From Global Hotspot to Global Impact: Recent Advances in Cetacean Stranding Medicine and Conservation

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All images were taken under IFAW's Stranding Agreement with NOAA Fisheries or NOAA Fisheries permits, as indicated

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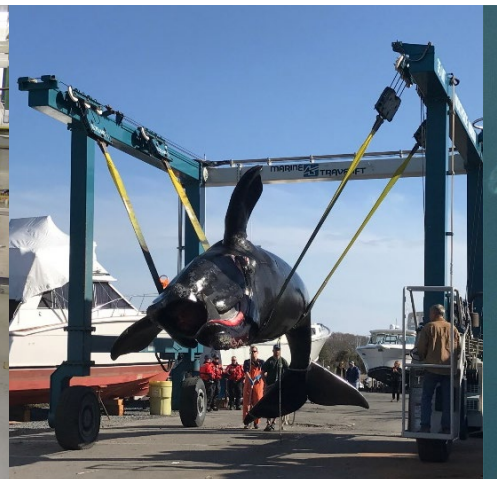
Marine Mammal Rescue & Research

Overview

- Marine mammal stranding network
- Cetacean strandings
- Stranding medicine & science
- Cetacean ICU
- Case Studies




Marine Mammal Stranding Network

Marine Mammal Stranding Network

NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION | U.S. DEPARTMENT OF COMMERCE

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Report a Stranded or Injured Marine Animal

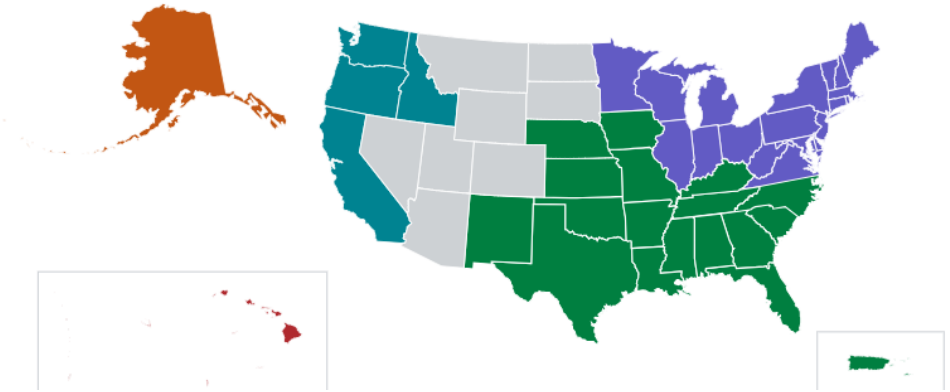
Reporting a sick, injured, entangled, stranded, or dead animal is the best way to make sure professional responders and scientists know about it and can take appropriate action. Numerous organizations around the country are trained and ready to respond. If you see a sick, injured, stranded, or dead marine mammal or sea turtle, immediately contact your local stranding network (phone numbers provided below).

You can also use our Dolphin and Whale 911 app to report a stranded marine mammal. The app is available for Apple devices.

The public should report all sightings of stranded animals to the appropriate contact number for your location (select your region below). If you see a stranded marine mammal or sea turtle, keep people and pets back a safe distance of at least 50 yards (150 feet).

Select Your Region

- Alaska
- New England/Mid-Atlantic
- Pacific Islands
- Southeast
- West Coast



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Marine Mammal Rescue & Research

- MMPA
- Federally permitted
- 1200 km of coastline
- Annual average of 262 responses per year to stranded cetaceans and pinnipeds
- Most frequent live cetacean strandings and mass strandings in the world

seal response


large whale medical intervention

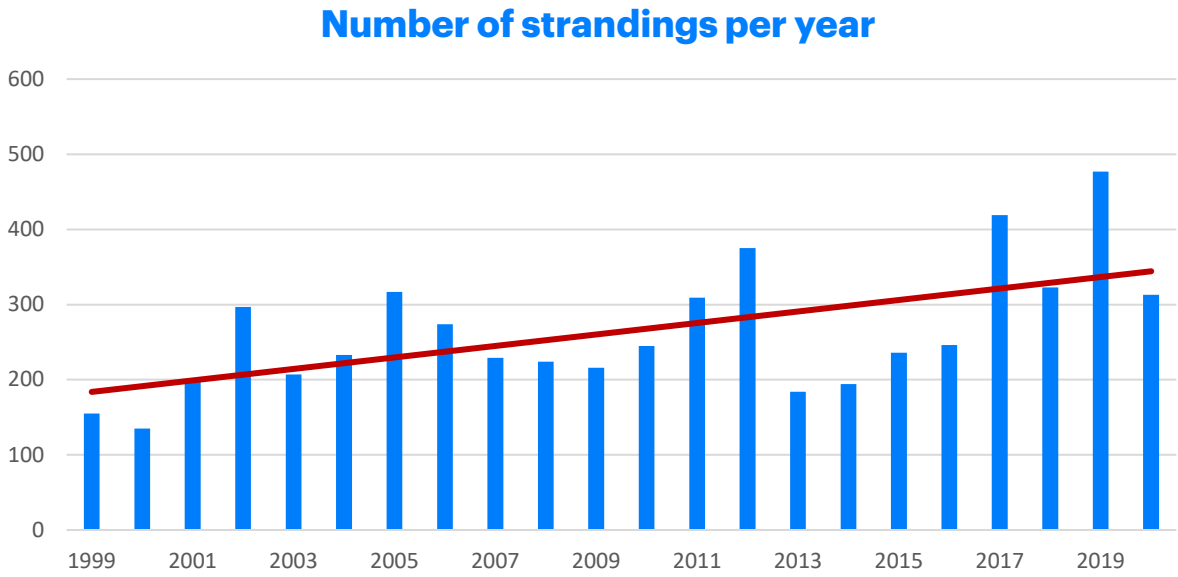
GDNR
NOAA permit #2056-01

dolphin and porpoise response


necropsy research

Stranding Response

- Innovative response techniques
- Cutting-edge veterinary care
- Post-release monitoring
- Cause of death investigations



Dead right whale, Martha's Vineyard, MA 29 Jan 2024

#5120 / IFAW24-017Eg
3 year old female
Deeply embedded line entanglement
Thin body condition

Deceased female North Atlantic right whale. Credit: Woods Hole Oceanographic Institute/Michael Moore. Taken under NOAA Permit # 24359.

Necropsy (animal autopsy) of North Atlantic right whale #5120. Credit: NOAA Fisheries. NOAA Fisheries Permit #24539

Common dolphin stranding, Wellfleet, MA
4 Feb 2024

New York Marine Rescue Center

STRANDING HOTLINE (631) 369-9829

- Located in Riverhead, NY
- Provide in-field response to sea turtles, pinnipeds and small cetaceans
- NYS sea turtle and pinniped rehabilitation facility
- Research focus: Post-release monitoring, Human interaction strandings, stress response and sex determination in juvenile cold stunned sea turtles
- Head veterinarian Dr. Rob Pisciotta robp2011@aol.com
- Director Maxine Montello mmontello@nymarinerescue.org

Atlantic Marine Conservation Society

Promoting Marine Conservation Through Action

- New York's Newest Sea Turtle Emergency Triage Center
- Marine mammal and sea turtle mortality investigations
- Wild population studies
- Seal health assessments
- Sea turtle tracking

Dara Fee, LVT

Julie Fithian DVM, CertAqV
Robert Pisciotta DVM
Richard Hanusch, DVM

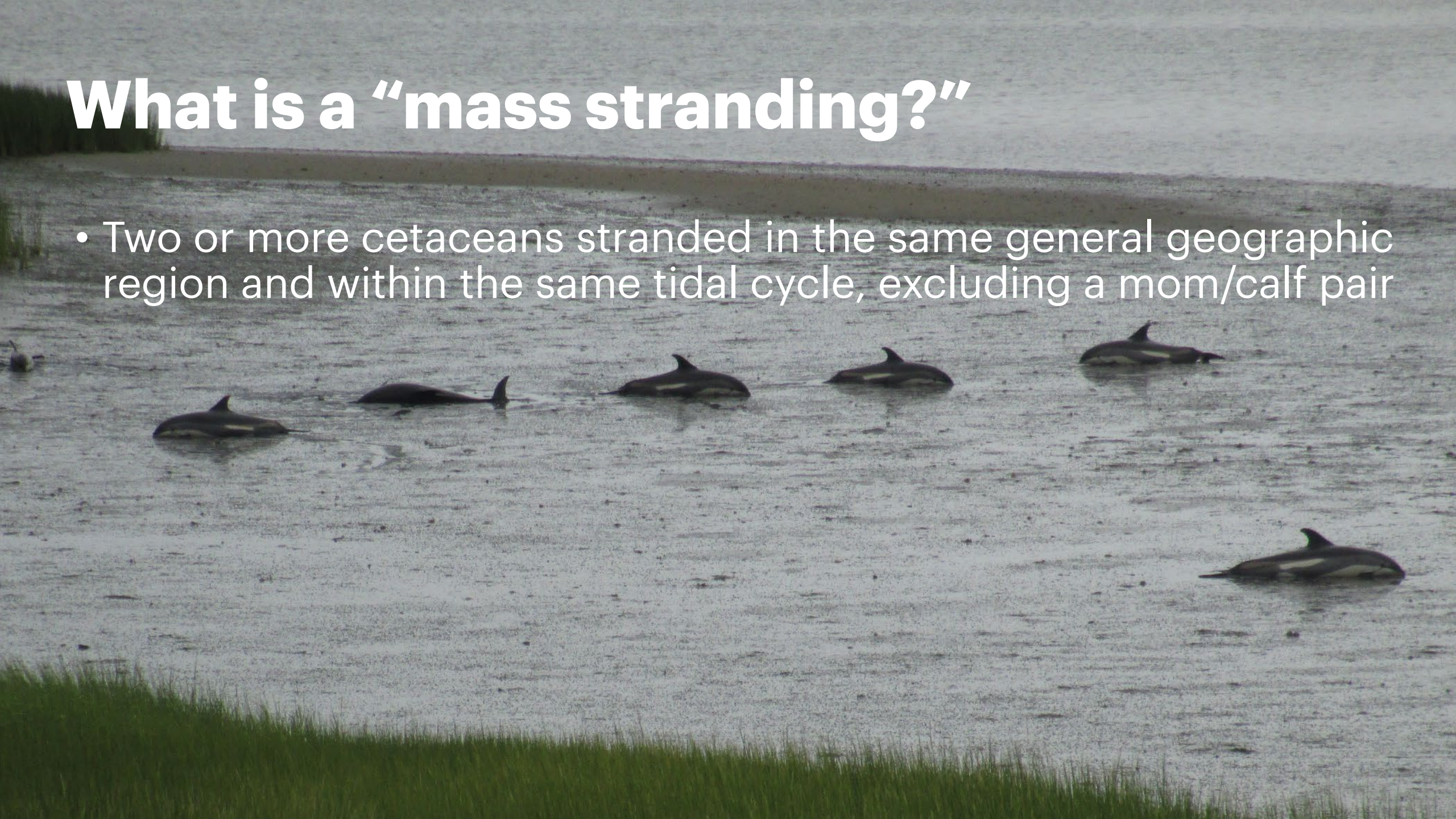
NYS Marine Mammal and Sea Turtle Hotline – 631-369-9829
AMSEAS.org
631-317-0030

Cetacean Strandings


Cetacean Strandings

What is a “mass stranding?”

