

Dr. Gregory Bossart, V.M.D, Ph.D.

Release of Cetaceans

In recent years, the public and media interest of reintroducing cetaceans under human care to the wild has been a topic of much discussion. Georgia Aquarium staff members have been active in the rescue, rehabilitation and release of various marine mammal species (including whales and dolphins) that have been under short-term human care for over 30 years. While scientific protocols for releasing short-term rescued and rehabilitated cetaceans have been developed to ensure that survivability is optimized, the scientific literature for releasing cetaceans under long-term human care is sparse and the results of the few scientifically conducted release projects report widely different results. Issues of concern in long-term situations include disease transmission between released animals and wild animals; the unwanted genetic exchange between the released cetacean and wild stocks; the elimination of behaviors developed in human care that could affect negatively impact survivability; and the ability of the released animal to adequately forage for itself, defend itself from predators and be integrated into a social group (Bossart, 1996; Spradlin and Terbush, 1999). Because of many of the above issues, the length of time under human care becomes an important consideration in any release protocol. Importantly, a study published regarding reintroduction of US Navy dolphins to the wild concluded that the benefits of reintroduction to either reintroduced animals or the indigenous populations could neither be predicted nor adequately quantified and that significant mortality risks existed to both the released animals and the wild stocks (Brill and Friedl, 1993).

Specifically, the reintroduction of the Russian beluga whales could negatively impact their health for behavioral and medical reasons. Specifically, many of the emerging and resurging marine mammal diseases we now see in some free-ranging marine mammal populations are not observed in marine mammals under human care (see disease references below). Thus, any translocation attempt could negatively impact the health of the reintroduced whales. Additionally, any translocation attempt could also inadvertently impact the well being of the free-ranging beluga whale population in which they are placed. Free-ranging wildlife populations including marine mammals have developed immunologic tolerance to a host of microorganisms that now live as commensals in their bodies including in the respiratory and gastrointestinal tracts. Alternatively, marine mammals under human care have developed immunologic tolerance to wide range of different microorganisms that now live as commensals in their bodies. The immunologic tolerance to different microorganisms is obviously adaptive and evolved slowly over time and is not an uncommon phenomenon in other mammalian species. Immunologic naivety to these new, different and potentially undefined organisms which in turn become opportunistic pathogens have the potential to negatively impact the health of the free-ranging beluga whale population as well as any reintroduced beluga whales. Precedent has been observed with similar disease outbreaks in humans and other wild animal species that have undergone various aspects of environmental translocation.

The length of time under human care also becomes a complicating variable for potentiating the health issues of concern for any successful reintroduction. In this case, the now normal microbial populations in the beluga whales housed near the Black Sea have microbes common to that geographic region only. Unfortunately, one additional complicating factor is the limited comparable health data of the free-ranging beluga populations in question. This health data would be critical for understanding disease transmission potential between both the reintroduced animals and the indigenous populations.

Specific behavioral issues of concern in this case would include that during their time in human care the beluga whales in question have been largely desensitized to humans and dependent on humans for their basic functions of life. As in other failed release attempts, released animals no longer have a healthy inherent fear of humans and engage humans in the search of food. In the worst case scenario, these animals would be unable to feed themselves and actually search out humans for companionship. Additionally, the social relationships of the reintroduced animals and the indigenous populations are difficult to determine and could cause unpredictable social consequences to the detriment of either group.

Probably the most infamous example of similar behavioral/social difficulties occurred with the failed tragic release attempt of the killer whale “Keiko”, the star of the movie “Free Willy”. According to Mark Simmons, noted marine mammal behaviorist and naturalist and the author of “Killing Keiko”, the release of “Keiko” who had been under long-term human care was not successful nor was he ever free (Simmons, 2014). “Keiko” never acquired skills to survive on his own, continued to seek out human interaction to his final days, never integrated with wild whales and died from improper and negligent care. According to Simmons, Keiko’s final years and days were cruel and unusual and constitute perhaps the most infamous case of animal exploitation and animal abuse in marine zoological history. This tragedy highlights that we must remember that our generous, human compassion for animals is not always well-conceived. We need to better understand what our actions actually mean for such animals as opposed to what they mean for ourselves or our agendas. While returning stranded marine mammals that have been rehabilitated is usually a compassionate act, there is no reason to abandon animals that have long depended on human care.

Based on these medical, social and behavioral issues of concern we do not consider the beluga whales in question to be reintroduction candidates.

