

PARASITES AND ASSOCIATED PATHOLOGY OBSERVED IN PINNIPEDS STRANDED ALONG THE OREGON COAST [□] [▣]

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Abstract: Forty-two seals and sea lions found dead along the Oregon Coast were examined for parasites and associated pathology. Nematode infections of the lung and/or gastrointestinal tract were the primary cause of death in 5 of 42 animals examined. New distribution records were established for *Pricitrema zalophi* and *Zalophotrema hepaticum*. New host records include *Z. hepaticum* and *Diphyllobothrium cordatum* in the Steller's sea lion (*Eumetopias jubatus*); *Nanophyetus salmincola* in the California sea lion (*Zalophus californianus*); *P. zalophi* in the harbor seal (*Phoca vitulina*); and *P. zalophi*, *Trigonocotyle* sp. and *Otostrongylus circumlitus* in the northern elephant seal (*Mirounga angustirostris*).

INTRODUCTION

Although parasitism has been reported in pinnipeds examined from Alaska to Baja California, seals and sea lions of the Oregon Coast have received little attention.^{2,4,7,8} Metazoan parasites recovered from four species of pinnipeds stranded along the Oregon Coast are listed (Table 1). Gross and microscopic pathology attributable to parasitism and new host and distribution records are reported.

SPECIMEN ACQUISITION

All animals examined were found dead or moribund on Oregon beaches. They were transported to the Oregon State University Veterinary Diagnostic Laboratory, Corvallis, Oregon for necropsy. When size or vehicle access prohibited transportation of the entire carcass, a necropsy was performed on the beach and the organs transported to the

laboratory for more thorough examination. Special efforts were made to collect and examine parasites from the lungs, liver, stomach and intestinal tract.

The bronchial tree was opened and examined for grossly visible parasites. The lungs were minced and then soaked in a warm solution of 4% formalin and physiological saline to recover tissue dwelling lungworms and larvae.

In most cases the stomach, entire small intestine and colon was examined and the contents washed through various sizes of wire sieves to recover parasites. Tissues were fixed in 10% buffered formalin, embedded in paraffin, sectioned at 6 μ m, stained with hematoxylin and eosin and examined by light microscopy for lesions.

Whole mounts of cestodes and trematodes were stained with celestine blue B or Semichon's carmine, dehydrated in ethanol, cleared in xylene and mounted in Permount. Nematodes

[□] This study was financed in part by a grant from the Oregon State University Graduate School (1973-1975). The Oregon State University Research Council (1975-1976) and the National Marine Fisheries Service (1976-1977).

[▣] Technical paper no. 4694 Agricultural Experiment Station, Oregon State University, Corvallis, Oregon 97331, USA.

were cleared in glycerin and mounted in glycerin jelly.

RESULTS AND DISCUSSION

A total of 42 animals were examined from January, 1973 until January, 1977. Parasites recovered from four species of stranded pinnipeds are listed in Table 1. Although lesions associated with parasites were observed in some animals that were in an advanced state of decomposition, the parasites often were autolyzed and were not collected for identification. Other parasites collected were in poor condition and could not be identified. Only parasites identified at least to genus are included in Table 1. Parasites observed in tissue sections but not collected for specific identification are not included in the table but are discussed in the text.

In the 42 pinnipeds examined, pneumonia induced by nematodes (*Parafilaroides* sp., *P. decorus*, and *Otostrongylus circumlitus*) was the primary cause of death in four juvenile animals. Hemorrhagic gastritis induced by nematodes (*Anisakis* sp.) was the primary cause of death in one animal. Very few lungworms were found in adult pinnipeds and when observed, did not appear to be pathogenic. However, the host response to heavy infections was both extensive and severe in the two Steller's sea lions (*Eumetopias jubata*) and two northern elephant seal (*Mirounga angustirostris*) yearlings that died of verminous pneumonia.

Pricitrema zalophi, *Anisakis simplex*, *Contraecaecum osculatum* and *Teranovia decipiens* were common to all four species examined. All use a large variety of fishes as intermediate hosts. The Pacific herring (*Clupea harengus pallasii*) is a prey species commonly found in all four species and is the known intermediate host for *Anisakis* sp.

Additional comments on occurrence or pathological effects on the host are discussed by host species.

Steller's Sea Lion (*Eumetopias jubata*)

Trematoda

P. zalophi was found in intestinal washings from six of the nine animals. Large numbers of these parasites were found in both yearlings and adults. Histologic sections of the jejunum and ileum frequently contained many small trematodes deep in the intestinal crypts. However, no significant lesions associated with the parasites were observed. This trematode previously has been reported from two of nine Steller's sea lions examined in Southern California,⁴ but this is the first report of its existence in animals along the Oregon coast.

