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Hematologic and Serum Biochemical Data from Mass Stranded Long-Finned Pilot Whales (*Globicephala melas*), Cape Cod, USA, 2002

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Abstract

Medical and stranding records from a mass stranding of long-finned pilot whales (*Globicephala melas*) were reviewed retrospectively. Of the 58 stranded animals, 40 were euthanized, while 18 died naturally. Seventeen individuals were male (29%), 37 individuals were female (64%), and sex was not recorded for four individuals (7%). During the stranding response, blood was collected from 20 individuals, providing for serum biochemistry (n = 20), serum protein electrophoresis (n = 19), serum cortisol (n = 19), complete blood count (n = 16), and coagulation profile (n = 5). Individuals from which blood was collected included 12 adult females, four juvenile females, one adult male, one juvenile male, and two individuals of unknown sex and age class. Hematologic and serum biochemical data did not reveal severe anomalies in any individual, and postmortem examinations did not reveal any serious disease. Common modest derangements included increased erythrocyte indices, elevated tissue enzyme activities, hyperglycemia, and elevated serum cortisol concentration. This study provides the first hematologic and serum biochemical data for mass stranded individuals of this species and provides further evidence that cetaceans may be in stable physiologic condition and free of overt disease prior to stranding.

Key Words: cetacean, pilot whale, *Globicephala melas*, hematology, biochemistry, mass stranding

Introduction

A mass stranding of cetaceans is defined as two or more cetaceans, excluding cow–calf pairs, stranding in proximity to one another in time and space (Geraci & Lounsbury, 2005). Mass strandings have been reported globally, involving a variety of species (Geraci & St. Aubin, 1977; Morimitsu et al., 1987; Walsh et al., 1991; Gales, 1992; Sweeny et al., 2005; Hohn et al., 2006; Bogomolni et al., 2010; Groom & Coughran, 2012; Sampson et al., 2012; Jepson et al., 2013; Wells et al., 2013; Sharp et al., 2014, 2016; Huertas & Lagueux, 2016; Raghunathan et al., 2016; Jeyabaskaran et al., 2018; Simeone & Moore, 2018; Alvarado-Rybak et al., 2019; Tyson-Moore et al., 2020). Mass strandings have been hypothesized to be caused by anthropogenic acoustic disturbance, extreme weather, geomagnetic anomalies, disease, and nearshore bathymetry (Klinowska, 1985; Brabyn & McLean, 1992; Duignan et al., 1995; Rogan et al., 1997; Balcomb & Claridge, 2001; Fernandez et al., 2005, 2008; Walker et al., 2005; Jeyabaskaran et al., 2018; Bernaldo de Quiros et al., 2019). Mass strandings of cetaceans are relatively common in Cape Cod, Massachusetts, and some of the animals involved appear to be free of overt illness or disease, indicating that other non-health factors may be involved (Bogomolni et al., 2010; Sampson et al., 2012).

Analysis of blood components is a routine part of health evaluation. Hematologic evaluation provides information about erythrocytes (red blood cells) that carry oxygen, leucocytes (white blood cells) that respond to infection and create inflammation, and platelets (thrombocytes) that promote blood clotting. Blood biochemical analysis includes a suite of assays that determine the concentrations of important elements and molecules (e.g., sodium, glucose, and proteins), the activities of certain enzymes (e.g., enzymes involved with metabolism inside liver and muscle cells), and compounds that characterize organ function (e.g., creatinine as an indicator of kidney function). Understanding the typical values for such analytes in healthy individuals allows comparative assessment of individuals with unknown health status.

Limited hematologic and serum biochemical data have been reported for mass stranded cetacean species, including short-finned pilot whales (*Globicephala macrorhynchus*), striped dolphins (*Stenella coeruleoalba*), Atlantic white-sided dolphins (*Lagenorhynchus acutus*), and short-beaked common dolphins (*Delphinus delphis*) (Walsh et al., 1991; Gales, 1992; Hohn et al., 2006; Sampson et al., 2012; Sharp et al., 2014, 2016; Tyson-Moore et al., 2020). Results of these studies indicate that some involved individuals demonstrate clinical pathologic abnormalities while others do not. Hematologic and serum biochemical data for mass stranded individuals of other cetacean species are lacking.