- Two or more cetaceans stranded in the same general geographic region and within the same tidal cycle, excluding a mom/calf pair

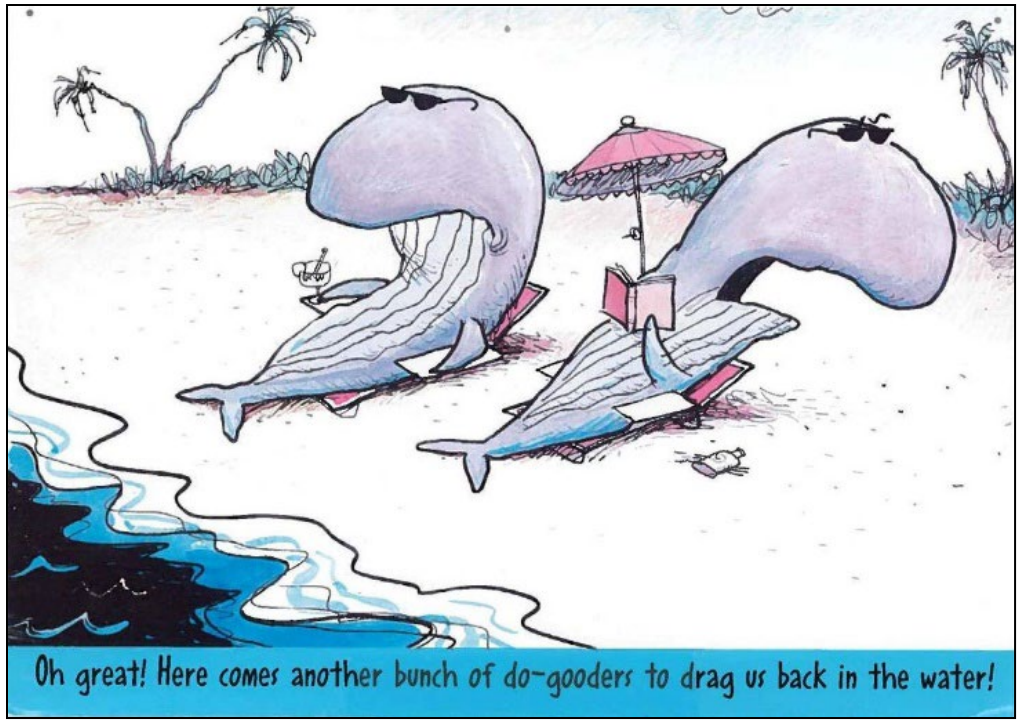


Why do they strand?

- Illness
- Injury (natural or anthropogenic)
- Abandonment (calves)
- Vessel strikes
- Entanglement
- Acoustic disturbances
- Social structure (mass strandings)
- Navigational difficulties
  - Cape's hook shape acts as a trap
  - Exacerbated by storm fronts
- Large tidal fluxes
  - Exacerbated by storm surges

It is not known why they sometimes run aground on the seashore; for it is asserted that this happens rather frequently when the fancy takes them and without any apparent reason.

Aristotle



Geographic Influences

- 75% of Cape Cod mass strandings occur in Wellfleet
  - Hook shape
  - Large tidal fluctuations
- Can be numerous animals in one location or spread out

Mortality Trends on Cape Cod

- 16 species
- 314 cases COD determined
  - Disease (37%)
  - Human interaction (10%)
    - 45% of gray seal deaths
  - Mass stranded NSF (31%)
    - 92% of all MS cetaceans
  - Predation (8%)
  - Abandonment (5%)
  - Single stranded NSF (4%)
  - Rock ingestion (3%)

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doi: 10.3354/dao02146

DISEASES OF AQUATIC ORGANISMS
Dis Aquat Org

Published January 25

OPEN ACCESS

Mortality trends of stranded marine mammals on Cape Cod and southeastern Massachusetts, USA, 2000 to 2006

Andrea L. Bogomolni[1,2,*], Katie R. Pugliares[3,4,*], Sarah M. Sharp[3], Kristen Patchett[4], Charles T. Harry[3], Jane M. LaRocque[3], Kathleen M. Touhey[3], Michael Moore[1,**]

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[2]Department of Pathobiology and Veterinary Science, University of Connecticut, Storrs, Connecticut 06269, USA
[3]International Fund for Animal Welfare***, 290 Summer Street, Yarmouthport, Massachusetts 02675, USA
[4]Department of Marine Sciences, University of New England, Biddeford, Maine 04005, USA

ABSTRACT: To understand the cause of death of 405 marine mammals stranded on Cape Cod and southeastern Massachusetts between 2000 and 2006, a system for coding final diagnosis was developed and categorized as (1) disease, (2) human interaction, (3) mass-stranded with no significant findings, (4) single-stranded with no significant findings, (5) rock and/or sand ingestion, (6) predatory attack, (7) failure to thrive or dependent calf or pup, or (8) other. The cause of death for 91 animals could not be determined. For the 314 animals that could be assigned a cause of death, gross and histological pathology results and ancillary testing indicated that disease was the leading cause of mor-

Dolphin Response

Extraction

Rescue Equipment

dolphin stretcher

dolphin tent

dolphin cart

mud mat

Assessment and Transport

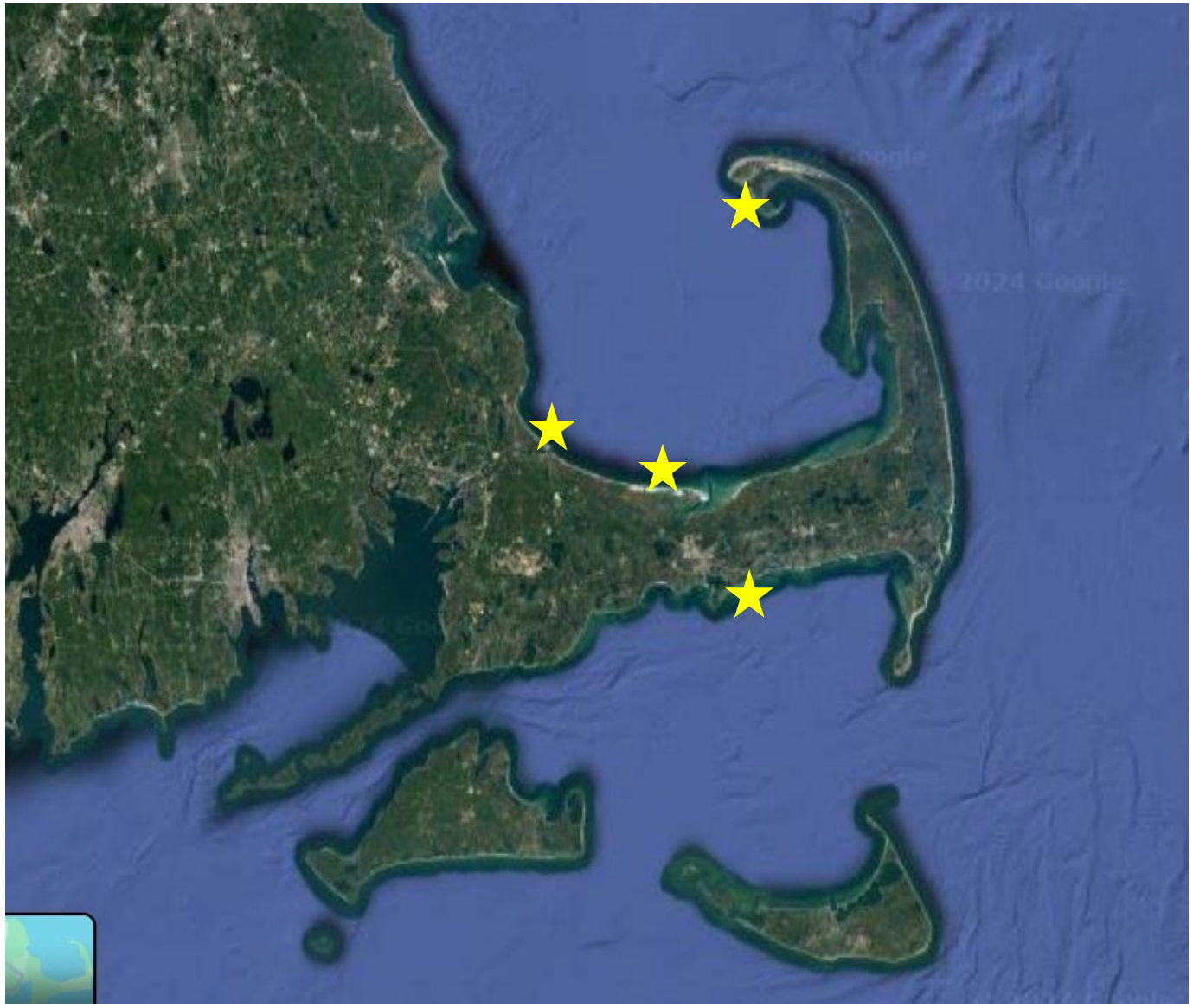
- Mobile dolphin rescue clinic “Moby”
- Transport to release site
- Health assessment
- Supportive care & treatments
- Veterinary Lab

Moby


Release

Relocation and Release

- Release candidates are transported to select release sites.
- Release locations are chosen based on:
  - Proximity of parking lot to water
  - Access to deep water from shore
  - Weather & tide conditions
  - No offshore sandbars
  - Minimal swell & waves



Stranding Medicine & Science

Pathophysiology of Stranding

- Compression of internal organs
- Poor end-organ perfusion due to recumbency and vascular shunting
- Exacerbation of pre-existing disease
- Poor respiratory exchange
- Reperfusion injury
- Shock
- Capture myopathy (?)

Shock

- DEFINITION: demand for O_2 exceeds O_2 delivery
- Inability to provide substrates and remove toxic metabolites
- Transition from illness to death
- Classifications
  - Cardiogenic, distributive (vasogenic), neurogenic
  - Also hypovolemic, obstructive, septic

Shock in Stranded Dolphins

- Pale mucous membranes
- Decreased or loss of responsiveness
  - palpebral reflex
  - visual tracking
- Arching/hyperlordosis
- +/- dive reflex
  - apnea
  - bradycardia
- Tachycardia
- Tachypnea, chuffing
- Frothy blowhole discharge (pulmonary edema)

Capture Myopathy

- Non-infectious metabolic muscle disease (suite of syndromes) occurring after severe stress, capture, restraint, and transport
- Pathophysiology
  - Severe fight or flight → mass discharge of epinephrine, etc → sympathetic exhaustion
  - Altered blood flow → dilated blood vessels, ↓ BP, blood pooling, vascular shock
  - Stress → ↑ACTH → cortisol release → alters glucose metabolism, modulates immune system
  - Intense muscle exertion →
    - lactic acid accumulation in muscles (lactic acidosis)
    - destruction of muscle fibers → released K, Ca, myoglobin → renal failure (days to weeks) +/- ventricular fibrillation
    - heart muscle destruction → cardiogenic shock

CM clinical signs

- Weakness
- Muscle cramping
- Ataxia/incoordination
- Shock
- Paresis or paralysis
- Irregular heartbeat (ventricular fibrillation)
- Brown urine (myoglobinuria)
- Death

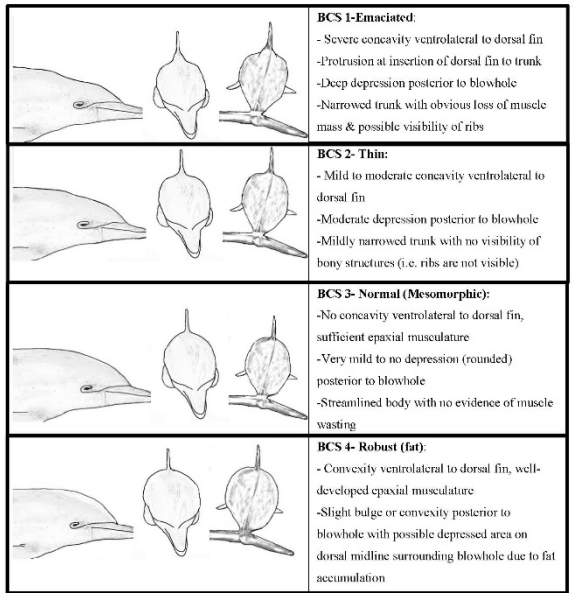
- Clinical pathology
  - Hypocalcemia, hyperphosphatemia, hyperkalemia
  - Elevated muscle enzymes (LDH, AST, CK)*
  - +/- ↑BUN
  - Myoglobinuria

Capture Myopathy Prevalence

- 2017 – 2020 live cetaceans (n= 301 events)
- Acute death or CM treatments (n=23)
- Species:
  - Short-beaked common dolphins (*Delphinus delphis*) n = 177 (18, 10%)
  - Atlantic white-sided dolphins (*Lagenorhynchus acutus*) n = 52 (4, 8%)
  - Harbor porpoise (*Phocoena phocoena*) n=22 (1, 5%)

Intake Procedures

- Weight
- Physical examination
  - Shock assessment
  - BCS
  - Cardiovascular
  - Respiratory
  - Ocular
  - Musculoskeletal



Joblon et al.
JMATE 7: 5-13 (2014)

Health Assessment

- Mobile blood lab
  - CBC
  - Chem
- Other diagnostics
  - ECG
  - Ultrasound
  - Radiographs
  - Capnography
  - Hearing tests

Dolphin ECG

- Marked sinus arrhythmia
- Class B ventricular activation
  - cetaceans
  - pinnipeds
  - hoofed mammals
- Primary QRS vectors from sternum to spine
- Not useful for cardiac chamber size
- Less useful for certain conduction abnormalities (BBB)

