

INFECTIOUS DISEASE MONITORING OF THE ENDANGERED HAWAIIAN MONK SEAL

A. Alonso Aguirre,^{1,9} Thomas J. Keefe,² John S. Reif,² Lizabeth Kashinsky,³ Pamela K. Yochem,⁴ Jeremiah T. Saliki,⁵ Jeffrey L. Stott,⁶ Tracey Goldstein,⁶ J. P. Dubey,⁷ Robert Braun,⁸ and George Antonelis⁸

¹ Wildlife Trust, 460 West 34th Street, 17th Floor, New York, New York 10001, USA

² Department of Environmental and Radiological Health Sciences, Colorado State University, Fort Collins, Colorado 80523, USA

³ Joint Institute for Marine and Atmospheric Research, University of Hawaii, 2570 Dole Street, Honolulu, Hawaii 96822-2396, USA

⁴ Hubbs-Sea World Research Institute, 2595 Ingraham Street, San Diego, California 92109, USA

⁵ Oklahoma Animal Disease Diagnostic Laboratory, Oklahoma State University, Farm Road and Ridge, Stillwater, Oklahoma 74078, USA

⁶ Department of Pathology, Microbiology, and Immunology, Laboratory for Marine Mammal Immunology, School of Veterinary Medicine, University of California, Davis, California 95616, USA

⁷ USDA-ARS-ANRI-PBESL, Building 1001 BARC-EAST, 10300 Baltimore Avenue, Beltsville, Maryland 20705, USA

⁸ Pacific Islands Fisheries Science Center, National Marine Fisheries Service, NOAA, 2570 Dole Street, Honolulu, Hawaii 96822, USA

⁹ Corresponding author (email: aguirre@wildlifetrust.org)

ABSTRACT: As part of conservation efforts between 1997 and 2001, more than 25% (332 animals) of the endangered Hawaiian monk seal (*Monachus schauinslandi*) population was sampled in the northwestern Hawaiian Islands. Serum samples were tested for antibodies to viruses, bacteria, and parasites known to cause morbidity and mortality in other marine mammal species. Antibodies were found to phocine herpesvirus-1 by using an enzyme-linked immunosorbent assay, but seropositive results were not confirmed by virus neutralization test. Antibodies to *Leptospira bratislava*, *L. hardjo*, *L. icterohaemorrhagiae*, and *L. pomona* were detected in seals from several sites with the microagglutination test. Antibodies to *Brucella* spp. were detected using 10 conventional serologic tests, but because of inconsistencies in test results and laboratories used, and the lack of validation by culture, the *Brucella* serology should be interpreted with caution. Antibodies to *B. canis* were not detected by card test. *Chlamydomydia abortus* antibodies were detected by complement fixation (CF) test, and prevalence increased significantly as a function of age; the low sensitivity and specificity associated with the CF make interpretation of results difficult. Antibodies to *Toxoplasma gondii* and *Dirofilaria immitis* were rarely found. There was no serologic evidence of exposure to four morbilliviruses, influenza A virus, canine adenovirus, caliciviruses, or other selected viruses. Continuous surveillance provides a means to detect the introduction or emergence of these or other infectious diseases, but it is dependent on the development or improvement of diagnostic tools. Continued and improved surveillance are both needed as part of future conservation efforts of Hawaiian monk seals.

Key words: *Brucella*, *Chlamydomydia*, Hawaiian monk seal, *Leptospira bratislava*, *Monachus schauinslandi*, phocine herpesvirus, serology, *Toxoplasma gondii*.

INTRODUCTION

The Hawaiian monk seal (*Monachus schauinslandi*) is one of the most endangered marine mammals in the world. Populations of Hawaiian monk seals have declined in recent years and are under the threat of extinction (Ragen and Lavigne, 1999). Although infectious diseases and biotoxins have significantly affected other marine mammal populations, their potential impacts on Hawaiian monk seals are

unknown. Ciguatoxin and mitotoxin have been suspected as causes of mortality in Hawaiian monk seals (Gilmartin et al., 1980), and sources of natural mortality have been described, including 1) mobbing (Hiruki et al., 1993); 2) starvation, primarily affecting juveniles (Banish and Gilmartin, 1992); 3) predation by sharks, particularly tiger sharks (*Galeocerdo cuvier*) and Galapagos sharks (*Carcharhinus galapagoensis*) (Balazs and Whitton, 1979; Alcorn and Kam, 1986); 4) net