Pilot whales (*Globicephala* spp.) are oceanic members of the family Delphinidae. This genus is known for its familial and social groupings, often comprised of 20 to 150 individuals. Pilot whales are found globally with two extant species: (1) short-finned pilot whales in the middle latitudes and (2) long-finned pilot whales (*Globicephala melas*) found closer to the poles, although there is some overlap between their ranges (Oremus et al., 2009; Téllez et al., 2014; Pugliares et al., 2016; Van Cise et al., 2016; Olson et al., 2018). The conservation status of both species of pilot whales is categorized as "Least Concern," and populations appear stable despite anthropogenic threats, including fisheries interactions and acoustic disturbance (Minton et al., 2018a, 2018b).

Mass strandings of both species of pilot whales are relatively common, occurring in many locations worldwide (Geraci & St. Aubin, 1977; Morimitsu et al., 1987; Walsh et al., 1991; Sweeny et al., 2005; Hohn et al., 2006; Bogomolni et al., 2010; Groom & Coughran, 2012; Wells et al., 2013; Huertas & Lagueux, 2016; Raghunathan et al., 2016; Jeyabaskaran et al., 2018; Alvarado-Rybak et al., 2019; Tyson-Moore et al., 2020). Although such strandings provide access to samples for scientific inquiry, and substantial effort has been put forth for pathological, toxicological, life history, and genetic investigations from these events (Morimitsu et al., 1987; Sweeny et al., 2005; Hohn et al., 2006; Oremus et al., 2009; Bogomolni et al., 2010; Bossart et al., 2013; Téllez et al., 2014; Van Cise et al., 2016; Beasley et al., 2019; Bolea-Fernandez et al., 2019), very few hematologic and serum biochemical data for mass stranded short-finned pilot whales have been described (Walsh et al., 1991; Hohn et al., 2006; Tyson-Moore et al., 2020), and no data have been described for long-finned pilot whales. Given the paucity of hematologic and serum biochemical data for mass stranded cetaceans, in general, and the complete lack of published data for long-finned pilot whales, this study describes hematologic and serum biochemical data that were collected during the management of mass stranded long-finned pilot whales from Cape Cod in 2002. Based on previous data for other mass stranded cetacean species in this geographic location, we hypothesized that hematologic and biochemical data for many individuals would indicate that they were in relatively stable physiologic status, free of overt abnormalities.

Methods

In 2018, veterinary and stranding records from a mass stranding of long-finned pilot whales that occurred in 2002 on Cape Cod, Massachusetts, were reviewed retrospectively. Records included those maintained by the New England Aquarium (Boston, MA, USA) and the International Fund for Animal Welfare (IFAW; encompassing the former Cape Cod Stranding Network, Yarmouth Port, MA, USA). Data retrieved from records included temporal and spatial information (dates and locations of strandings), number of animals, age class, sex, hematologic and serum chemical data, and outcome (euthanized, natural death, or released). Upon initial review of records, it was clear that the scope and challenges of the stranding response had resulted in limited recordkeeping for many of the individuals. As such, personnel who had been involved with the stranding response were interviewed in 2018, and newspaper reports from 2002 were reviewed to supplement the limited records. To categorize age class, males and females were classified as adults when greater than 4.6 and 3.6 m total length, respectively, while individuals < 2 m total length were classified as neonates, and all other individuals were categorized as juveniles (Kasuya et al., 1988).

Methodology for blood sampling and handling was derived from medical records and personal interviews with stranding personnel. Blood was drawn preferentially from the mixed arterial/venous rete of the caudal peduncle, with the superficial veins of the fluke being a second choice; however, records did not indicate details of needle and syringe size, sample volume, or which site was used for each individual. Blood samples were obtained just prior to euthanasia in the majority of animals sampled, but blood may have been obtained immediately following death for two individuals that died of natural causes. Blood handling followed conventional mammalian methods, with blood for hematologic analysis being stored in EDTA tubes and blood for coagulation profiles stored in citrate tubes (Vacutainer; Becton Dickinson Company, Franklin Lakes, NJ, USA). Blood for biochemical analysis was transferred to a tube lacking anti-coagulant and allowed to clot prior to centrifugation and serum separation on the same day. As best could be accommodated under the circumstances, blood was stored in coolers, and serum was separated as soon as possible on the same day of collection, but temporal details were not recorded.

