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PARASITE-RELATED LESIONS IN A BEARDED SEAL, *Erignathus barbatus* [1]

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Abstract: A free-ranging adult male bearded seal *(Erignathus barbatus)* killed by polar bears was salvaged and examined at necropsy. Significant findings included diffuse intrahepatic bile duct fibrosis and chronic cholangitis; multiple nodules of chronic fibrosing pancreatitis; and gastric ulcers. Trematode eggs (Family *Campulidae)* were found in the pancreatic nodules. These eggs and the trematodes that produced them probably caused the pancreatic and liver lesions. *Phocanema decipiens* and *Contracaecum osculatum* were found in the stomach lumen; several *P. decipiens* were attached to gastric ulcers. *Sarcocystis* sp. is reported for the first time in a bearded seal.

INTRODUCTION

The carcass of an adult male bearded seal *(Erignathus barbatus),* recently killed by polar bears, was salvaged from ice in the Chukchi Sea at 71°26'N, 164°52'-55'W on 21 July 1977. A necropsy was performed; pertinent lesions unrelated to trauma are reported.

MATERIALS AND METHODS

Representative tissues were fixed in 10% formalin-sea water, embedded in paraffin, sectioned at 6 μm and stained with modified Mayer's hematoxylin and eosin (H&E). Tissues also were stained with Masson's trichrome, modified Brown and Brenn Gram, and Gomori's methenamine silver (GMS) stains.

Helminths were fixed in 5% formalin-sea water and transferred to neutral buffered 5% formalin with 5% glycerol. Fecal samples were examined microscopically after flotation using a saturated solution of zinc sulfate; sediment from the zinc sulfate mixture also was examined. Eggs and microscopic-sized trematodes were preserved by adding 5% formalin to selected samples.

CASE REPORT

The seal was estimated to weigh 115-140 kg and had a standard length[4] of approximately 218 cm. There was extensive wearing and attrition of teeth. The baculum measured 17.5 cm. Using published criteria,[4] the seal was considered an adult, probably at least 10 years old. The blubber layer over the sternum was 3.5 cm thick.

Although there was extensive mutilation of the head and neck, the remainder of the carcass was essentially intact.

The liver weighed 4.5 kg and was firm. Most intrahepatic bile ducts were surrounded by thick concentric cuffs of fibrous connective tissue; grossly they appeared as firm, tan anastamosing cords and nodules (Fig. 1). The epithelium of some larger ducts was hyperplastic and formed luminal papillary projections (Fig. 2). The lobular pattern was accentuated by diffuse por-

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FIGURE 1. Extensive bile duct fibrosis in a lobe of liver from a bearded seal.

tal fibrosis, associated with acute and chronic inflammation and hyperplasia of bile ductules (Fig. 3 and 4). In some areas one or more liver lobules were effaced by fibrosis. Gram-negative bacilli were common in lumens of small bile ducts and occasionally were associated with focal necrosis of duct mucosa. The gall bladder contained approximately 500 cc of dark green bile. The common bile duct formed an intramural ampulla, 5 cm in diameter, in the wall of the duodenum; several small soft dark green stones were attached to the mucosa of this ampulla. Although the wall of the gall bladder and extrahepatic bile ducts was not grossly thickened, the mucosa was hyperplastic. Extrahepatic and larger intrahepatic bile ducts were opened and the liver was cut into 1-2 cm thick slices; no parasites were found grossly or histologically.

The pancreas was firm and contained numerous firm, gray, finely lobulated nodules up to 1 cm in diameter. Many nodules contained large numbers of yellow-walled trematode eggs with either a triangular or pyriform outline and a single operculum (Fig. 5). The eggs were surrounded by fibrous tissue and acute and chronic inflammation; many degenerate eggs were infiltrated by multinucleated giant cells. The nodules also contained atrophic acini and exocrine ducts with hyperplastic epithelium (Fig. 6). Adult trematodes were not seen, possibly because the pancreatic ducts were not carefully examined.

