Defend Brigantine Beach INC and Downbeach

P.O Box 562 Brigantine, NJ 08203 **defendbrigantinebeach@gmail.com**
defendbrigantinebeach.org

February 5, 2024

Jolie Harrison, Chief
Permits and Conservation Division
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, MD 20910

RE: Incidental Take Authorization: Takes of Marine Mammals Incidental to Specified Activities; Taking Marine Mammals Incidental to Marine Site Characterization Surveys Off New Jersey and New York for Atlantic Shores Offshore Wind, LLC;

Dear Chief Harrison:

Defend Brigantine Beach Inc. and Downbeach is a broad-based coalition of conservationists, environmentalists, fishermen and women, boaters, divers, surfers, students, businessmen and women, New Jersey residents, and tourists united to defend our beaches and ocean from Federal and State planned industrial impacts on our ocean and community including the proposed by Atlantic Shores offshore wind projects. Defend Brigantine Beach, INC and Downbeach submits the following comments to the National Oceanic and Atmospheric Administration's ("NOAA") National Marine Fisheries Service ("NMFS") in opposition to the request for an Incidental Harassment Authorization ("IHA") by Atlantic Shores (henceforth, the "Applicant") to conduct high-resolution geophysical ("HRG") marine site characterization surveys on the Outer Continental Shelf in a federal offshore Lease Areas OSC – A 0499, OCS-A 0541, and OCS- A0549, and associated offshore export cable corridor routes in waters off of New York, New Jersey, Delaware, and Maryland.

The IHA request, if approved, would authorize the "takes" of 14 species of marine mammals by "Level B harassment" over the course of one year, with the possibility of a one-year renewal for the IHA. In addition, this IHA application would combine the requested takes with two other active IHAs associated with ongoing HRG survey activities in Lease Areas OCS-A 0499 and OCS-A 0549 (permit previously ending on 6/8/24) and another in BOEM Lease area OCS-A 0541 (permit previously ending on 8/9/24) under one single IHA which will begin on 4/1/24 and end on 4/1/25. The IHA permit would allow 120 active survey days nearshore and 180 survey days offshore and would cover 3,600 kms and 25,200 kms, respectively. Total survey area will be approximately 20,251 square kms extending to the shoreline to approximately 74kms offshore.

According to the Public Notice, "Underwater sound resulting from Atlantic Shores' proposed activities has the potential to result in incidental take of marine mammals in the form of Level B harassment." Defend Brigantine Beach INC and Downbeach have concerns about the impacts, especially cumulative, of the numerous and concurrent incidental take authorizations being requested, reviewed, and issued for offshore wind preconstruction and construction activities off the New York and New Jersey coast, as well as the entire East Coast of the United States.

The number of Level B Harassment Takes on the Atlantic Coast during the 2024-25 time period totals 249,503 and the number of Level A Injury Takes during the 2024-25 time period totals 761. The total number of Level B takes of endangered species totals 920 and Level A Injury endangered species Takes total 9. This includes IHA Permits for 26 offshore wind projects from Massachusetts to South Carolina. The total number of Level B Harassment Takes for Atlantic Shores project permits alone will total 10,998 during the time period including 35 takes for endangered species. (See Appendix A). The authorization of this cumulative level of takes is irresponsible and reckless.

NOAA NMFS Office of Protected Species is "responsible for the protection, conservation, and recovery of more than 160 endangered and threatened marine and anadromous species under the Endangered Species Act. The goal of the ESA is to conserve these species and the ecosystems they depend on." (National Oceanic & Atmospheric Administration, "About Us: Office of Protected Resources," as seen on 12/9/2022, https://www.fisheries.noaa.gov/about/office-protected-resources). The government is obligated to provide assessments of the potential and real marine ecosystem impacts, and then stipulate policies and regulations to avoid and reduce negative impacts and ensure appropriate and meaningful mitigation of the unavoidable impacts. This also requires, at minimum, a fair, comprehensive, and independently peer-reviewed pilot project for this unproven, large-scale industry in US waters. Indeed, this also requires sound science supported by robust baseline ecological assessments and independent and peer-reviewed studies which are currently planned, only just begun, or underway and incomplete.