Samples were delivered by courier to a commercial veterinary diagnostic laboratory (Idexx Laboratories, North Grafton, MA, USA) on the day of collection or the morning after. In 2018, laboratory personnel were queried to determine the analytical methodologies that had been used in 2002 (D. Wunn, pers. comm., 2018). Automated complete blood counts were performed using the CellDyne 3500, and cell morphology and thrombocyte estimates were described by a Board-certified veterinary clinical pathologist upon review of a blood smear. Serum biochemical profiles were performed using the Hitachi 747 analyzer, serum electrophoresis was performed using the Beckman Paragon Electrophoresis System, and cortisol analysis was performed using the Immulite 1000. Coagulation profiles were performed using the BBL 60415 Fibrometer for prothrombin time (PT) and partial thromboplastin time (PTT), with heat precipitation utilized for the fibrinogen. Descriptive statistics for blood data were calculated using Microsoft *Excel* (Microsoft Corporation, Redmond, WA, USA).

Carcasses were transferred to a landfill site at which necropsies were conducted outdoors. Tissue samples were collected and preserved in formalin for histopathologic evaluation by a single veterinary pathologist at the Armed Forces Institute of Pathology in Washington, DC.

Results

Fifty-eight long-finned pilot whales stranded on Chapin Beach, Dennis, Cape Cod, Massachusetts, on the morning of 29 July 2002. Circumstantial details are provided herein as context for limited recordkeeping. In addition to managing the stranded whales, stranding personnel were forced to manage large crowds of beach visitors, some of whom, without authorization, attempted to unsafely assist individual whales. One whale was euthanized due to poor prognosis, and eight animals died naturally, but the incoming tide prevented euthanasia of additional animals at that time. The remaining animals refloated and were "herded" away from the beach by boat when water depth permitted. Two individuals were found stranded nearby later that day and were euthanized.

On 30 July 2002, the remainder of the pod was found stranded on Lieutenant Island, Wellfleet, Cape Cod, approximately 24 km (straight line) northeast of the original stranding site. Several animals were euthanized, but the rising tide again prompted responders to attempt to refloat and herd the remaining animals. These efforts were unsuccessful, and the group stranded for a third time immediately east of the release site on the same day. All remaining individuals could be accessed at that time and were euthanized or died naturally. Carcasses were then removed for safe disposal. Of the 58 animals, 40 were euthanized and 18 died naturally. Seventeen individuals were male (29%), including 10 adults, five juveniles, one neonate, and one that could not be categorized due to absent length data. Thirty-seven individuals were female (64%), including 25 adults, 11 juveniles, and the individual that could not be categorized. Sex was not recorded for four individuals (7%). Individual sex and length data are provided in Supplemental Table 1 (Supplemental Table 1 is available in the "Supplemental Material" section of the *Aquatic Mammals* website: https://www.aquaticmammalsjournal.org/index.php?option=com_content&view=article&id=10&Itemid=147). Detailed notes regarding body condition were not recorded; however, the absence of notations regarding poor body condition and the 2018 interviews with stranding responders suggest that animals were in good body condition.

During the stranding response, blood was collected from 20 individuals, providing adequate volume and preservation for the following analyses: serum biochemistry (n = 20), serum protein electrophoresis (n = 19), serum cortisol (n = 19), complete blood count (n = 16), and coagulation profile (n = 5). Individuals included 12 adult females, four juvenile females, one adult male, one juvenile male, and two individuals of unknown sex and age class. Summary hematologic and serum biochemical data are provided in Tables 1 through 4, and individual data are provided in Supplemental Table 1. Although thrombocytes were not quantified, blood smear evaluations resulted in "Adequate" subjective thrombocyte counts in all but one case, with thrombocytes for that case being described as "Decreased to Adequate." Hematologic and biochemical analyses were successfully completed for all blood samples, and interpretation by three veterinarians (GC, SS, and CI) indicated that results were biologically reasonable in comparison to data for presumed healthy short-finned pilot whales and other delphinids.

The 11 whales that died or were euthanized on 29 July 2002 were evaluated by necropsy on 30 July 2002; this number included four adult males (whales 179, 184, 185, and 235) and seven females, encompassing three pregnant with near-term fetuses

Table 1. Complete blood count data for 17 mass stranded pilot whales (*Globicephala melas*); MCV = erythrocyte mean cellular volume, MCH = erythrocyte mean cellular hemoglobin, and MCHC = erythrocyte mean cellular hemoglobin concentration.