Harms et al. 2013 JZWM

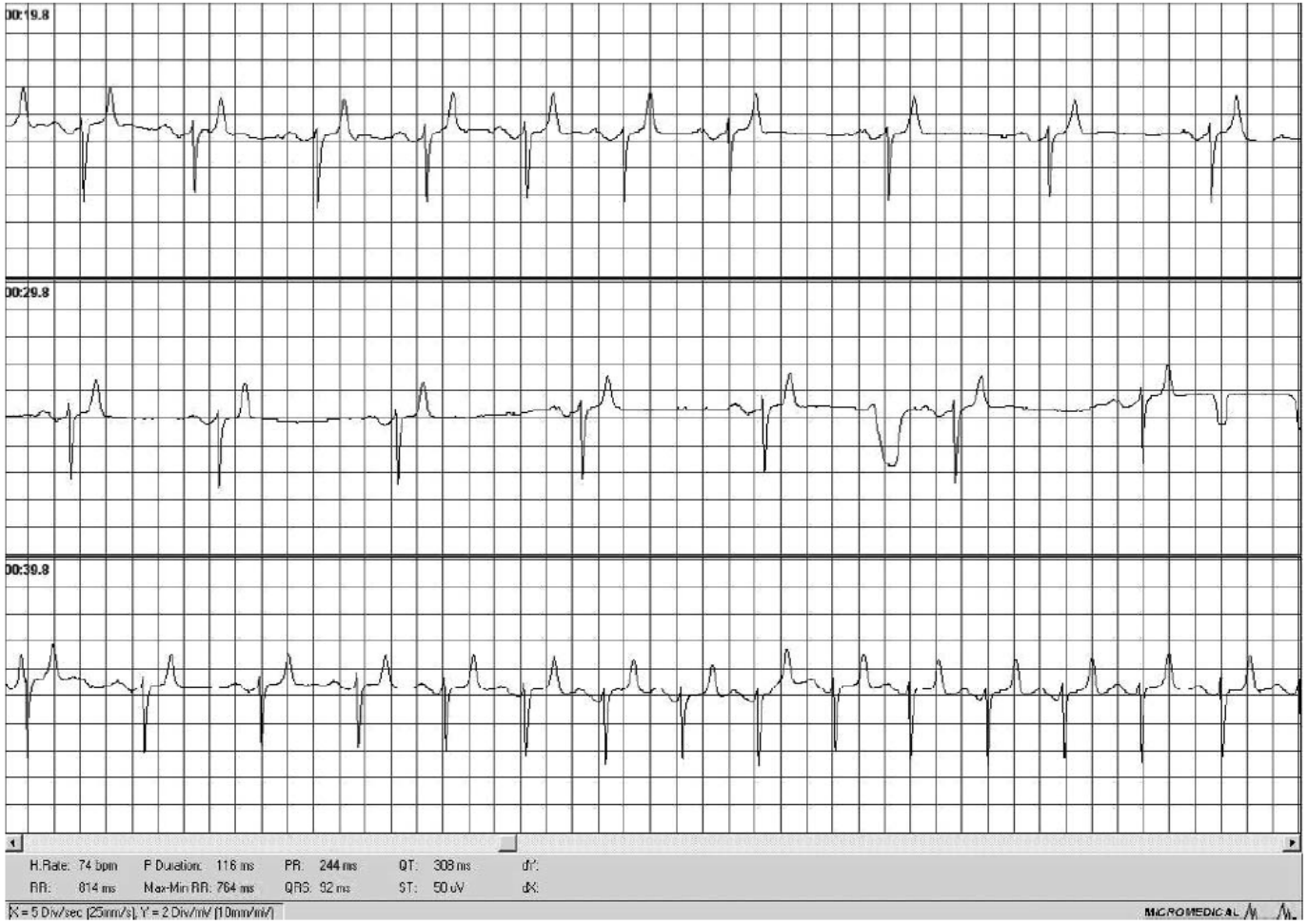


Figure 4. Representative bottlenose dolphin lead II electrocardiograph, demonstrating normal pronounced sinus arrhythmia following breath in third row. There are two motion artifacts in the right side of the second row. Heart rate 42 beats/min prior to breath, 96 beats/min after breath. X-axis, 5 divisions/sec, 10 sec/row; Y-axis, 2 divisions/mV.

Dolphin Ultrasound exam

- Pulmonary ultrasound
- Abdominal ultrasound
- Gas bubbles in stranded dolphins (Dennison et al. 2012)
- Pregnancy evaluation
  - Fetal age
  - Fetal viability
    - HR
    - Gas bubbles in umbilical vessels
    - Echogenicity of amniotic fluid
  - Fetal activity

PROCEEDINGS OF THE ROYAL SOCIETY B

Proc. R. Soc. B (2012) **279**, 1396–1404
doi:10.1098/rspb.2011.1754
Published online 12 October 2011

Bubbles in live-stranded dolphins

S. Dennison[1], M. J. Moore[2,*], A. Fahlman[3], K. Moore[4], S. Sharp[4], C. T. Harry[4], J. Hoppe[4], M. Niemeyer[4], B. Lentell[2] and R. S. Wells[5]

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[4]*Marine Mammal Rescue and Research, International Fund for Animal Welfare, 290 Summer Street, Yarmouth Port, MA 02675, USA*
[5]*Chicago Zoological Society, c/o Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota, FL 34236, USA*

Bubbles in supersaturated tissues and blood occur in beaked whales stranded near sonar exercises, and post-mortem in dolphins bycaught at depth and then hauled to the surface. To evaluate live dolphins for bubbles, liver, kidneys, eyes and blubber–muscle interface of live-stranded and capture-release dolphins were scanned with B-mode ultrasound. Gas was identified in kidneys of 21 of 22 live-stranded dolphins and in the hepatic portal vasculature of 2 of 22. Nine then died or were euthanized and bubble presence corroborated by computer tomography and necropsy, 13 were released of which all but two did not re-strand. Bubbles were not detected in 20 live wild dolphins examined during health

ECVDI Veterinary Radiology & Ultrasound

ORIGINAL INVESTIGATION | Open Access

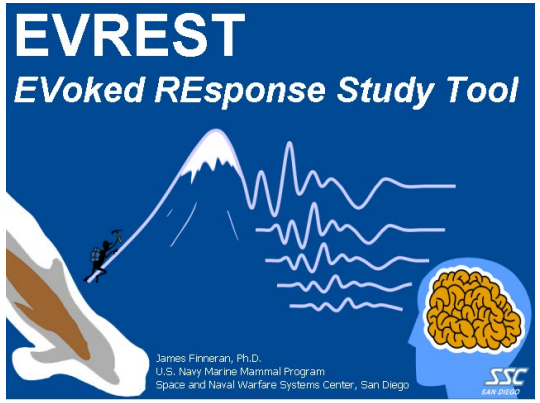
Ultrasonographic findings associated with normal pregnancy and fetal well-being in the bottlenose dolphin (*Tursiops truncatus*)

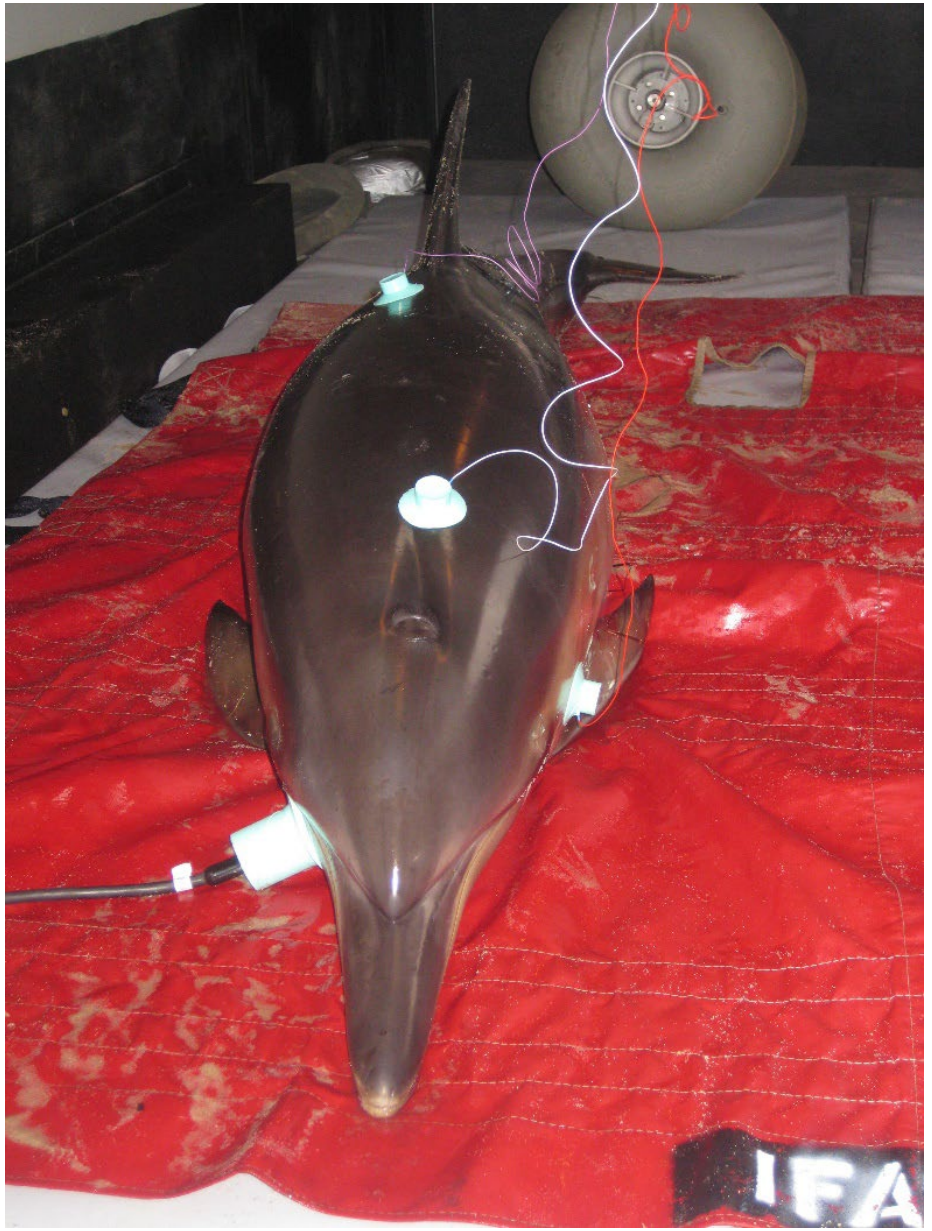
Marina Ivančić, Forrest M. Gomez, Whitney B. Musser, Ashley Barratclough, Jennifer M. Meegan, Sophie M. Waitt, Abraham Cárdenas Llerenas ... See all authors

First published: 03 January 2020 | https://doi.org/10.1111/vru.12835 | Citations: 6

Auditory Evoked Potential

- Test hearing range and sensitivity of stranded odontocetes
- EVREST software
- Collected data on common dolphins, Atlantic white-sided dolphins, Risso's dolphins





Stranded Dolphin Care

- Supportive care
  - Minimize stress
  - Quiet environment
  - Soft foam padding
  - Minimize handling
  - Monitor body temperature
  - Protect from sun and wind

- Empirical Treatments
  - Isotonic crystalloid fluid (lactated ringers solution) boluses
  - Vit E / Se (0.06 mg/kg Se)
  - Brief physical therapy in water prior to release

Prognosis Guidelines

RELEASE CRITERIA

The 'Release Criteria Score' is the sum of the Behavior, PE, Blood, and Social scores below

(Behavior + PE + Blood + Social = Release Criteria)

Release Criteria Scores fall under the following three categories:

0 – 2 = Good Release Candidate

3 – 5 = Borderline (Fair-Poor) Release Candidate ***these candidates should be satellite tagged, if possible***

6 – 12 = Do Not Release (Grave)

1. Behavior *(An animal should be placed under the category of their highest/worst applicable bullet point)*

0 = Good	1 = Fair	2 = Poor	3 = Grave
• BAR, mentally alert, aware, visual tracking strong • Calm but responsive • Condition remains stable during transport	• BAR to QAR, visual tracking normal • Occasional hyperesthetic tendencies (twitchy, hypersensitive to touch/manipulation) • Occasional thrashing in response to stimulus • Condition remains stable or improves during transport	• Dull, visual tracking decreased • Hyperesthetic (twitchy, hypersensitive to touch/manipulation) • Thrashing, rolling, or some arching, unprovoked • Condition not improving or declining during transport	• Stuporous, visual tracking absent, unaware of surroundings • Severe and frequent thrashing, rolling, arching • Condition declining during response/transport