The types of parasites found and their location are given in Table 1.

Phocanema decipiens and *Contracaecum osculatum* were found in the luminal mucus of both chambers of the stomach; about 100 of each were

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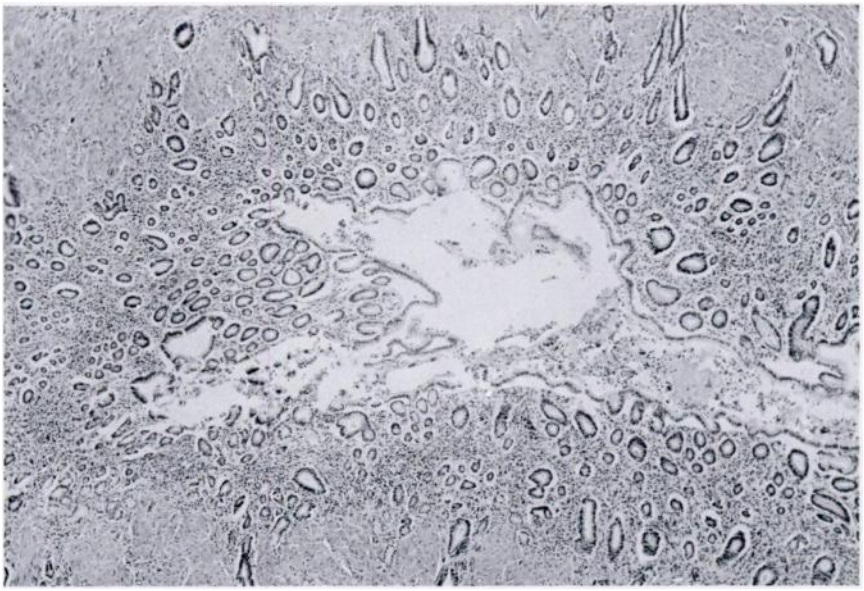

FIGURE 2. Large intrahepatic bile duct with chronic inflammation and hyperplasia of mucosa.

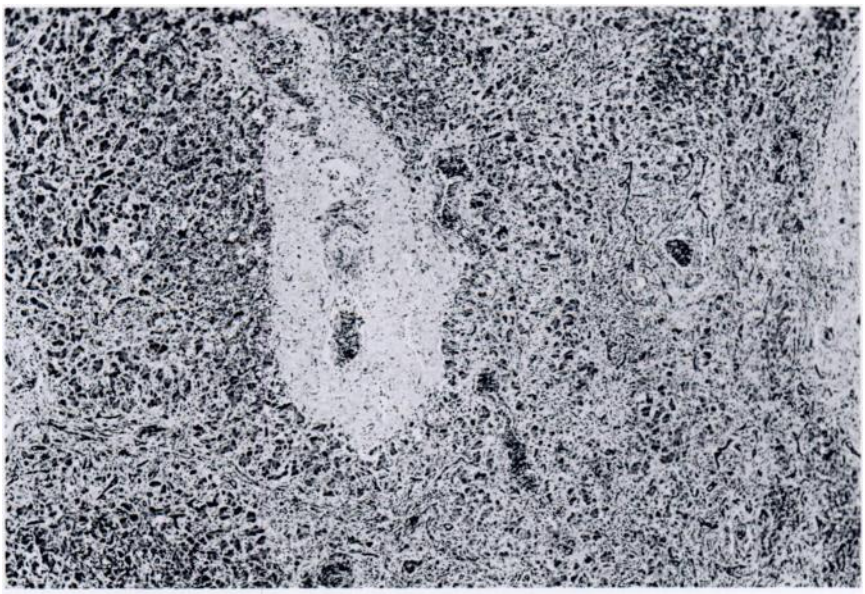

FIGURE 3. Section of liver with fibrosis of portal triads and parenchyma, proliferation of bile ductules, and chronic inflammation.