	Mean	Median	SD	Minimum	Maximum
Hematocrit (%)	50.0	52.0	4.8	40.0	55.0
Erythrocytes (10^6/µL)	4.2	4.4	0.5	3.2	4.8
Hemoglobin (g/dL)	18.6	19.2	1.8	14.5	20.6
MCV (fL)	119.2	118.0	6.1	111.0	129.0
MCH (pg)	44.4	44.0	2.1	39.9	47.8
MCHC (g/dL)	37.1	37.2	1.4	34.9	39.8
Leukocytes (10^3/µL)	6.6	6.0	2.3	3.7	12.5
Neutrophils (10^3/µL)	4.9	4.7	1.8	1.9	9.3
Lymphocytes (10^3/µL)	1.3	0.8	1.1	3.4	5.0
Monocytes (10^3/µL)	0.11	0.07	0.1	0	0.26
Eosinophils (10^3/µL)	0.34	0.25	0.24	0.07	0.89
Neutrophils (%)	74.0	79.0	11.8	51.0	90.0
Lymphocytes (%)	18.0	14.0	11	8.0	40.0
Monocytes (%)	1.7	1.0	1.9	0	7.0
Eosinophils (%)	5.7	4.0	4.2	1.0	15.0

(whales 178, 182, and 187), two non-pregnant adults (whales 186 and 188), and two juveniles (whales 180 and 181); however, corresponding blood data were only available from one of these individuals (whale 178). Necropsy and histopathology findings were very limited but are provided here as context for pod health. Necropsy personnel were challenged by environmental temperatures of 35° to 39°C; thus, thorough gross examination was not completed for any individual, and detailed gross examination notes were not recorded. A brief summary report indicated that no significant external or internal gross lesions were detected, with a focal abscess on the caudal peduncle of one individual (whale 178) and gastric nematodes in another (whale 186). Histopathologic evaluation was performed for 10 animals, but interpretation was limited by extensive autolysis in every case. Lesions included mild, multifocal myocardial fibrosis (adult male whales 179 and 184); mild focal granulomatous pneumonia with intrabronchiolar nematodes (one adult pregnant female whale 187); and diffuse, acute, moderate pulmonary congestion and edema, with ulcerative tracheitis (adult female whale 188). These limited data were included in a previous study of postmortem findings of 405 stranded marine mammals from Cape Cod (Bogomolni et al., 2010).

Discussion

Blood data in this study are generally consistent with those described for presumably healthy captive short-finned pilot whales and other captive and free-ranging delphinids, with only modest deviations as detailed below (Medway & Moldovan, 1966; Ridgway et al., 1970; Goldstein et al., 2006; Venn-Watson et al., 2007; Schwacke et al., 2009; Gulland et al., 2018). Hematologic and serum biochemical data did not reveal severe derangements in any individual, and limited postmortem examinations did not reveal grossly visible signs of disease in most cases. Acknowledging that more thorough postmortem investigations (i.e., molecular and microbiological investigations) could have identified cryptic disease conditions, this study provides further evidence that some mass stranded cetaceans are physiologically stable and free of overt disease (Bogomolni et al., 2010; Sampson et al., 2012; Sharp et al., 2014, 2016).

Erythrocyte indices, including hematocrit, erythrocyte count, and hemoglobin, were modestly elevated in nine individuals (e.g., PCV = 52 to 55%) in comparison to data for captive short-finned pilot whales (Medway & Moldovan, 1966; Ridgway et al., 1970; Gulland et al., 2018). This phenomenon has also been described for mass stranded striped dolphins, Atlantic white-sided dolphins, short-beaked common dolphins, and short-finned pilot whales (Walsh et al., 1991, 2001; Gales, 1992; Hohn et al., 2006; Sampson et al., 2012). Higher erythrocyte indices may be seen in wild vs captive marine mammals as the oxygen carrying capacity of the former is routinely challenged by long-distance movements, hunting, and deep, prolonged diving. It is also possible that the relatively high hematocrit of some mass stranded cetaceans may be part of the physiologic stress response (Medway

Table 2. Serum biochemical values for 20 mass stranded pilot whales, and cortisol data derived from 19 animals. ALP = alkaline phosphatase, ALT = alanine aminotransferase, AST = aspartate aminotransferase, CK = creatine kinase, LDH = lactate dehydrogenase, GGT = gamma glutamyl transferase, A/G = albumin/globulin, Na/K = sodium/potassium, BUN = blood urea nitrogen, B/C = BUN/creatinine, and TCO_2 = total carbon dioxide.