References:

Bossart GD (2011) Marine mammals as sentinel species of ocean and human health. *Vet Pathol* 48:

676–690

Bossart GD, Reiderson T, Dierauf L, Duffield D (2001) Clinical pathology. In: Dierauf L, Gulland F (eds) *Marine mammal medicine*. CRC Press, Boca Raton, FL, 383–436 pp

- Bossart GD, Ghim S, Rehtanz M, Goldstein J and others (2005) Orogenital neoplasia in Atlantic bottlenose dolphins (*Tursiops truncatus*). *Aquat Mamm* 31: 473–480
- Bossart GD, Goldstein JD, Murdoch EM, Fair PA, McCulloch S (2006) Health assessment of bottlenose dolphins in the Indian River Lagoon, Florida and Charleston, South Carolina. Harbor Branch Oceanographic Technical Report No. 93. Harbor Branch Oceanographic Institute, Ft. Pierce, FL
- Bossart GD, Romano TA, Peden-Adams MM, Rice CD and others (2008) Hematological, biochemical and immunological findings in Atlantic bottlenose dolphins (*Tursiops truncatus*) with orogenital papillomas. *Aquat Mamm* 34: 166–177
- Bossart GD, Romano T, Peden-Adams M, Schaefer A and others (2011) Clinicoimmunopathologic findings in Atlantic bottlenose dolphins *Tursiops truncatus* with positive morbillivirus titers. *Dis Aquat Org* 97: 103–112
- Bossart GD (2001) Manatees. In: Dierauf L, Gulland F (eds) *Marine mammal medicine*. CRC Press, Boca Raton, FL, 939–960 pp
- Bossart GD (2011) Marine mammals as sentinel species for oceans and human health. *Vet Pathol* 48: 676–690
- Bossart GD, Ewing R, Lowe M, Sweat M and others (2002) Viral papillomatosis in Florida manatees (*Trichechus manatus latirostris*). *Exp Mol Pathol* 72: 37–48
- Bossart GD, Meisner R, Rommel SA, Ghim S, Jenson AB (2003) Pathological features of the Florida manatee cold stress syndrome. *Aquat Mamm* 29: 9–17
- Bossart GD, Meisner R, Rommel SA, Lightsey JA, Varela RA, Defran RH (2004) Pathologic findings in Florida manatees (*Trichechus manatus latirostris*). *Aquat Mamm* 30: 434–440
- Bossart GD, Reif JS, Schaefer AM, Goldstein J, Fair PA, Saliki JT (2010) Morbillivirus infection in free-ranging Atlantic bottlenose dolphins (*Tursiops truncatus*) from the southeastern United States: seroepidemiologic and pathologic evidence of subclinical infection. *Vet Microbiol* 143: 160–166
- Bossart GD (1984) A suspected acquired immunodeficiency in an Atlantic bottlenose dolphin with lobomycosis and chronic-active hepatitis. *J Am Vet Med Assoc* 185:1413–1414, 1984.
- Bossart GD, Odell DK, Altman NH (1985) Cardiomyopathy in stranded pygmy and dwarf sperm whales. *J Am Vet Med Assoc* 187:1137– 1140
- Bossart GD, Ewing R, Herron AJ, et al (1997) Immunoblastic malignant lymphoma in dolphins: ultrastructural and immunohistochemical features. *J Vet Diagn Invest* 9:454–458
- Bossart GD, Baden DG, Ewing R, et al (1998) Brevetoxicosis in manatees (*Trichechus manatus latirostris*) from the 1996 epizootic: gross, histologic and immunohistochemical features. *Toxicol Pathol* 26:276–282

Bossart GD, Ewing R, Lowe M, et al (2002) Viral papillomatosis in Florida manatees (*Trichechus manatus latirostris*). *Exp Mol Pathol* 72:37–48

Bossart GD, Baden DG, Ewing RY, et al: Manatees and brevetoxicosis. In: *Molecular and Cell Biology of Marine Mammals*, ed. Pfeiffer C, pp. 205–212. Krieger, Melbourne, FL, 2002.

Bossart GD, Meisner R, Rommel SA, et al (2003) Pathological features of the Florida manatee cold stress syndrome. *Aquatic Mammals* 29(1): 9–17

Bossart GD, Meisner R, Varela R, et al (2003) Pathologic findings in stranded Atlantic bottlenose dolphins (*Tursiops truncatus*) from the Indian River Lagoon, Florida. *Florida Scientist* 66(3):226–238

Bossart GD, Meisner R, Rommel SA, et al (2004) Pathologic findings in Florida manatees (*Trichechus manatus latirostris*). *Aquatic Mammals* 30(3):434–440