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present. Numerous shallow ulcers, generally 1-2 mm in diameter, were scattered throughout the mucosa of the forestomach. Eight *P. decipiens* were attached to one chronic ulcer with a fibrotic base infiltrated by inflammatory cells (Fig. 7). No perforations were evident.

More than 1000 cestodes were present in the small intestine, most in the distal jejunum; a few were found in the second portion of the stomach and in the terminal colon. A few acanthocephalans were attached to the mucosa of the lower jejunum and ileum. Microscopic examination of ingesta from the small intestine revealed numerous specimens of an unidentified species of *Pricetrema*.

Small numbers of sarcocysts were present in the skeletal muscle of the tongue.

Other lesions included focal nodular adrenal cortical hyperplasia and mild arteriosclerosis of the abdominal aorta and common iliac arteries.

DISCUSSION

Bile duct fibrosis and epithelial hyperplasia in animals and man have been associated with various parasites, including trematodes, coccidia and cryptosporidia; pancreatic duct fibrosis has been attributed to trematode infection.[13,18] Although parasites were not found in the biliary lesions and adult trematodes were not found in the pancreatic nodules, the eggs found in the latter lesion were triangular in shape, a feature of eggs of some members of the family *Campulidae*.[35]

Three trematode species are known to inhabit bile or pancreatic ducts of bearded seals: *Opisthorchis temuicollis* and 2 campulids, *Orthosplanchmus arcticus*

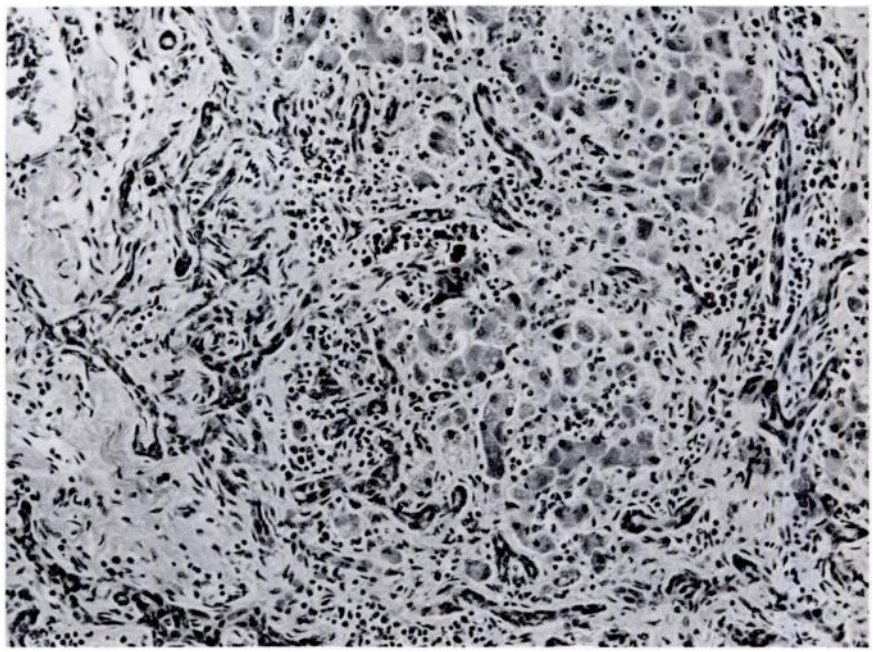

FIGURE 4. Section of liver with proliferation of bile ductules, fibrosis, and nonsuppurative inflammation.