	Mean	Median	SD	Minimum	Maximum
ALP (U/L)	582	417	440	214	2,114
ALT (U/L)	72	28	127	12	551
AST (U/L)	337	201	342	119	1,399
CK (U/L)	637	304	773	96	2,601
LDH (U/L)	1,220	934	682	416	2,538
GGT (U/L)	49	38	41	24	213
Total protein (g/dL)	7.2	7.3	0.8	5.8	9.3
Albumin (g/dL)	3.8	3.8	0.3	3.2	4.2
Globulin (g/dL)	3.4	3.5	0.8	1.7	5.5
A/G ratio	1.2	1.1	0.4	0.7	2.4
Sodium (mmol/L)	154	154	3	147	158
Chloride (mmol/L)	116	115	6	103	125
Potassium (mmol/L)	4.6	4.5	0.6	3.6	6.0
Na/K ratio	34	35	4.3	25	42
Glucose (mg/dL)	128	118	31	86	180
Calcium (mg/dL)	8.8	8.8	0.7	7.9	10.6
Phosphorus (mg/dL)	6.1	6.0	1.5	3.3	10.6
BUN (mg/dL)	43	45	9	28	62
Creatinine (mg/dL)	2.1	2.1	0.6	1.2	3.6
B/C ratio	20.7	21.2	4.7	12.7	29.2
Uric acid (mg/dL)	0.06	0.05	0.07	0	0.30
Cholesterol (mg/dL)	268	278	53	174	368
Bilirubin (mg/dL)	0.3	0.3	0.1	0	0.6
TCO_2 (mmol/L)	21.0	22.0	3.0	17.0	27.0
Anion gap (mEq/L)	21.8	20.5	5.2	14.0	32.0
Cortisol (µg/dL)	9.4	7.8	6.1	2.0	23.2

& Geraci, 1986). While dehydration may cause increased hematocrit, other evidence of dehydration was not present. No individual showed evidence of anemia, which has been linked to poor post-release prognosis in other stranded delphinids (Sharp et al., 2014). Leukocyte counts were generally normal, with mild leukocytosis, neutrophilia, and/or lymphocytosis in two individuals (whales 205 and 227), possibly associated with physiologic stress ("stress leukogram"), inflammation, or immune stimulation.

Serum biochemistry data showed only mild to moderate abnormalities, with most individuals showing normal hydration, renal function, hepatic function, and physiologic homeostasis. Mildly to moderately increased tissue enzyme activities (e.g., ALP, ALT, AST, CK, LDH, and GGT) were likely related to general cellular injury associated with stranding, possibly including mild hepatocellular and myocyte injury. Serum glucose concentrations were mildly to moderately elevated, which is consistent with a physiologic stress response ("stress hyperglycemia"), with four individuals showing glucose concentrations > 160 mg/dL. Similar biochemical and hematologic changes were noted in mass stranded short-finned pilot whales (Walsh et al., 1991; Hohn et al., 2006; Tyson-Moore et al., 2020). Serum protein electrophoresis results in this study were generally similar to those previously reported for this species (Medway & Moldovan, 1966), with the exception of hyperproteinemia and hyperglobulinemia in one adult female (whale 205).

Serum cortisol concentrations were generally elevated in comparison to values for healthy cetaceans (often < 5 µg/dL; e.g., Thomson & Geraci, 1986; Funasaka et al., 2011). These observations are

Table 3. Protein electrophoresis results for 19 mass stranded pilot whales; A/G = albumin/globulin.

	Mean	Median	SD	Minimum	Maximum
Total protein (g/dL)	7.2	7.2	0.8	5.8	9.3
Albumin (g/dL)	3.7	3.6	0.3	3.3	4.7
Globulin (g/dL)	3.5	3.6	0.7	2.2	5.3
A/G ratio	1.1	1.0	0.2	0.8	1.6
α1 globulin (g/dL)	0.6	0.5	0.2	0.4	1.0
α2 globulin (g/dL)	0.7	0.7	0.2	0.2	0.9
β1 globulin (g/dL)	0.4	0.3	0.2	0.2	0.8
β2 globulin (g/dL)	0.3	0.3	0	0.2	0.3
ϒ1 globulin (g/dL)	1.8	1.8	0.6	0.6	3.3

Table 4. Coagulation profile data for five mass stranded pilot whales; PT = prothrombin time and PTT = partial thromboplastin time.