*** Note if behavior is stable, improving, or declining during response/transport as this is an important factor in behavioral prognosis*

PROGNOSIS SCORING: Good candidates (0) = the majority of findings are WNL; **Fair (1) =** < 5 mild abnormalities and the remainder WNL; **Poor (2)** 5-10 mild or 1-5 moderate abnormalities, **Grave (3):** ≥ 1 severe, > 5 moderate, or > 10 minor abnormalities

Prognosis Guidelines

Marine Mammal Rescue and Research
Cetacean Health Assessment Prognosis Guidelines

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2. Physical Examination (PE)

		PE ABNORMALITIES		
	Normal PE FINDINGS	Mild	Moderate	Severe
Body Condition	mesomorphic or robust (BCS 4-5) post-nuchal fat pad firm to convex	slightly thin (BCS 3); post-nuchal fat pad spongy to firm	thin (BCS 2); post-nuchal fat pad spongy	emaciated (BCS 1); post-nuchal fat pad concave (peanut head)
Temperature*	96 – 98° F, stable	95°F or 99°F or has increased/decreased by ~5°F	94°F or 100-101°F or has increased/decreased between 5°F & 10°F	<93° F, >101° F or has increased/decreased by ≥10°F
Neurologic	Alert; if seen swimming, no listing or tight unidirectional circling; no nystagmus or strabismus	Slightly decreased alertness	Dull; possible slow horizontal pendulous (HP) hystagmus; mild to moderate listing if seen swimming	Stuporous; tight circling or marked listing if seen swimming; nystagmus other than HP; strabismus
Ophthalmic (Eyes)	palpebral reflex normal; globe intact; no squinting; visually tracking; no ocular discharge besides clear mucous, no opacities or other lesions; no perioribital wounds	palpebral reflex ↓ to normal or slightly ↑; mild squinting in one eye; mildly abnormal ocular discharge, minor opacity or other lesion in one eye; minor perioribital wounds	palpebral reflex moderately ↓ to absent or moderately ↑; moderate squinting in one eye or mild in both; visual tracking decreased; moderately abnormal ocular discharge, minor opacities or other lesions present in both eyes/ moderate in one eye; moderate periorbital wounds	palpebral reflex absent; globe not intact; moderate to marked squinting in both eyes; not visually tracking; copious bloody or purulent ocular discharge; significant opacities or other lesions present in both eyes; marked periorbital wounds (nerves, vessels exposed, muscles severed)
Oral (mouth, tongue, teeth, mm color)	MM color pink/light pink; CRT 1-2 seconds; teeth intact, sharp/ slightly worn; no halitosis; no lesions	MM pale pink; CRT may be <1 sec as result of compensated shock; <25% teeth partially worn, single small oral ulcer or other lesion	MM white/gray and unable to correct; CRT >2 sec; 25-50% teeth shorn, broken, or worn to gingiva; mild - mod halitosis; multifocal oral ulcers or lesions affecting <25% mucosa	MM injected (bright red) or cyanotic and unable to correct with CRT >2 sec or < 1 sec; >50% teeth missing, broken shorn or worn to gingiva; severe oral lesion or multiple lesions affecting >25% mucosa
Cardiovascular**	HR 50-70/100-120 bpm with marked split (normal sinus arrhythmia/NSA), no murmurs or other arrhythmias	HR 70-90/120-140 bpm with moderate split (NSA); GR I-II or soft, focal murmur ("swish" instead of "lub dub")	HR 100-140 bpm w/ minimal to no split and not correctable; GR III heart murmur; other abnormal arrhythmia	HR <50 bpm or >150 bpm with no split and not correctable; Gr IV-VI heart murmur; atrial fibrillation or other marked arrhythmia
Respiratory**	RR 2-5/min; no malodorous blow; blowhole seal intact; crisp deep breaths; all lung fields clear	RR 6-10/min; mild blowhole injury, but able to seal; mild white blowhole discharge; occasional respirations may be slow or abnormal; harsh lung sounds without well-defined crackles or wheezes in any lung field; mildly increased respiratory effort (RE);	RR 10-15/min; mild-mod malodorous blow; moderate blowhole injury, but sea intactl; moderate blowhole discharge that may be frothy or discolored; frequent abnormal respirations; crackles, wheezes, or decreased lung sounds in 1-2 lung field; moderately increased RE	RR >15/min sustained; severe blowhole injury, seal compromised; discolored and frothy blowhole discharge or large volume; normal respirations are rare; crackles, wheezes, or decreased lung sounds present in >2 lung fields; absent lung sounds in any field; markedly increased RE
Gastrointestinal	no flatulence, normal gut sounds; no vomiting; feces green to brown, soft	mildly increased or decreased gut sounds; very mildly foamy, mucoid, liquid, or discolored feces	occasional flatulence; moderately increased or decre… gut sounds; single vomit episode; moderately foamy, mucoid, liquid, or discolored feces;	frequent flatulence; absent or markedly increased gut… feces
Urogenital	urine straw to light yellow colored; no lesions on genital slit/penis; if lactating, milk is cream white to slightly yellow tinged	urine yellow; might have small, superficial UG lesions; mild white UG discharge	urine moderately discolored (dark yellow, orange, green, red) or cloudy; multiple or moderate severity of UG lesions or discharge	urine tea colored/brown or very cloudy; marked UG lesions or discharge
Musculoskeletal	no muscle atrophy; no signs of peduncle deformity (scoliosis, kyphosis, lordosis); full pectoral ROM (no ankylosis or crepitus); no fractures or wounds into muscle/bone	very mild muscle atrophy; slightly decreased pectoral ROM, no crepitus	mild to mod muscle atrophy; mild to moderate scoliosis, kyphosis, lordosis; moderately decreased pectoral ROM, mild crepitus; wounds into superficial muscle	mod to marked muscle atrophy; marked scoliosis, kyphosis, or lordosis; minimal to no pectoral ROM, marked crepitus; fracture (s); deep penetrating wounds into muscle or bone
Integument	no sloughing; no wounds/lesions	minimal sloughing; no to minimal sunburn affecting <25% skin; any wounds are minor/superficial/small and do not appear infected	moderate sloughing; sunburn affecting 25-50% skin; larger wounds, wounds into blubber or fascia, or more minor wounds with possible infection, small abscess	marked sloughing; sunburn affecting >50% skin; large and/or deep wound or multiple moderate severity wounds; large abscess or other obvious signs of significant infection

Sharp, Sarah (ssharp@ifaw.net) is signed

Prognosis Guidelines

Marine Mammal Rescue and Research
Cetacean Health Assessment Prognosis Guidelines

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3. Blood

0 = Good

Summary

Bloodwork indicative of an animal in good health, not suffering from chronic disease or significant stranding-related conditions

Reference Ranges

In-house Vetscan	In-house HM5
Na = 143-149	WBC = 5 - 12
K = 3.3 – 5.0	LYM = 0.5 - 2
Cl = 120 – 121	MON = 0 - 2
TCO2 = 25-35	NEU = 4 – 12
CK = 130-250	EOS = 0 - 2
GLU = 80-150	BAS = 0 - 2
BUN = 30-50	RBC = 5 – 6.4
CRE = 0.3 – 1.2	HGB = 17.5 – 19
AST = 150-500	HCT = 46-55
TBIL = 0.3 – 1.0	MCV = 90 - 110
GGT = 20-50	MCH = 25-35
ALB = 3.0 – 3.6	MCHC = 25-35
TP = 6 – 7.5	RDWc(%) = 12.3 – 14.7
GLOB = 3 – 4.5	PLT = 150-300

**From "In-house Dolphin Reference Ranges 2021 SMS"*

1 = Fair

Summary *(one below bullet qualifies an animal as 'Fair')*

- Mildly ↑ AST, LDH, CK (muscle)
- Mildly ↑Na, Cl, K, BUN, Creat, RBC, HCT, HGB, TP (dehydration)
- Mildly ↑ ALT, GGT, Tbili (liver)
- Mildly ↑ or ↓WBC, Globs
- Mild anemia without dehydration

Range Guidelines for Key Parameters

In-house Vetscan	In-house HM5
Na = 150-155	WBC = 3-5 or 12-15
Cl = 122-125	LYM = 0.2-0.5 or 3-4
BUN 51-55	NEU = 3 or 12-15
Creat 1.2-1.5	RBC = 4
AST = 500-1000	HGB = 16.8-17.5 or 19-20
LDH = 500-1000	HCT = 40-45 or 56-60
CK = 250-397	
ALT = 60-200	
GGT 51-100	
TBILI 1.1-1.5	

2 = Poor

Summary *(one below bullet qualifies an animal as 'Poor')*

- Moderately ↑AST, LDH, AST (muscle)
- Mod.↑ BUN, creatinine, electrolytes, hemoconc. (dehydration vs renal)
- Mod. ↑ AST, ALT, GGT, TBili (liver)
- Moderate anemia
- Mild-mod leukopenia/neutropenia
- Moderate – marked hyperlactatemia

Range Guidelines for Key Parameters

IDEXX:	In-house (iSTAT):
CK > 397 U/L	Lactate > 4.19 mmol/L
ALT > 432 U/L	BUN > 55 mg/dL
AST > 1059 U/L	HGB <16.7 g/dL (HM2)
LDH >1197 IU/L	HCT > 41% (iSTAT)
GGT > 138 U/L	HCO3 <35 mmol/L

**Suggested indicators of poor prognosis from Table 4, Sharp et al. 2014*

3 = Grave

Summary

Animals with multiple abnormalities falling under the poor prognosis ranges should be considered to have a grave prognosis

Range Guidelines

Multiple parameters fall within the "Poor" Range Guidelines (from Sharp et al. 2014)

**note that iSTAT HCT and HGB values are consistently lower than HM2/5 values*

4. Social/Situational *(An animal should be placed under the category of their highest/worst applicable bullet point score)*

0 = Good

- A good or fair release candidate (from PE & Blood Scoring, whichever is worse) from a mass stranded animal that has other healthy animals to be released with

1 = Fair

- A good release candidate (from PE & Blood scoring) that will be released with one other poor candidate
- A poor release candidate from a mass stranding released with one or more good release candidates
- A good release candidate bayside single stranded animal

2 = Poor

- A good release candidate single stranded animal from a sound or ocean-side stranding
- Single stranded fair release candidate (PE/blood), bayside
- Mass stranded fair/poor release candidate that is being released with another fair/poor release candidate

3 = Grave

- *Dependent calves and neonates are scored '6'
- Poor single stranded release candidate from a sound or ocean-side stranding

Decision Making

Options

- No response
- Tag and refloat from site
- Relocate, tag and release
- Euthanize
- Short-term rehab (Cetacean ICU)
- **No long-term rehab available**