Instead, the government is fast-tracking projects, including the Applicant's project. However, fast tracking projects is not protective of marine species. The government's fast-tracking of OSW projects is inconsistent with good governance of public resources, the precautionary principle, and most importantly, laws including the Endangered Species Act ("ESA"). From the outset:

> *Section 7(a)(2) of the ESA requires BOEM, in consultation with NOAA Fisheries, to ensure that any action the agencies authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered species or result in the destruction or adverse modification of designated critical habitat; this coordination is accomplished through ESA section 7 consultations. BOEM and NOAA Fisheries are required by the ESA to use the best scientific and commercial data available when carrying out these consultations.* (NOAA Fisheries, "Section 7: Types of Endangered Species Act Consultations in the Greater Atlantic Region," as seen 4/30/2023, https://www.fisheries.noaa.gov/insight/section-7-types-endangered-species-act-consultationsgreater-atlantic-region.)

In addition to our concerns over the sheer number of take permits and substantial number of takes off of the Atlantic coast during the 2024-25 time period, we believe that the Atlantic Shores request for authorization for incidental takes should be denied for the following reasons:

- The survey areas seem much larger than what is needed to characterize the current lease areas and potential export cable routes. What is the justification for this? Is the applicant looking for sites for new wind turbine projects? But that is the job of the federal agency, to identify the "wind energy areas" and they should not be prejudiced by a company survey, so why should NOAA approve such large areas?

- The applicant says it is using a new sparker device, the Geo Marine system instead of the prior Dura-spark 240 unit. The applicant says it has a source level of 195 decibels (dB). If true, that would be much better than the Dura-spark unit, but this smaller surrogate device is used to get that number. The noise measurements for the Geo Marine device itself are missing. Why isn't the manufacturer providing them so a real noise source number can be provided? In the application it is implied that the unit will be operated at 400 joules of energy input, but there is no statement that it will be exclusively operated at that level. At what depths will higher energy input be needed resulting in a higher noise source level?

- The assumption of noise dissipation rate of 20 dB for every 10-fold increase in distance is only valid until the noise wave hits the bottom, beyond that the noise dissipates less.

- What is the model and how were measurements taken to conclude that there is now a very low-density number for right whale presence in the area based on the Duke University's study? This study contradicts the density data in the Atlantic Shores construction application of just a year ago and seems to contradict the past 10 years of observational data. What is the reason for this contradiction? Where is the physical and scientific justification for the right whale not coming in the area anymore? What is the probability of the migration path location of the right whale given its historic migration range of about 60 miles from shore?

  How does the Duke University study compare to the New York State Department of Environmental Conservation "Species Status Assessment (New York State Department of Environmental Conservation, "Species Status Assessment," as seen 12/9/2022, https://www.dec.ny.gov/docs/wildlife_pdf/sgcnnatrightwhale.pdf) which states that right whales are present in the mid-Atlantic more often than previously believed? It is documented that North Atlantic right whales are in the region at all times of the year. Data from WhaleMap and the Mid-Atlantic Ocean Data Portal indicated an abundance of NARWs off the NJ coast throughout the year. (https://whalemap.org; https://portal.midatlanticocean.org.) Further a Right Whale Slow Zone southeast of Atlantic City was effective in December 2021.(National Oceanic & Atmospheric Administration, Fisheries, "Extension of Right Whale Slow Zone Southeast of Atlantic City, NJ." As seen, 11/15, 2022: https://content.govdelivery.com/accounts/USNOAAFISHERIES/bulletins/2fef565)

  According to the Conserve Wildlife Foundation of New Jersey:

  > *Within the western North Atlantic Ocean, right whales feed during spring, summer, and fall in temperate and subpolar latitudes near eastern Canada and the northeastern U.S. During the winter, many individuals from this population can be found off the northeast coast of Florida and Georgia, their breeding and calving grounds. Some right whales, however, may remain at their northern feeding grounds during the winter.* Conserve Wildlife Foundation of New Jersey, "New Jersey Endangered and Threatened Species Field Guide: (North Atlantic Right Whale," as seen 12/9/2022, http://www.conservewildlifenj.org/species/fieldguide/view/Eubalaena%20glacialis/)

