² in a survey of all killer whales taken in the Pacific northwest, found that if whales were mature at capture they had a much lower rate of survival than immatures. This more limited data would tend to support their conclusion. In the group considered here, five whales would have been judged mature from body length data.⁴ Four of these have died. There is little difference in capture lengths between living and dead whales if we cast out these five, giving an average capture length of 385 cm for living whales and 376 cm for those that died.

It is apparent from the data that the captive females have had a considerably higher rate of mortality than males. Also it appears that females that died had a higher yearly growth rate than those

surviving. This finding deserves further study. Among the questions that should be asked are: (1) Is it possible that over-feeding produced the increased growth rates and increased susceptibility to disease? (2) Are the whales more susceptible to disease during periods of rapid growth as they are approaching sexual maturity? (3) Why are females more likely to die than males?

Hui and Ridgway³ have shown that the rates of mortality for killer whales in major North American oceanaria were relatively low (7.0% yearly for females and 2.1% yearly for males) from 1965 to 1976. Mortalities in the two years since that study was completed would raise the female mortality slightly and decrease the rate for males which is extremely low.

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