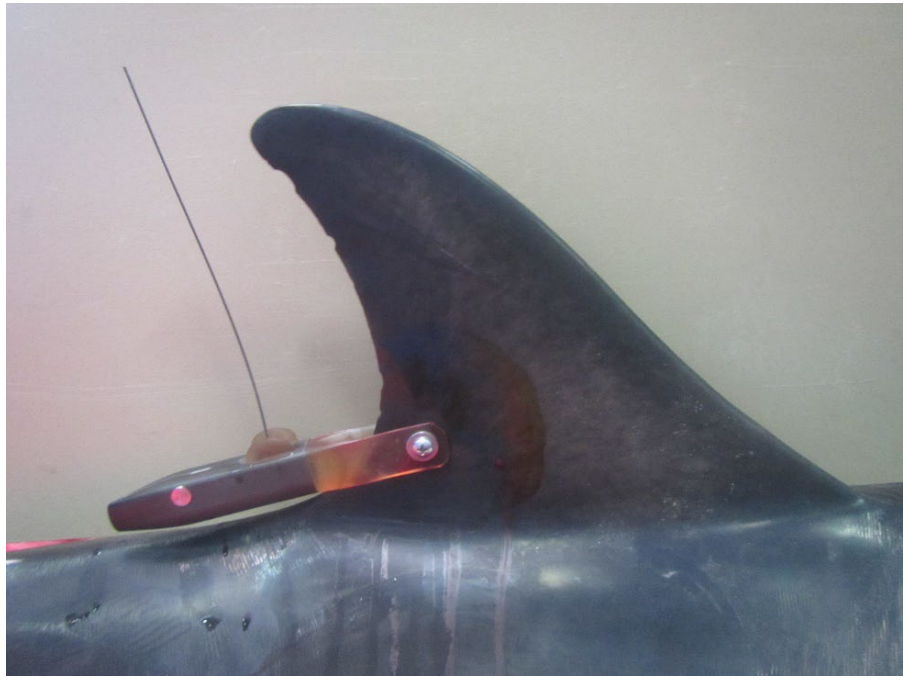
Post-release Monitoring

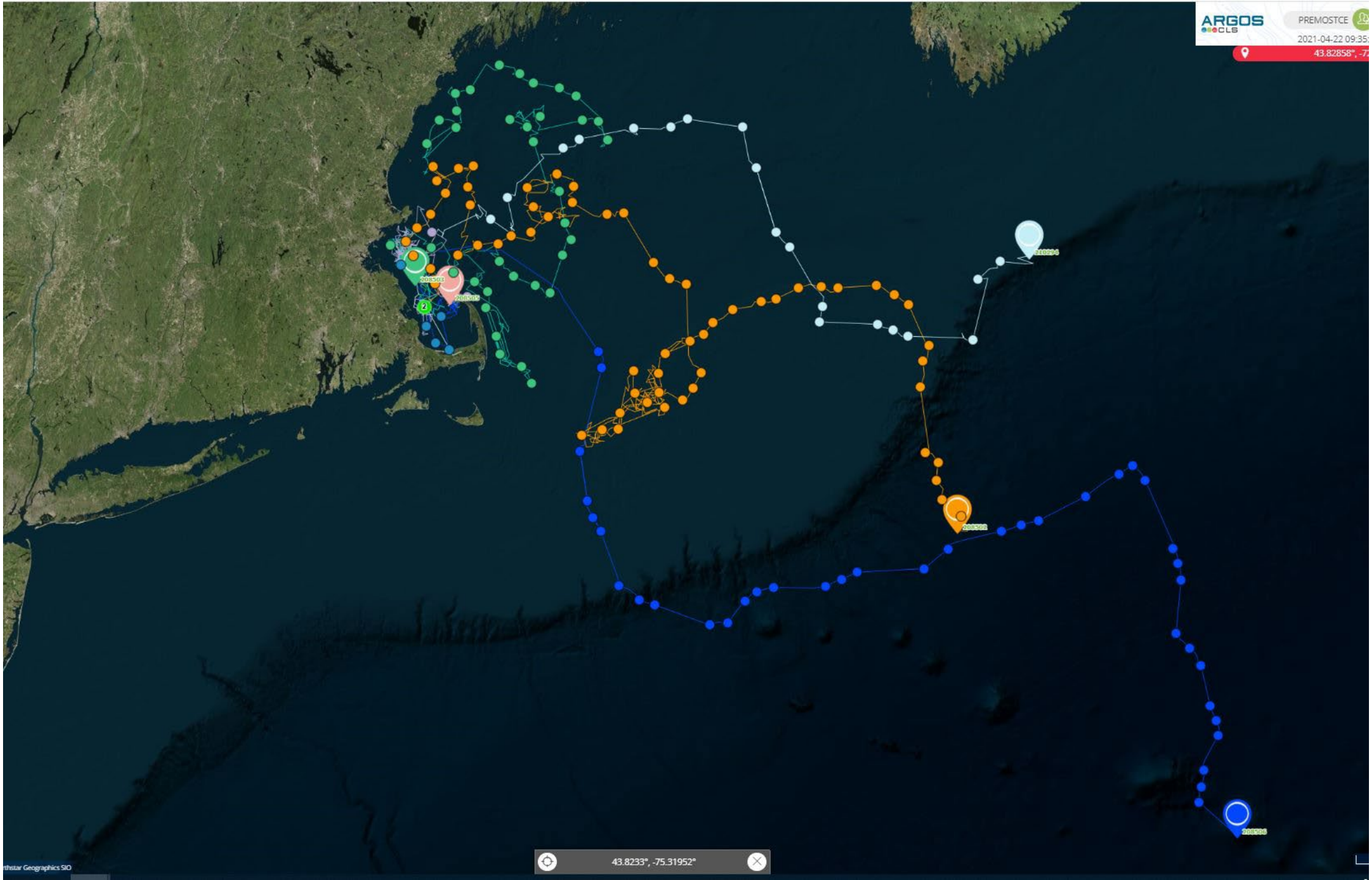
- Started in 2010
- Originally focused on single stranded cetaceans
  - 28% of single stranders had no significant findings on necropsy
- 140 cetaceans tagged

106 common dolphins
20 white-sided dolphins
4 Risso's dolphins
3 bottlenose dolphins
2 minke whales
2 harbour porpoise
3 1 humpback whale
1 pilot whale
1 striped dolphin

Satellite Tagging

- GOAL: track post-release success
- Minimally invasive tag
- Hydrodynamic design
- Corrodible attachment
- Position-only & TDR tags
- Battery life 45-90 days
- Local block with dental infuser

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43.82858°, -7
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Geographics SIO

Single Dolphin Release

Marine Mammal Science

MARINE MAMMAL SCIENCE, 32(1): 161–180 (January 2016)

DOI: 10.1111/mms.12255

A comparison of postrelease survival parameters between single and mass stranded delphinids from Cape Cod, Massachusetts, U.S.A.

SARAH M. SHARP, CHARLES T. HARRY, JANE M. HOPPE, KATHLEEN M. MOORE, MISTY E. NIEMEYER, IAN ROBINSON, KATHRYN S. ROSE, W. BRIAN SHARP,[1] International Fund for Animal Welfare, Marine Mammal Rescue and Research Program, 290 Summer Street, Yarmouth Port, Massachusetts 02675, U.S.A.; SCOTT LANDRY, Center for Coastal Studies, 5 Holway Avenue, Provincetown, Massachusetts 02657, U.S.A.; JESSICA RICHARDSON, Nicholas School of the Environment, Duke University, Durham, North Carolina 27708, U.S.A.; MICHAEL J. MOORE, International Fund for Animal Welfare, Marine Mammal Rescue and Research Program, 290 Summer Street, Yarmouth Port, Massachusetts 02675, U.S.A. and Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, U.S.A.

ABSTRACT

The viability of healthy single stranded dolphins as immediate release candidates has received little attention. Responders have been reluctant to release lone delphinids due to their social needs, even when they pass the same health evaluations as mass stranded animals. This study tracked postrelease success of 34 relocated and released satellite tagged delphinids from single and mass strandings. Three postrelease survival parameters (transmission duration, swim speed, and daily distance) were examined to evaluate whether they differed among single stranded/single released (SS/SR), mass stranded/single released (MS/SR), or mass stranded/mass released (MS/MR) dolphin groups. Comparisons were also made between healthy and borderline release candidates. Satellite tags transmitted for a mean of 21.2 d (SD = 19.2, range = 1–79), daily distance traveled was 42.0 km/d (11.25, 20.96–70.72), and swim speed was 4.3 km/h (1.1, 2.15–8.54). Postrelease parameters did not differ between health status groups, however, SS/SR dolphins transmitted for a shorter mean duration than MS/MR and MS/SR groups. Postrelease vessel-based surveys confirmed conspecific group location for two healthy, MS/SR dolphins. Overall, these results support the potential to release healthy stranded single delphinids; however, further refinement of health assessment protocols for these challenging cases is needed.

Key words: dolphin, stranding, single release, health, satellite telemetry, postrelease monitoring, Cape Cod, *Delphinus delphis*, *Lagenorhynchus acutus*, *Globicephala melas*.

Single Dolphin Results

- 34 dolphins
- 4 singly released *D. delphis* found within social groups
- Many transmitted > 3 weeks, but ↓ duration
- Borderline not statistically different
- 36% borderline failed after 1 day (17% healthy)

- can be released and survive
- can relocate and integrate into groups
- none of the animals caused subsequent mass strandings of unique animals

Prognostic Indicators

- Physical parameters
  - heart rate
  - respiratory rate
  - BMI: mass/length^2
  - length : girth ratio
  - length : weight ratio
- Blood parameters
  - CBC/Chem (IDEXX)
  - in-house analysis:
    - Abaxis Vetscan HM2: CBC
    - i-STAT
      - CG4+
      - Chem8+

Marine Mammal Science

MARINE MAMMAL SCIENCE, 30(3): 864–887 (July 2014)

DOI: 10.1111/mms.12093

Hematological, biochemical, and morphological parameters as prognostic indicators for stranded common dolphins (*Delphinus delphis*) from Cape Cod, Massachusetts, U.S.A.

SARAH M. SHARP,[1] Marine Mammal Rescue and Research Program, International Fund for Animal Welfare, 290 Summer Street, Yarmouth Port, Massachusetts 02675, U.S.A. and Tufts Cummings School of Veterinary Medicine, 200 Westboro Road, North Grafton, Massachusetts 01536, U.S.A.; JOYCE S. KNOLL, Tufts Cummings School of Veterinary Medicine, 200 Westboro Road, North Grafton, Massachusetts 01536, U.S.A.; MICHAEL J. MOORE, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts 02543, U.S.A. and Marine Mammal Rescue and Research Program, International Fund for Animal Welfare, 290 Summer Street, Yarmouth Port, Massachusetts 02675, U.S.A.; KATHLEEN M. MOORE, CHARLES T. HARRY, JANE M. HOPPE, MISTY E. NIEMEYER, IAN ROBINSON, KATHRYN S. ROSE, W. BRIAN SHARP, Marine Mammal Rescue and Research Program, International Fund for Animal Welfare, 290 Summer Street, Yarmouth Port, Massachusetts 02675, U.S.A.; DAVID ROTSTEIN, Consulting Veterinary Pathologist, Olney, Maryland 20832, U.S.A.

ABSTRACT

The current paucity of published blood values and other clinically relevant data for short-beaked common dolphins, *Delphinus delphis,* hinders the ability of veterinarians and responders to make well-informed diagnoses and disposition decisions regarding live strandings of this species. This study examined hematologic, clinical

Prognosis Results

- Failed animal profile:
  - thinner
  - anemic
  - acidemic
  - hypoalbuminemic

- Indicators of poor prognosis:
  - hemoglobin < 13.9 g/dL
  - CK > 400 U/L
  - ALT > 500 U/L
  - base excess < 8 mmol/L
  - lactate > 4.5 nmol/L
  - TCO2 < 34 mmol/L
  - length : Girth Ratio > 2.04
  - BMI < 17.5
  - heart rate > 119 bpm

Additional Findings

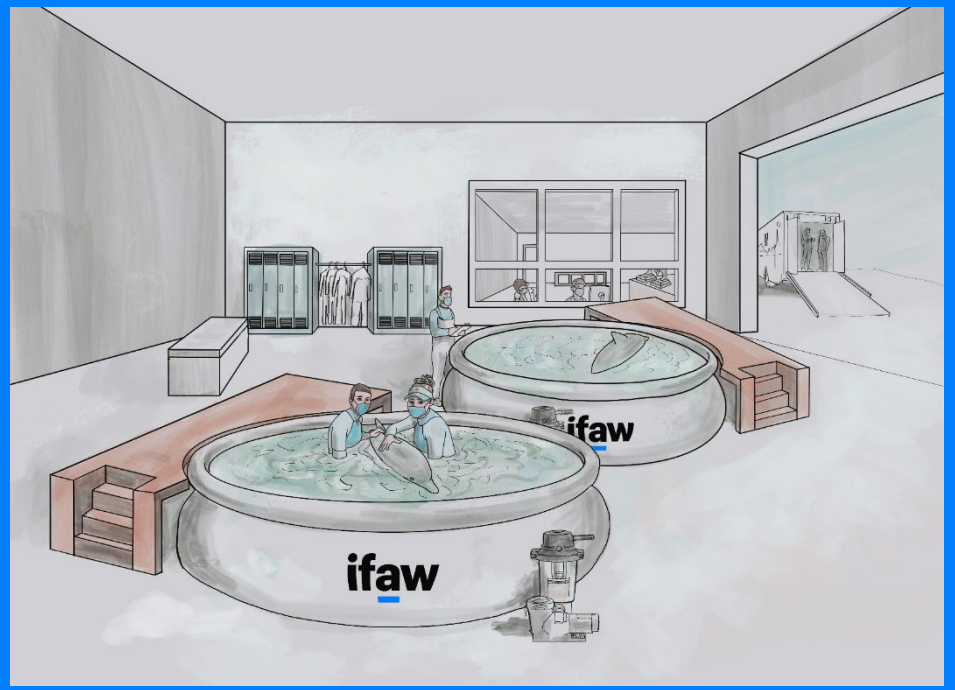
- Failed animals presented exceptionally high outliers:
  - ALT (1213 U/L)
    - Liver disease
  - GGT (544 U/L)
    - Liver disease
  - Lactate (6.14 mmol/L)
    - Metabolic acidemia
  - AST (1708 U/L)
  - LDH (4310 IU/L)
  - CK (770 IU/L)