Zalophotrema hepaticum was recovered from the bile ducts of five of nine individuals. The changes associated with *Z. hepaticum* included mild chronic pericholangitis, biliary fibrosis and bile duct hyperplasia. Similar lesions attributable to *Z. hepaticum* has been described in an Atlantic bottlenosed dolphin and in California sea lions.^{3,5} It has been reported previously from California sea lions in California and various animal parks, and from northern elephant seals and harbor seals.^{2,4} The recovery of *Z. hepaticum* from Steller's sea lions represents new host and distribution records for this parasite.

Cestodes

Two genera of adult cestodes were recovered from the small intestine of one of nine animals examined. *Pyramicocephalus phocarum* has been previously reported from this host.² Although *Diphyllbothrium pacificum* has been reported, *D. cordatum* has not previously been reported from Steller's sea lions.²

Nematoda

Gastric nematodes were the primary cause of death in only one adult animal. A massive infection of *Anisakis* sp. had denuded the mucosal surface of the pyloric stomach. Severe hemorrhage was present and clotted, semidigested blood was found throughout the intestinal

TABLE 1. Parasites identified from four species of pinnipeds stranded along the Oregon Coast.

Parasite	Location	Steller sea lion (<i>E. jubata</i>) 9 examinations	California sea lion (<i>Z. californianus</i>) 7 examinations	Harbor seal (<i>P. vitulina</i>) 18 examinations	Northern elephant seal (<i>M. angustirostris</i>) 8 examinations
Trematoda					
<i>Zalophotrema hepaticum</i> (USNHC # 74676)*	bile duct	6**	1		
<i>Pricitrema zalophi</i> (USNHC # 74675)*	intestine	4	3**	3**	2**
<i>Rossicotrema venustum</i>	intestine			1	
<i>Nanophyetus salmincola</i>	intestine		1**		
Cestoda					
<i>Diphyllobothrium</i> sp.	intestine	1			
<i>D. cordatum</i> (USNHC # 74664)*	intestine	1**			
<i>Pyramicocephalus phocarum</i> (USNHC # 74665)*	intestine	1			1**
<i>Trigonocotyle</i> sp.	intestine				
Nematoda					
<i>Parafilaroides</i> sp.					2
<i>P. decorus</i> (USNHC # 74680 & 74681)*	bronchi	5	1		
<i>Ostrostrongylus circumlitus</i>	bronchi				2**
<i>Anisakis</i> sp.	stomach	3	1	1	1
<i>A. simplex</i>	stomach	4	1	1	1
<i>A. similis</i>	stomach		1		
<i>Contracaecum</i> sp.	pancreatic duct			1	
<i>C. osculatum</i>	stomach	2	2	1	1

TABLE 1. (continued)

<i>Terranova decipiens</i> (USNHC # 74679)*	stomach-intestine	3	1	7	1
<i>Dipetalonema odendhali</i>	subcutis	2			
<i>Skjabinaria spirocauda</i>	pulmonary arteries heart		2	2	
Acanthocephala					
<i>Corynosoma</i> sp.	intestine			2	1
<i>C. strumosum</i> (USNHC # 74689)*	intestine	1		6	
<i>C. villosum</i> (USNHC # 74688)*	intestine	1			3
<i>C. bullosum</i>	intestine				
<i>C. semerme</i>	intestine			2	
Acarina					
<i>Orthohalarachne attenuata</i>	lung	1		2	
<i>O. diminuta</i>	nasal turbinates	3			
<i>Halarachne miroungae</i>	nasal turbinates nasal pharynx			1	1

*type specimen deposited in U.S. National Museum Helminthological Collection, Beltsville, Maryland

**New Host Record

tract. The feces were black and tarry. The submucosal and muscular layers of the stomach were edematous and the adjacent gastric lymph nodes were enlarged, edematous and darkly pigmented. All other tissues were anemic.