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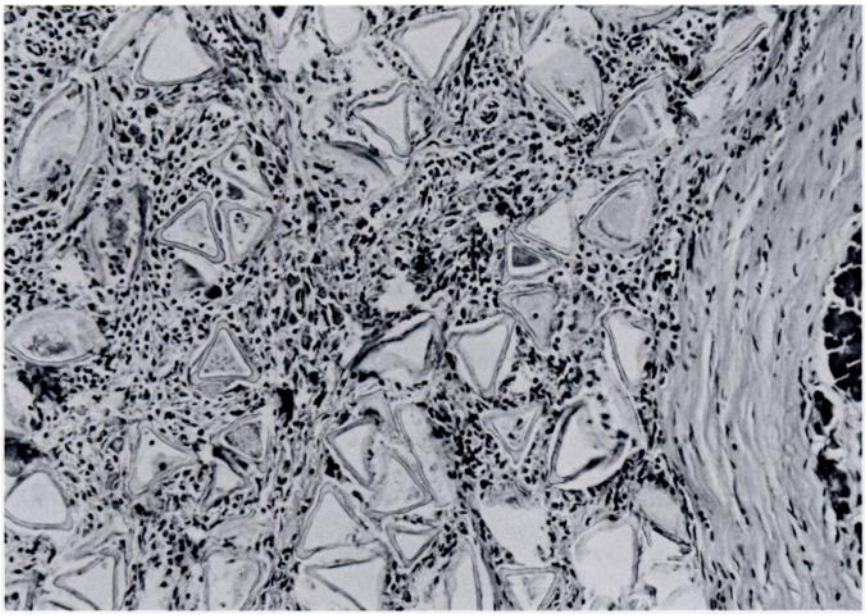

FIGURE 5. Fibrotic nodule from pancreas with campulid-type trematode eggs.

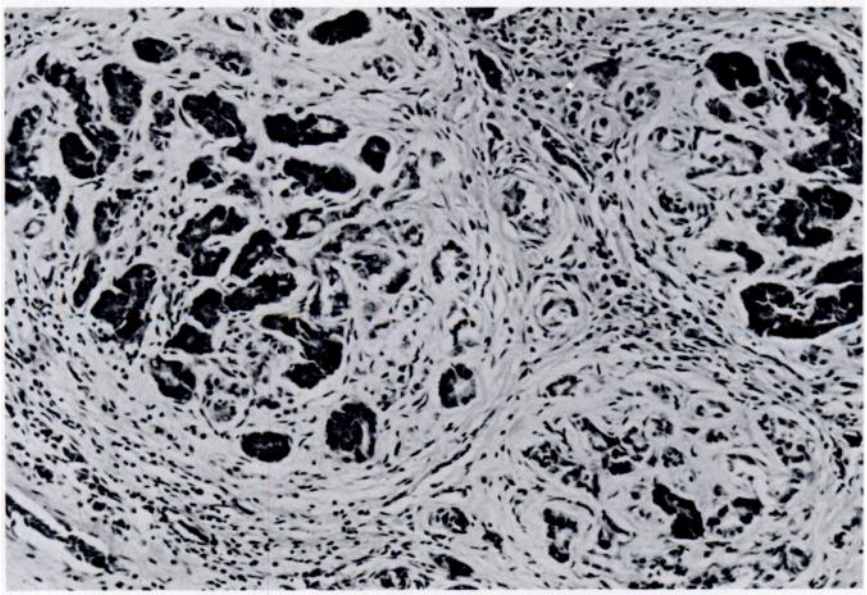

FIGURE 6. Nodule from pancreas with atrophy of acini, interstitial fibrosis, and chronic inflammation.

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TABLE 1. Parasites found in a bearded seal and their tissue location.

Trematoda	
Eggs, Family Campulidae	Pancreas, fibrotic nodules
Pricetrema sp.	Small intestine, lumen
Nematoda	
Phocanema decipiens	Stomach, lumen and attached to mucosal ulcers
Contracaecum osculatum	Stomach, lumen
Cestoda	
Diphyllobothrium cordatum (adults and plerocercoids)	Small intestine, lumen
Pyramicocephalus phocarum	Small intestine, lumen
Acanthocephala	
Corynosoma validum	Small intestine, attached to lumen
Protozoa	
Sarcocystis sp.	Tongue