Capture Myopathy

Research Outcomes

- Post-release success depends on:
  - preexisting conditions
  - stranding-related capture myopathy
- Certain blood and PE parameters can be used as prognostic indicators
- Healthy single and mass stranded dolphins are viable release candidates
- Some animals may benefit from short term care

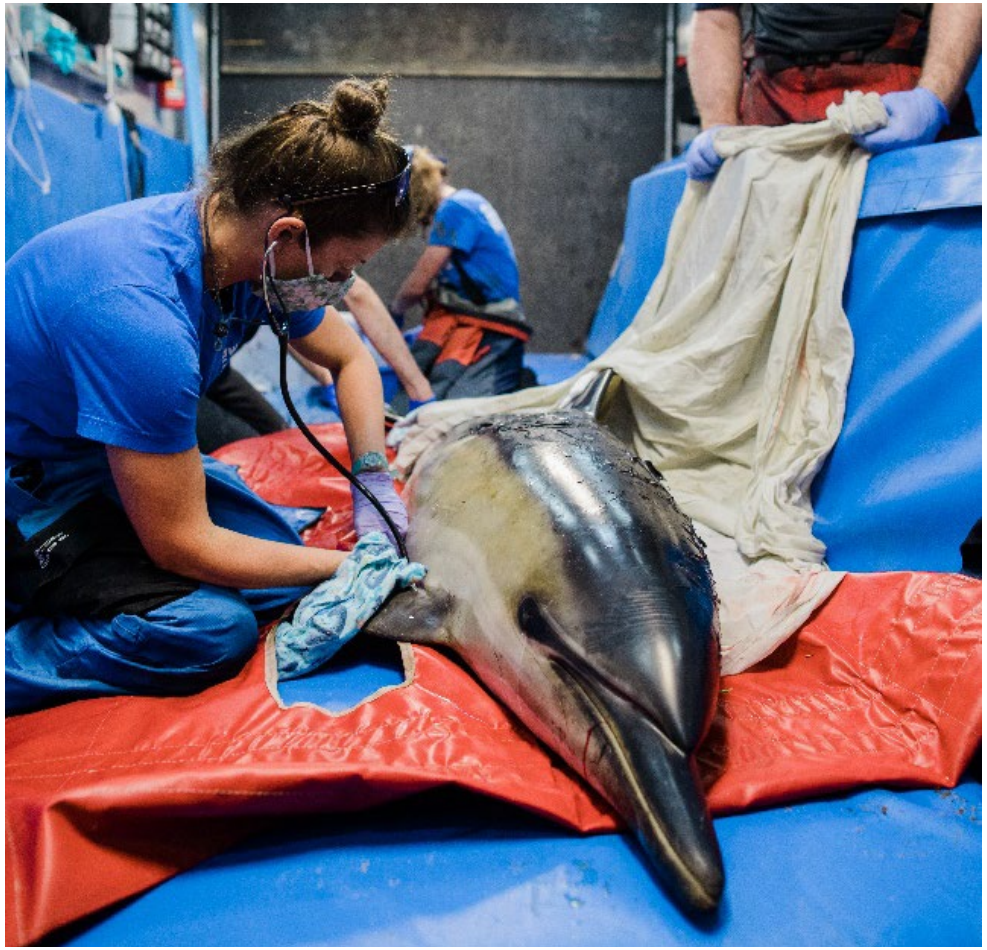
Cetacean ICU



Cetacean ICU

CICU Program Overview

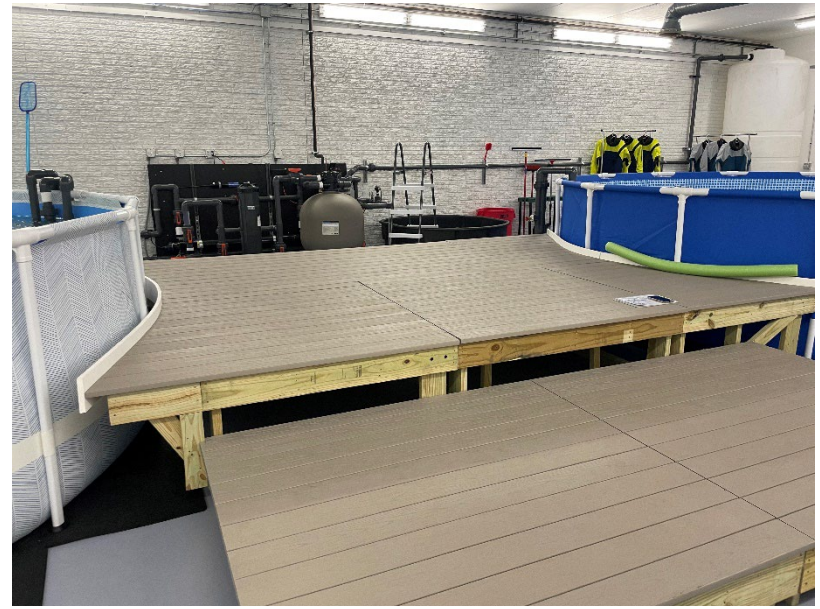
- CICU GOAL: Improve post-release survival for live stranded small cetaceans
- Objectives:
  - Veterinary care
  - Applied Research
  - Professional Trainings



Three year pilot project to test concept of short term rehab

CICU Program Overview

- Target Patients
  - Single stranded dolphins & porpoises up to 250 kgs
  - “Borderline” release candidates (~22 each year)
  - Aiming for 12 cases/year to start
  - Animals experiencing acute effects from stranding
    - Shock
    - Trauma
    - Weakness
  - Cases for which further diagnostics may better inform decision
- Also provides option to hold animals temporarily if release conditions are unsafe



CICU Program Overview

- Permitted to provide care for up to 96 hours
  - Difficult decisions will have to be made in some cases
  - All released animals will be satellite tagged to monitor post-release survival
- Standard pool capacity for common dolphins
  - 2 adults, 3 juveniles, 1 mom/calf pair

Veterinary Procedures

- Most procedures will be performed with the animal in the water
- Admission procedures:
  - Ultrasound
  - Physical examination
  - Treatments
- Treatment plan established & revised at least every 24 hrs
- Daily veterinary examinations & likely blood analysis
- Other procedures, as indicated
- Goal is to handle animal as little as possible and minimize stress

24hr Care & Monitoring

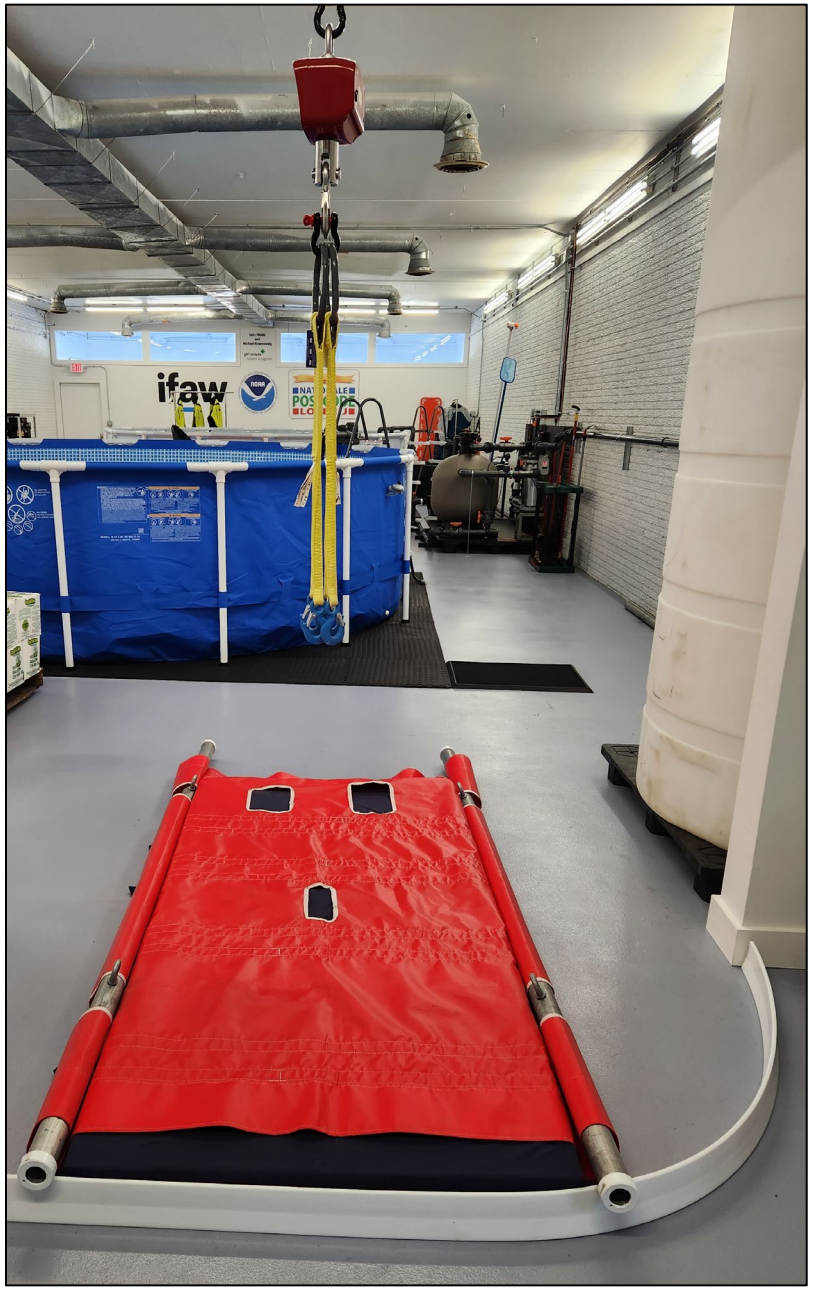
- Staff will evaluate animal's ability to swim independently
  - If able, animal is released into the pool
  - If unable, staff & Level 3 volunteers will remain in the pool to provide support to the animal
- Animal will be monitored constantly
- Animal will be reassessed regularly and released as soon as cleared by vet
- Euthanasia may be elected if animal's condition is declining or not improving

In-water supportive Care

- Provided by staff and Level 3 volunteers
- Level of care provided depends on animal needs
- Hands-off as much as possible
- Various stretchers, slings, pool noodles, mats, etc. can be used to assist with flotation
- Animal is walked around pool perimeter
- Allow animal to surface/breathe without significant effort

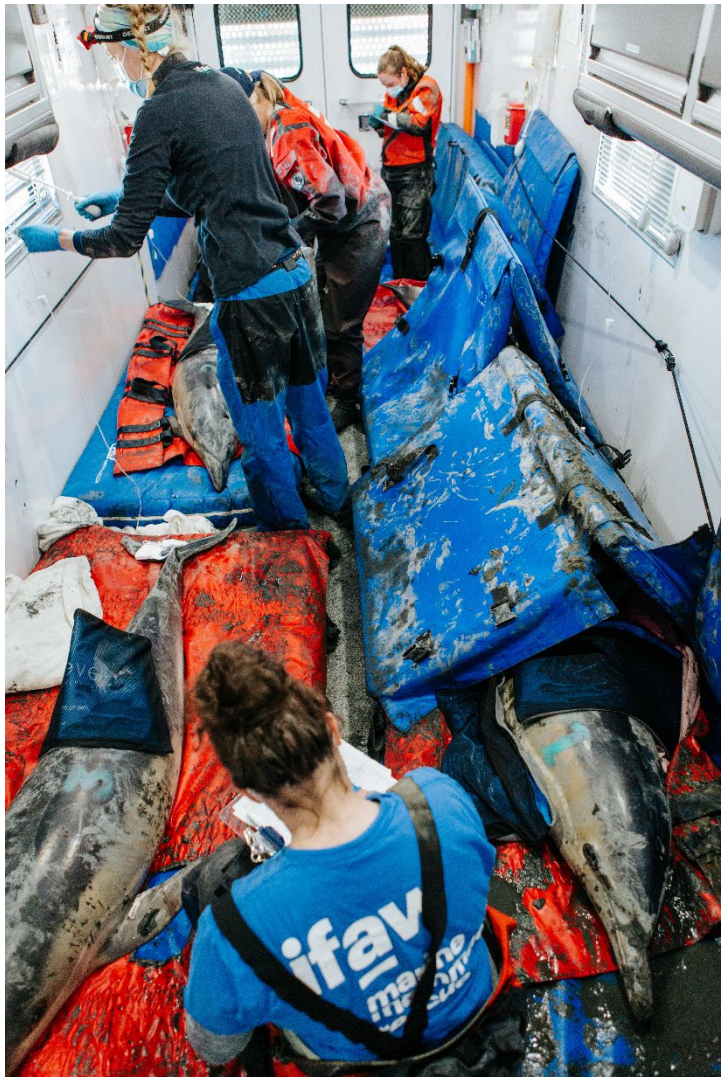
Feeding

- Likely will provide fluid-therapy only for first 12 hrs then slowly reintroduce food
- Types of feeding in order of use:
  - Offer whole fish first
  - Assist-feeding
  - Force-feeding
  - Fish gruel (tubing)
- Slowly increase calories and nutrients offered
- Feeding needs & plan determined by veterinarian for each patient in consultation with a veterinary nutritionist



Applied Research

- Progression of clinical signs
- Capture myopathy& shock pathophysiology investigations
- Better diagnostics & case documentation
- Response to treatment
  - Treatment trials
- Pharmacokinetic studies



Professional Trainings

- Regional & international requests for capacity building
- TMMC International Veterinarian in Residence Collaboration
- IFAW's New Academy of Rescue & Conservation

Academy of Rescue and Conservation

Who are we?