Bossart GD, Ghim S, Rehtanz M, et al (2005) Orogenital neoplasia in Atlantic bottlenose dolphins (*Tursiops truncatus*). *Aquatic Mammals* 31(4):473–480

Bossart GD (2006) Marine mammals as sentinel species for oceans and human health. *Oceanography* 19(2):44–47

Bossart GD (2007) Emerging diseases in marine mammals: from dolphins to manatees. *Microbe* 11(2):544–549

Bossart GD, Hensley G, Goldstein J, et al (2007) Cardiomyopathy and myocardial degeneration in stranded pygmy (*Kogia breviceps*) and dwarf sperm (*Kogia sima*) whales. *Aquatic Mammals* 33(2):214–222

Bossart GD, Romano TA, Peden-Adams, et al (2008) Hematological, biochemical and immunological findings in Atlantic bottlenose dolphins (*Tursiops truncatus*) with orogenital papillomas. *Aquatic Mammals* 34(2):166–177

Bossart GD, Mignucci-Giannoni Antonio A, Rivera-Guzman Antonio L, Jimenez-Marrero Nilda M, Camus Alvin C, Bonde Robert K, Dubey Jitender P, Reif John S (2012) Disseminated toxoplasmosis in Antillean manatees *Trichechus manatus manatus* from Puerto Rico. *Diseases of Aquatic Organisms* 101: 139-144

Bossart GD, Reif JS, Schaefer AM, et al (2012) Morbillivirus infection in free-ranging Atlantic bottlenose dolphins (*Tursiops truncatus*) from the southeastern United States: seroepidemiologic and pathologic evidence of subclinical infection. *Vet Microbiol* 143:160–166

Bossart GD, Romano T, Peden-Adams M, Schaefer A, McCulloch S, Goldstein J, Fair P, Cray C, Reif JS (2014) Clinicoimmunopathologic findings in Atlantic bottlenose dolphins (*Tursiops truncatus*) with positive *Chlamydiaceae* antibody titers. *Diseases of Aquatic Organisms* 108: 71-81

Bossart GD, Schaefer AM, McCulloch S, Goldstein J, Fair PA, Reif JS (2015) Mucocutaneous lesions from free-ranging Atlantic bottlenose dolphins, *Tursiops truncatus*, from the southeastern United States. *Diseases of Aquatic Organisms* 115:175-184

Bossart, G. D., Romano, T. A., Peden-Adams, M. M., Rice, C. D., Fair, P. A., Goldstein, J. D., Cammen, K., and Reif, J. S. (2008) Hematological, biochemical and immunological findings in Atlantic bottlenose dolphins (*Tursiops truncatus*) with orogenital papillomas. *Aquatic Mammals* 34(2): 166-177

Bossart GD, Odell DK and Altman NH. (1985) Cardiomyopathy in stranded pygmy and dwarf sperm whales. *J Am Vet Med Assoc* 187:1137-1140

Bossart GD, Cray C, Solorzano JL, Decker SJ, Cornell LH and Altman NH (1996) Cutaneous papovaviral-like papillomatosis in a killer whale (*Orcinus orca*). *Marine Mammal Science* 12: 274-281

Bossart GD, Hensley G, Goldstein J, Kroell K, Manire C, Defran R, and Reif J (2007) Cardiomyopathy and myocardial degeneration in stranded pygmy (*Kogia breviceps*) and dwarf sperm (*Kogia sima*) whales. *Aquatic Mammals* 33(2): 214-222

Bossart GD (1996). Release of dolphins was inhumane. articles.sun-sentinel.com/1996-07-19/news/9607180251_1_buck-and-luther-atlantic-bottlenose-dolphins-animals

Brill RL and Fridel WA (1993) Reintroduction to the wild as an option for managing Navy marine mammals. NCCOSC/NRaD Tech. Report 1549, 86 pp.

Fair PA, Houde M, Hulsey TC, Bossart GD, Adams J, Balthis L, Muir DC (2012) Assessment of perfluorinated compounds (PFCs) in plasma of bottlenose dolphins from two southeast US estuarine areas: Relationship with age, sex and geographic locations. *Mar Pollut Bull* 64: 66-74

Fair P, Adams J, Mitchum G, Hulsey T, Reif J, Houde M, Muir D, Wirth E, Wetzel D, Zolman E, McFee W, and Bossart G (2010) Contaminant blubber burdens in Atlantic bottlenose dolphins (*Tursiops truncatus*) from two southeastern US estuarine areas: Concentrations and patterns of PCBs, pesticides, PBDEs, PFCs, and PAHs. *Science of the Total Environment* 408: 1577-1597