Nematodes frequently were associated with large granulomatous ulcers in the gastric mucosa. The stomachs of five of nine animals examined contained from one to six ulcers. In two cases nematodes were found protruding from a necrotic center. The cause and effect relationship of ulcers and nematodes in sea mammals have been studied.^{9,13}

Parafilaroides decorus was found in four of nine animals. Larviparous nematodes in the alveoli were observed in histologic sections of lung from two additional animals and these also were presumed to be *P. decorus*. Verminous pneumonia was diagnosed as the primary cause of death in two yearlings. The lungs were markedly edematous and the bronchi were filled with mucinous froth. Numerous light gray nodules containing adult worms were observed beneath the pleura and throughout the lungs. Histologic examination revealed adult larviparous nematodes together with larvae, lymphocytes, macrophages, proteinaceous fluid and neutrophils in the alveolar spaces and bronchi. The inflammatory reaction presumably was in response to the larval nematodes because a comparable response was not observed in lung tissue containing only adult lungworms. Similar pathologic changes have been described in young California sea lions.^{3,6,10,11} The intermediate host for the northern infections probably is a tidepool fish similar to the opal-eye (*Girella nigricans*),¹ the intermediate host for *P. decorus* in California sea lions. The assumption is based on the presence of lungworms in two yearling sea lions found dead near the rookery area at Sea Lion Caves, Oregon. Yearlings were too young to have migrated to and from known enzootic areas in California where the opal-eye is

found, hence a local fish must serve as the intermediate host.

California Sea Lion (*Zalophus californianus*)

Trematoda

Nanophyetus salmincola was recovered from the intestines of one of seven animals. This trematode has not been reported previously in wild pinnipeds although its presence was suspected because they prey on salmonid fish from streams located in the enzootic area of this parasite.

Nematoda

The lungworm *P. decorus*, responsible for many strandings of young sea lions in Southern California, was found in only one animal.¹¹ No significant lesions were associated with this nematode. The low prevalence of *P. decorus* in adult animals may be the result of an immunological cleansing process and refractivity to further infection in older animals or different feeding habits which decreases the exposure to the intermediate host species, such as the opal-eye fish.

Adult *Dipetalonema odendhali* was recovered from the subcutaneous tissue of the scrotum of two animals. Microfilariae, presumed to be *D. odendhali* were numerous in histologic sections of the mesenteric lymph node, liver and an adrenal tumor found in one of the animals.

Harbor Seal (*Phoca vitulina*)

Trematoda

Rossicotrema venustum was found in the intestine of two of eighteen and *P. zalophi* in one of eighteen seals. Neither parasite induced an inflammatory response in sections of intestine examined histologically. *P. zalophi* has not been reported previously from harbor seals.

Nanophyetus salmincola was not found even though most harbor seals examined were found near or at the

mouths of rivers where the intermediate host, salmonid fishes, often congregate. Harbor seals are known predators of salmon in these estuaries.

Nematoda

Skrjabinaria (Dipetalonema) spirocauda was found in the pulmonary arteries of two animals. Severe proliferative endarteritis associated with the parasite was observed histologically. In one case, a major branch of the pulmonary artery was completely occluded by the parasites and fibrin thrombi.

Larviparous nematodes morphologically similar to *P. decorus* were observed microscopically in sections of lung tissue. The infections were light in both animals and the microscopic changes were non-significant. Specimens were not recovered for positive identification.

Northern Elephant Seal (*Mirounga angustirostris*)

Trematoda

P. zalophi was recovered from the intestines of two of eight animals and is the first report of this trematode from northern elephant seals. Over 100,000 were recovered from one animal; however, lesions associated with these parasites were not observed in histologic sections of the intestine.

Cestoda

Trigonocotyle sp. was found in the intestine of one seal. Unfortunately, the

single specimen recovered was in poor condition and identification to species was not possible. This is the first report of this genus in the northern elephant seal.

Nematoda

Otostrongylus circumlitus was recovered from the bronchi of two of eight seals. Verminous pneumonia characterized by severe vasculitis and bronchopneumonia associated with the presence of large adult nematodes caused the death of one yearling seal. *O. circumlitus* has not been reported previously in this host or from this geographic region.

A second yearling elephant seal also died of verminous pneumonia. However, in the second case, smaller larviparous nematodes identified as *Parafilaroides* sp. were considered to be the cause of pneumonia. The bronchi contained considerable amounts of thick mucus and froth presumably produced in response to large numbers of first stage larvae. Prior to death, the animal suffered severe respiratory distress. In histologic sections, adult nematodes containing larvae and free larvae were observed primarily in the alveoli and small bronchioles. Hemorrhage, organized proteinaceous debris, and a few neutrophils were noted associated with the nematodes.

Gastric ulcers were present in two of eight seals examined. They were associated with large numbers of *A. simplex* and *C. osculatum*.

Acknowledgements

Technical assistance was provided by Mr. Carl Estrella, California State University, Long Beach.

Game Division officers of the Oregon State Police and Dr. Bruce Mate, School of Oceanography, Oregon State University are gratefully acknowledged for reporting and aiding in the recovery of beached animals.

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Received for publication 15 November 1977