- The Academy of Rescue and Conservation (ARC) is an educational initiative sponsored by IFAW and supported by a generous grant by the Suzanne McGraw Foundation to consolidate, compile, and present the most accurate and up-to-date information in the fields of animal rescue and conservation.

What do we do?

- The ARC provides education and training in animal rescue and conservation, both online and in-person, to individuals and partner organizations interested in improving their knowledge in these fields.

Academy of Rescue and Conservation

How do we work?

- Classes can be presented online, hybrid, and in-person.
  - **Online courses:** self-paced (asynchronous) and scheduled (synchronous)
  - **Hybrid:** online portion (asynchronous)/ in-person portion (to be scheduled)
  - **In-person:** to be scheduled (synchronous)
- Format:
  - Course catalogue available on Canvas Catalogue (March 2024)
  - Courses presented on Canvas Learning Management System (March 2024)

Academy of Rescue and Conservation

Available Courses

General	Disaster Response	Wildlife Rescue
Animal Welfare: an Introduction	Disaster Response: Definitions, Types, and Scales (Coming Soon)	• CARE Project Course for Front Line and Law Enforcement Officers
Animal Welfare and Conservation (Coming Soon)	Disaster Response: Introduction (Coming Soon)	• CARE Project Course for Front Line and Law Enforcement Agencies
	Disaster Response: Assessments	• Legal Best Practices for Wildlife Confiscations (Coming Soon)
	Disaster Response: Interventions	
	Fire Awareness	

Academy of Rescue and Conservation

Available Courses

Marine Mammal Rescue	
General	• Pinniped Identification • Cetacean Identification • Cetaceans of Kenya (Coming Soon)
Stranded Marine Mammal Response Training (SMMRT)	• Stranded Marine Mammal Response Team (SMMRT) Training Introduction • Mass Stranding Response Workshop • Mass Stranding Training Exercise
Cetacean Intensive Care Unit (CICU)	• General Guidelines • Biosecurity • Hazard and Injury Mitigation • Zoonotic Disease Guidelines • Level 1: Introduction and Training • Level 2: Admission and Animal Handling Techniques

Stranding Case Studies

IFAW 17-079Dd
Signalment and Case History

- Initial stranding on 25 Feb in Wellfleet, MA
- Mass stranding of 7 conspecifics
- Male calf/juvenile (141.3 cm)
- Teeth erupted, lingual papillae present

Physical Exam

- BCS (3/5), 20 kg
- BAR, vocalizing, tail fluttering
- Tachypnea (21/min) and tachycardia (200/min) on admit
  - Some double and exhale-only resps
  - No sinus arrhythmia
- Lungs clear
- Flatulence and foamy feces observed during transport

POC bloodwork

- Hyperglycemia (219)
- Mild neutropenic leukopenia
  - WBC 4.05 10^9/L
  - GRA 2.67 10^9/L

Treatments

- Selenium and vitamin E
- LRS bolus 500 ml
- Supportive care

Outcome

- 2 died prior to extraction
- Released at Scusset Beach with 4 others

Case History: 2nd stranding

- Stranded again on 27 Feb in Wellfleet (2 days later)
  - Initially observed swimming – herding unsuccessful
  - With adult female (non-lactating)

Physical exam

- BAR, vocalizing, tail fluttering
- RR 8-9/min

POC bloodwork

- Increased WBC/GRA to WNL
  - WBC 7.28
  - GRA 4.61

Outcome

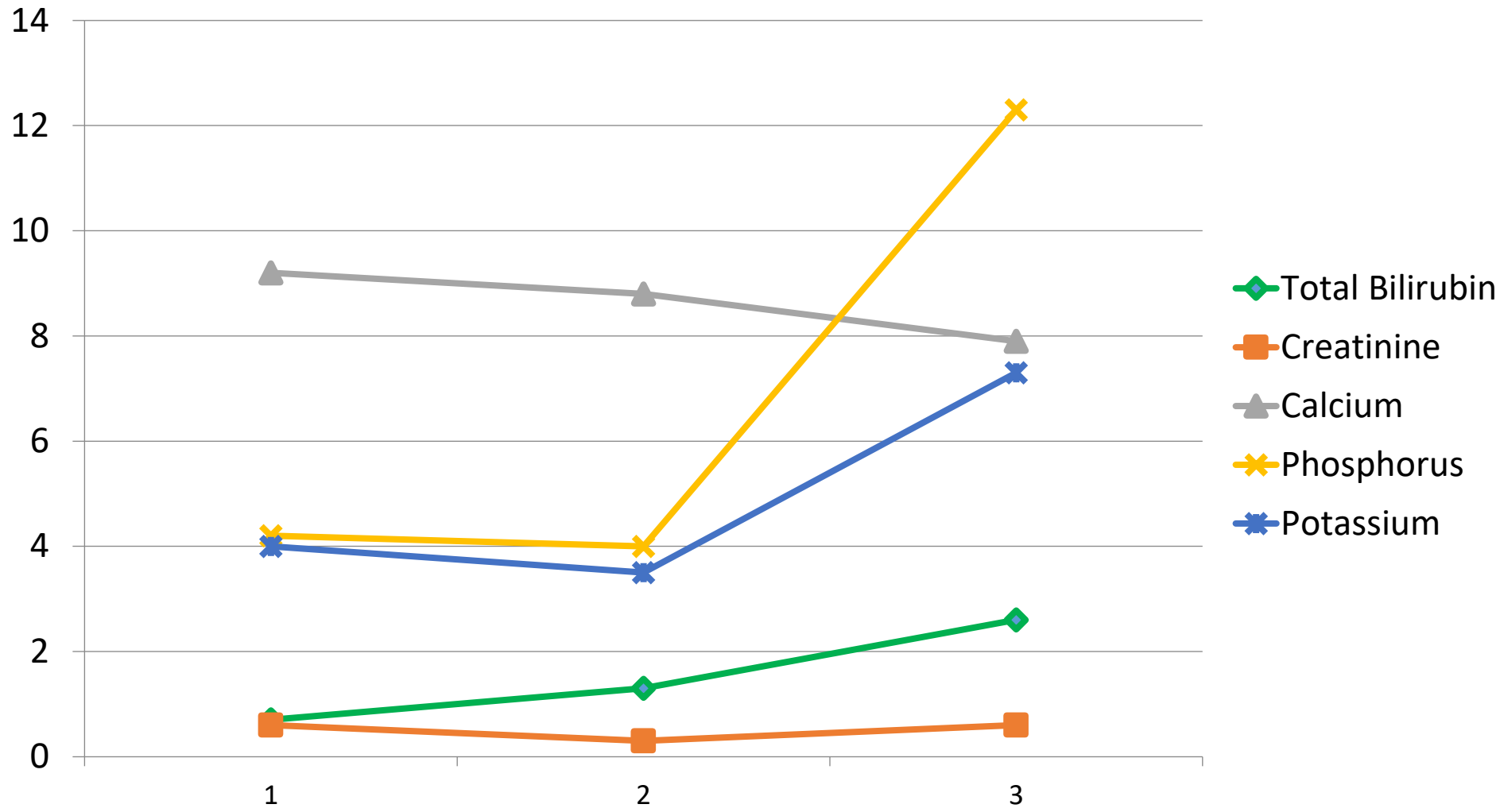
- Released together
- Scusset Beach, Bourne

Case History: 3rd Stranding

- *Adult female from second stranding re-stranded alone on 3 March and was euthanized*
- Stranded a third time on 4 March
  - 7 days after initial stranding
  - Alone in Plymouth, MA
  - Pushed out by bystanders
  - Immediately restranded
  - Euthanized & necropsied