Fair PA, Mitchum G, Hulsey TC, Adams J, Zolman E, McFee W, Wirth E, and Bossart GD. (2007) Polybrominated diphenyl ethers (PBDEs) in blubber of free-ranging bottlenose dolphins (*Tursiops truncatus*) from two southeast Atlantic estuarine areas. *Arch Environ Contam Toxicol* 53: 483-494

Fire SE, Wang Z, Leighfield TA, Morton SL, McFee WE, McLellan WA, Litaker RW, Tester Harms C, Rotstein DS, Barco SG, Costidis A, Sheppard B, Bossart GD, Stolen M, Durden WN, Van Dolah FM (2009) Domoic acid exposure in pygmy and dwarf sperm whales (*Kogia* spp.) from southeastern and mid-Atlantic U.S. waters. *Harmful Algae* 8: 658-664

Greig TW, Bemiss JA, Lyon BA, Bossart GD, and Fair PA. (2007) Prevalence and diversity of antibiotic resistant *Escherichia coli* in bottlenose dolphins (*Tursiops truncatus*) from the Indian River Lagoon, Florida, and Charleston Harbor area, South Carolina. *Aquatic Mammals* 33(2): 185-194

Houde M , Pacepavicius G, Darling C, Fair P, Alae M, Bossart GD, Solomon K, Letcher R, Bergman A , Marsh G, and Muir D (2009) Polybrominated diphenyl ethers and their hydroxylated analogs in plasma of bottlenose dolphins (*Tursiops truncatus*) from the United States east coast. *Environmental Toxicology and Chemistry* 28: 2061-2068

Rector A, Stevens H, Lacave G, Lemey P, Mostmans S, Salbany A, Vos M, Van Doorslaer K, Ghim S, Rehtanz M, Bossart G D. Jenson A. B, Van Ranst M (2008) Genomic characterization of novel dolphin papillomaviruses provides indications for recombination within the Papillomaviridae. *Virology* 378: 151–161

Rehtanz M, Ghim S, McFee W, Doescher B, Lacave G, Fair P, Reif J, Bossart G and Jenson A. (2010) Papillomavirus antibody prevalence in free-ranging and captive bottlenose dolphins (*Tursiops truncatus*). *Journal of Wildlife Disease* 46: 136-145

Reif JS, Fair PA, Adams J, Joseph B, Kilpatrick DS, Sanchez R, Goldstein JD, Townsend FI Jr, McCulloch SD, Mazzoil M, Zolman ES, Hansen LJ, and Bossart GD (2008) Evaluation and comparison of the health status of Atlantic bottlenose dolphins from the Indian River Lagoon, Florida and Charleston, South Carolina. *J Amer Vet Med Assoc* 233: 299-307

Schaefer AM, Stavros HW, Bossart GD, Fair PA, Reif JS (2011) Effects of mercury on hepatic, renal, endocrine and hematological parameters in Atlantic bottlenose dolphins (*Tursiops truncatus*) along the Eastern coast of Florida and South Carolina. *Archives of Environmental Contamination*. doi: 10.1007/s00244-011-9651-5

Simmons, M (2014) *Killing Keiko: The true story of Free Willy's return to the wild*. Callinectes Press, Orlando, FL, 398 pp.

Spradlin TR and Terbush AD (1999) Rescue of 2 bottlenose dolphins released to the wild without adequate preparation. 13th Biennial Conference on the Biology of Marine Mammals, Maui, HI

Stavros HW, Bossart GD, Hulsey TC, Fair PA (2007) Trace element concentrations in skin of free-ranging bottlenose dolphins (*Tursiops truncatus*) from the southeast Atlantic coast. *Science of the Total Environment* 388: 300-315

Stavros HW, Bossart GD, Hulsey TC, Fair PA (2008) Trace element concentrations in blood of free-ranging bottlenose dolphins (*Tursiops truncatus*): Influence of age, sex and location. *Marine Pollution Bulletin* 56: 348-379

Schaefer AM, Goldstein JD, Reif JS, Fair PA and Bossart GD (2009) Antibiotic-resistant organisms cultured from Atlantic bottlenose dolphins (*Tursiops truncatus*) inhabiting estuarine waters of Charleston, SC and Indian River Lagoon, FL. *Ecohealth*. DOI: 10.1007/s10393-009-0221-5.

Schaefer AM, Bossart GD, Mazzoil M, Fair PA, Reif JS (2011) Risk factors for colonization of *E. coli* in Atlantic bottlenose dolphins (*Tursiops truncatus*) in the Indian River Lagoon, Florida. *Journal of Environmental and Public Health*. doi:10.1155/2011/597073