Whale #	178	206	214	216	220
Sex	Female	Male	Female	Female	Female
Total length (cm)	403	381	417	431	432
PT (s)	9.8	9.8	9.8	10.6	12.8
PTT (s)	> 90	34.3	> 90	> 90	> 90
Fibrinogen (mg/dL)	410	100	505	510	283

consistent with those previously reported for mass stranded short-finned pilot whales where values as high as 16 µg/dL were noted (St. Aubin & Dierauf, 2001). While the origin of the St. Aubin & Dierauf (2001) data is unclear (the cited source Geraci & St. Aubin [1977] does not include cortisol data), presumably these data came from the cited stranding event but were unpublished. Elevated serum cortisol, leukocytosis, neutrophilia, and hyperglycemia are consistent with activation of the hypothalamic-pituitary-adrenal physiologic stress response as might be expected in association with stranding. In this study, there was a ten-fold difference between the highest and lowest cortisol concentrations, potentially indicating a broad range in the physiologic stress response among individual animals. Alternatively, this variation could also correspond to varying times of day, reproductive status, or time of blood draw in relation to time of stranding or numbers of sequential strandings for an individual (i.e., whales that stranded multiple times or for a longer duration of time). Unfortunately, lack of detail regarding the timing of blood collection prohibits further evaluation.

Results for the smallest individual from which blood was collected (juvenile female whale 223 at 219 cm total length) were interesting, showing ALP activity that was at least two-fold greater than any other individual. Based on the age-length curve for this species (Kasuya et al., 1988), this individual is estimated to have been 2 to 3 y old. In many mammal species, ALP activity is often markedly elevated in juvenile animals due to rapid bone growth (Harper et al., 2003). This individual also had the lowest globulin concentration of any individual, possibly associated with its relatively immature immune system.

Results from female whale 205 showed several concurrent, parsimonious abnormalities. This individual had a relatively high leucocyte count, driven by a relatively high number of the neutrophil cell line, which often indicates infection, inflammation, or a stress response. This individual also had elevated concentrations of total protein, driven by elevation of the gamma globulin protein fraction, which often indicates an ongoing immune response. Elevated cortisol in this case provides further support for a physiologic stress response. Finally, elevations of bilirubin and LDH may suggest liver injury and reduced liver function. While comparative data for known healthy individuals are limited, the cumulative data for this individual suggest that it was not in perfect health. Unfortunately, this individual was not evaluated by postmortem examination, preventing correlation of these blood abnormalities with its physical status.

Coagulation profiles were performed for only five animals in this study. These data are provided despite the limited sample size as they add to the very limited data for this species. PT values were consistent with those reported for bottlenose dolphins (*Tursiops truncatus*) and are presumed normal, indicating a functional coagulation cascade (extrinsic pathway and common components) (Tibbs et al., 2005). PTT values in four of five animals exceeded 90 s, consistent with previous observations in other cetacean species for which PTT is prolonged, representing impaired function of the intrinsic pathway of coagulation due to absence of Factor XII (Tibbs et al., 2005). The reason for the shorter PTT (34 s) in one (male) individual is unclear but may have been artifactual (falsely decreased), a sex difference, or may have indicated a truly hypercoagulable state. This individual also had substantially lower fibrinogen concentrations than the other individuals. Fibrinogen values were similar to values reported previously for pilot whales and bottlenose dolphins, with two of five animals (both females) having slightly higher concentrations (> 500 mg/dL), potentially indicating mild inflammation (Goldstein et al., 2006; Gulland et al., 2018). Consistent with other clinicopathologic data in this study, these limited coagulation data indicate that the stranded animals were in generally good health.

There are many limitations to the present study, including incomplete physical examination data, minimal recorded detail of blood sampling methodology, limited sample size, a female skewed population, and limited postmortem correlation. Many of these problems occurred due to the challenging logistical circumstances of the mass stranding event and have also been noted in previous reports (Walsh et al., 1991; Hohn et al., 2006; Sampson et al., 2012). Ideally, when possible, more rigorous recordkeeping and methodology details are recommended. The animals and data described in this study cannot be presumed to represent healthy free-ranging specimens for purposes of "baseline" or "normal" blood values. However, interpretation of their blood data did not reveal obvious, substantial abnormalities, providing further evidence that some cetaceans may be in stable physiologic condition and free of overt disease prior to stranding. These data add to the limited hematologic and biochemical data for long-finned pilot whales, and the limited data for mass stranded cetaceans in general. Results of this study may be useful for future comparisons to other stranded cetaceans.

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