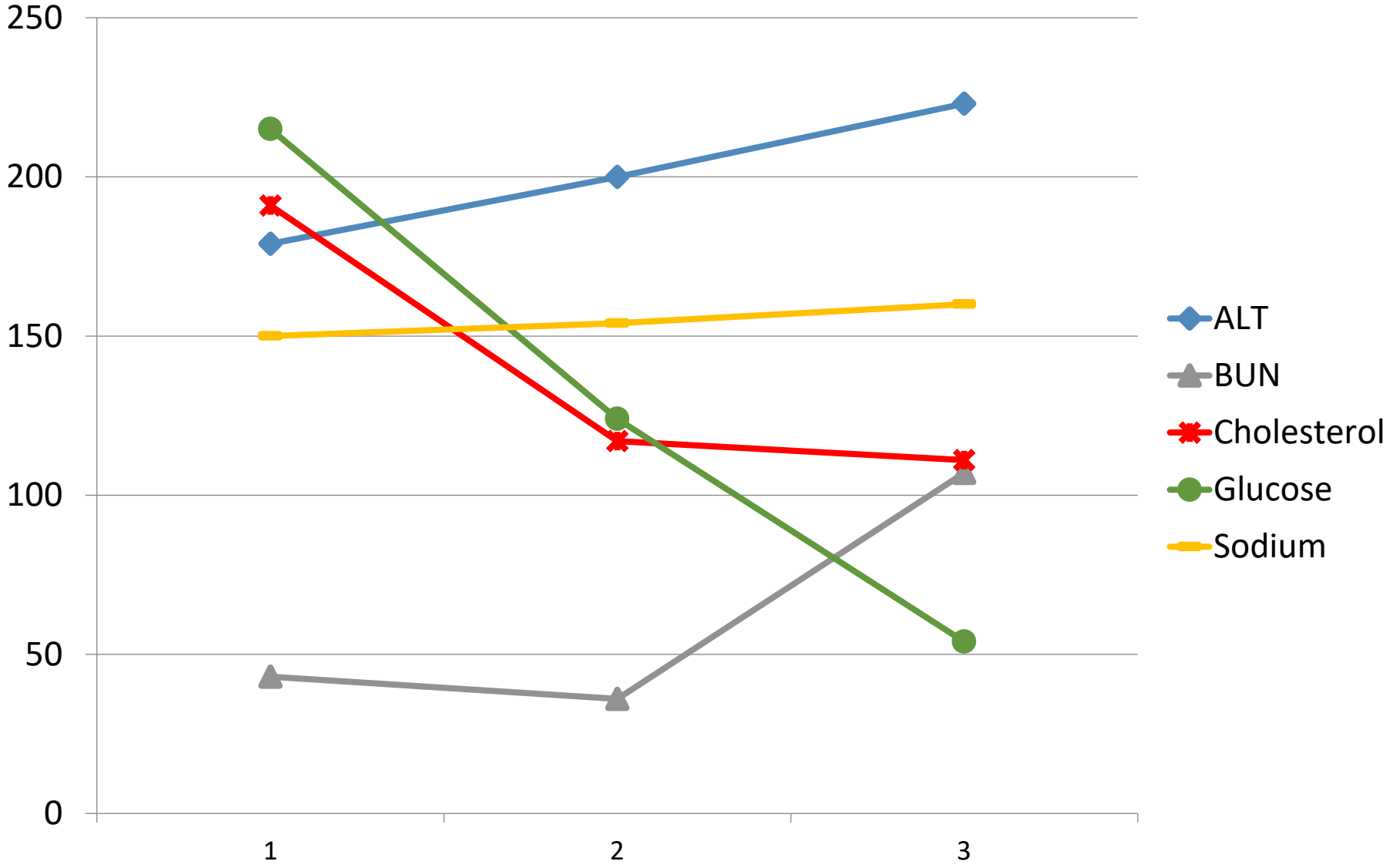
Serum Chemistry Changes Over Time

- 3rd stranding:
  - ↑K
  - ↑ P



Serum Chemistry Changes Over Time

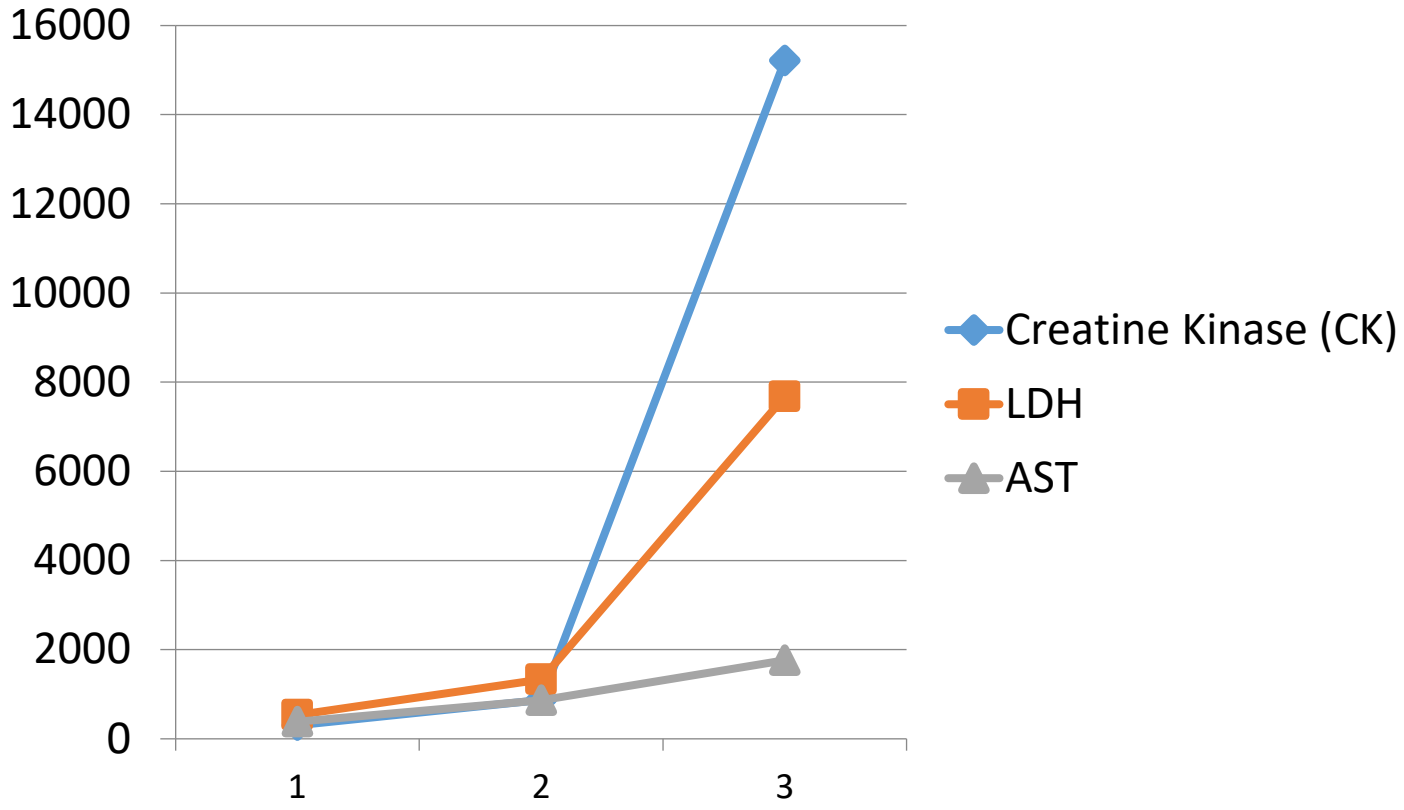
- Marked increase in BUN on 3rd stranding
- Progressive decrease in cholesterol
- Progressive hypoglycemia



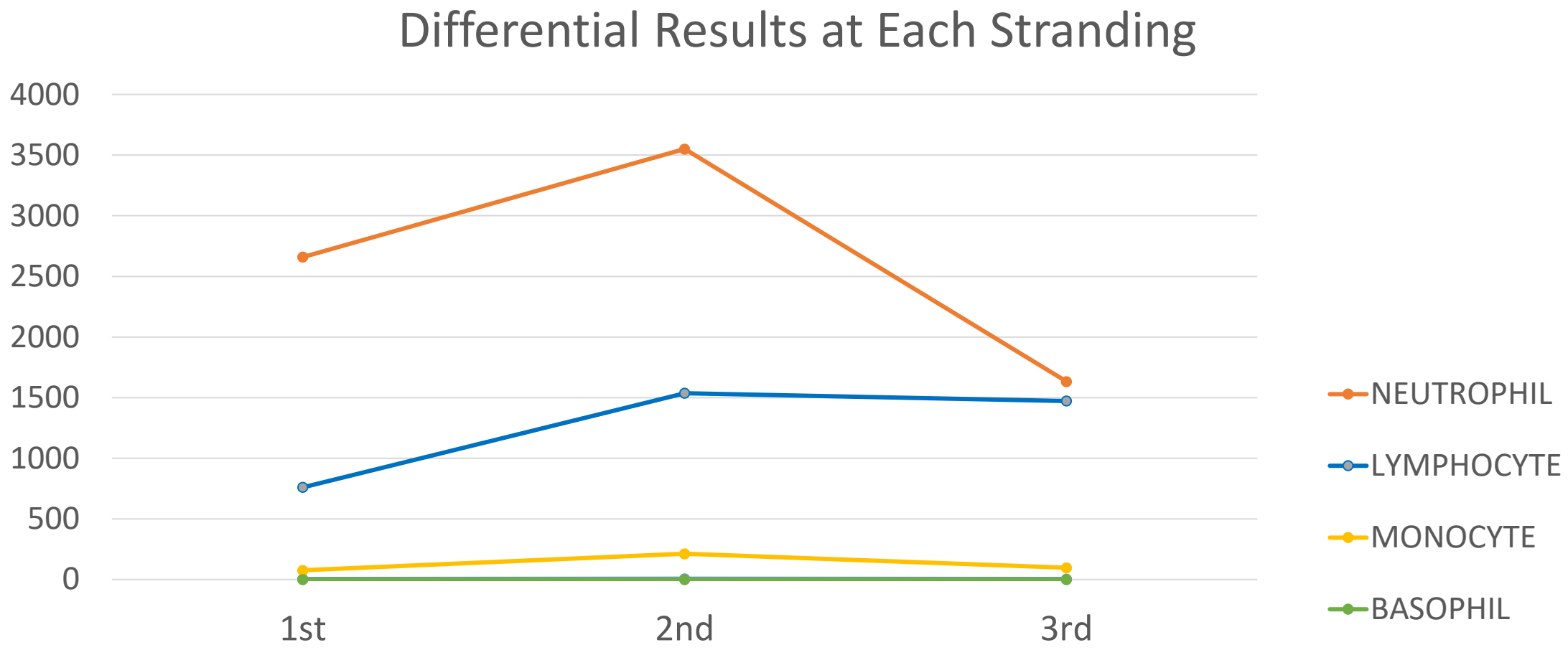
serum chemistry changes over time

- Marked ↑ muscle enzymes: CK, AST, LDH
  - Suspect due to crush injury / rhabdomyolysis / capture myopathy

AST	Creatine Kinase (CK)	LDH
381	305	537
863	873	1329
1761	15214	7674



CBC Results


Differential Results at Each Stranding
4000
3500
3000
2500
2000
1500
1000
500
0
1st
2nd
3rd
NEUTROPHIL
LYMPHOCYTE
MONOCYTE
BASOPHIL

IFAW17-079Dd Necropsy Summary

- Thin, BCS = 2/5
- Blubber: mildly icteric
- Muscle: multifocal pallor
- Lungs: areas of consolidation, dark, wet, froth-filled airways
- Liver: patchy nutmeg coloration
- Pigmenturia

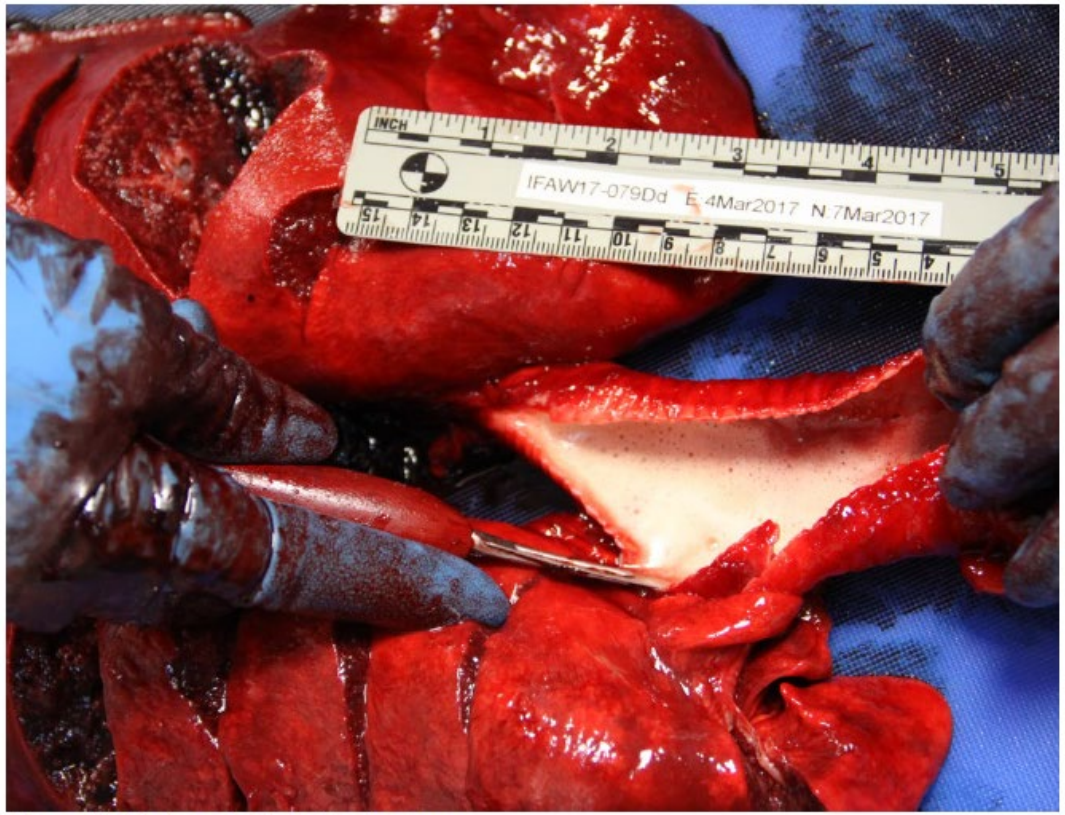


Figure 7. Copious froth in the trachea

Cause of Death

- Ultimate: euthanasia
- Proximate: stranding trauma, maternal separation

Case Study #2

- 45 dolphin mass stranding
- Welfleet, MA
- August 9, 2020

Triage

Concerns

- Heat/hyperthermia
- Sun exposure
- Shock
- Number of animals
- Drowning with incoming tide
- Refloating in dangerous area (prone to re-strand)
- Limited transport space (~12 dolphins per 1.5 hr round trip)
- Limited personnel
- Limited time
- Human safety

Options

- Provide care in place (limited), refloat, herd
- Extract as many as possible, provide better care, climate control, relocate to better area, release
- Some combination of the two

Outcome

- 2 DOA
- 11 extracted
  - 9 relocated, and released
    - IVF boluses, sunburn care, abx, pain meds
  - 2 euthanized

Outcome

- Remainder (32) refloated in place and herded
  - Only minimal supportive care
  - 5 restranded & euthanized
- Overall, consider response successful
- Many lessons learned and response improvements implemented

Summary

- Live dolphins strand on Cape Cod with great frequency (& LI occasionally!)
- Advancing stranding science and medicine with each event
- NEW short term rehabilitation facility just opened
- Expanded professional training opportunities
- Get involved locally!
  - Atlantic Marine Conservation Society
  - New York Marine Rescue Center
- Donate! ifaw.org/strandings

Atlantic Marine Conservation Society
Promoting Marine Conservation Through Action

ny marine rescue center

Thank you!

Visit ifaw.org/strandings for more information and to help support our work!