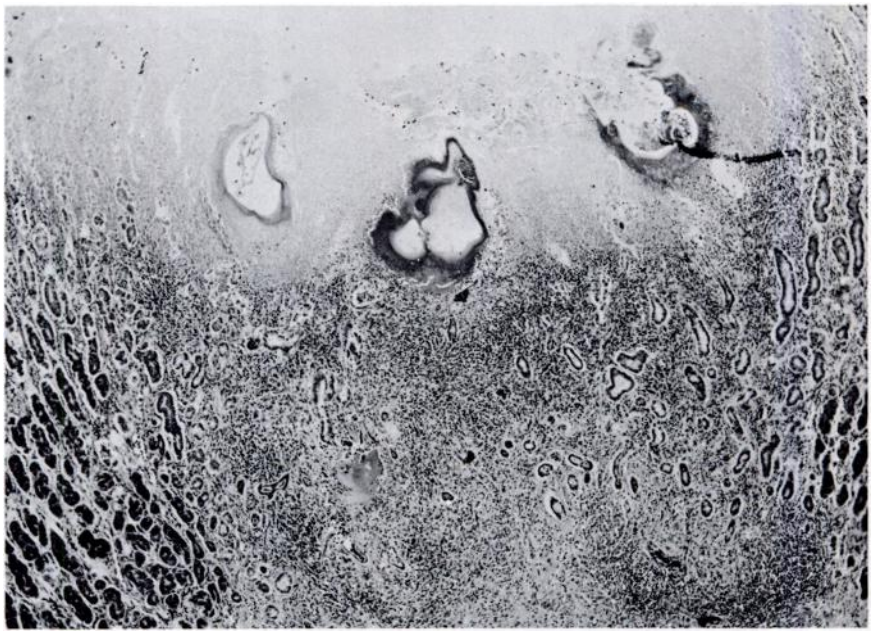

FIGURE 7. Chronic gastric ulcer with hyalin caps marking site of nematode attachment (nematodes were dislodged during tissue processing).

and *Orthosplanchmus fraterculus*.[6,7,25] Although no lesions have been associated with these parasites in the bearded seal, *O. fraterculus* produces mucosal hyperplasia and chronic inflammation of the gall bladder of the sea otter.[26] The same species has been found in both gall bladder and pancreatic ducts of bearded seals.[26] Additionally, the author has seen severe bile duct fibrosis

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and chronic proliferative cholangitis associated with either eggs or both eggs and adult trematodes in sections of liver from 2 other bearded seals infected with *O. fraterculus*. Although specific identification of the cause of the pancreatic and liver lesions in the seal of this case report is impossible, the lesions are most likely the result of parasitism by either *O. fraterculus* or *O. arcticus*. Adult worms may no longer have been present or may have been present in small numbers which were overlooked. The absence of eggs in the liver lesions may reflect sampling error. Of comparative interest is the association of 3 other members of the *Campulidae* with bile or pancreatic duct lesions in other marine mammals.[2,8,21,25,30,34]

Sarcocystis sp. has been reported infrequently in marine mammals.[1,4,5,24] This appears to be the first report of sarcocysts in a bearded seal.

Gastric ulcers occur in various species of marine mammals, but have not been reported in bearded seals. Although the cause of such ulcers is debatable,[9,10,16,27,28] the majority of reports directly associate the lesions with parasitism by an unspecified *Anisakinae*,[31] *Anisakis* sp.[11,14,21,22,28,32,36] *Contracaecum osculatum*,[8,12,15,17,28,29,30,33,36] *Phocanema decipiens*;[15,20,26,36] some of these parasites also produce gastrointestinal disorders in man.[19,42] Only the latter two species are found in bearded seals; both were present in the subject seal although only *P. decipiens* were attached to ulcers at necropsy.

This report of pathologic findings in a free-ranging bearded seal provides one more example of the importance of parasites in the induction of a variety of lesions in marine mammals.

Acknowledgements

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