- The applicant's confidence regarding mitigation measures, particularly visible observers, is misplaced and contradicts NOAA's guidance. NOAA itself states:

> *"Right whales can be very difficult to spot from a boat due to their dark color and lack of a dorsal fin. Poor weather and sea state or low light conditions can make spotting these whales nearly impossible"* (National Oceanic & Atmospheric Administration, National Marine Fisheries Service, "Reducing Vessel Strikes to North Atlantic Right Whales," https://www.fisheries.noaa.gov/national/endangered-species-conservation/reducingvessel-strikes-north-atlantic-right-whales as seen on 5/15/2023.) ; (U.S.C. § 1371(a)(5)(A)(i)).

NOAA Fisheries assumes that mitigation measures for impacts from offshore wind development are successful. Before mitigation is considered, avoidance and minimization are required. However, without baseline studies and a pilot project to determine impacts, how can mitigation measures be established? This massive cumulative impact of multiple projects by a nascent US industry has not been assessed, and as described above has no precedent or permitting system. The following questions must be answered:

- What is this mitigation strategy based on?
- What if mitigation measures fail?
- Since there is no transparent, consistent publicly available real-time assessment and reporting activities, how will NMFS even know whether mitigation fails?
- How is NMFS judging if mitigation measures are enough to prevent harassment to marine mammals during the survey work?
- What are the ecological guardrails?
- How and when would it be determined that additional harassment is occurring, and work must stop?

- In January 2024 ,the *BOEM and NOAA Fisheries North Atlantic Right Whale and Offshore Wind Strategy* was released and is nothing more than "guidance". BOEM and NOAA Fisheries North Atlantic Right Whale and Offshore Wind Strategy In this report the Offshore Wind Industry is listed as a "partner" and a "financial resource" for the strategy. Nowhere in the Financial Resources Section 5 of the report does it include any mandates or negative consequences to Offshore Wind Developers if they do not follow the strategy. The guidelines don't obligate anyone to anything and use language such as "can support", "voluntary efforts", "could be implemented", and "highly encourage". Offshore Wind companies are for-profit corporations, and their number one priority is to satisfy stockholders by maximizing profits. They are not our friends nor are they in business to be altruistic to marine mammals and the ocean environment. Are NOAA and BOEM so naïve as to believe that Offshore Wind Companies will take any of their Strategy seriously? If any of these strategies impact their bottom line, they will either ignore it, pretend to comply (since no one will be monitoring their compliance) or cut corners in other safety measures to make up the added cost of compliance.

  Per the report,

  > "OSW Developer Support—Developers **can support** this effort through complying with requirements of project approvals and authorizations or through **voluntary efforts** to fund or carry out actions related to this Strategy. As part of this Strategy, BOEM and NOAA Fisheries will continue to identify the impacts of OSW development on NARWs and ways for developers to mitigate and monitor these impacts. To aid in this effort, Appendix B includes development of measures that **could be implemented** as lease terms, plan conditions, or other mechanisms.

BOEM and NOAA Fisheries **highly encourage** developers to coordinate and share plans, results, and data to help improve the efforts and monitor progress on addressing the information needs under this Strategy."

- Allowable harms described as non-lethal (Level B) such as Temporary Threshold Shift (TTS) or temporary deafness, can lead to significant behavior modifications in protected marine mammals. This harm can lead to flight and secondary mortality events such as ship strikes or standings. This needs to be studied further.

- Scallop, oyster, and clam beds have been altered and decimated coinciding with the recent survey activities. This has severely impaired local commercial fisherman. Continued ongoing activity will put thousands of jobs and livelihoods at risk.

- Horseshoe crab protected areas have an will be further infringed upon, putting this medically and migratory important species at risk. The horseshoe crab is vital to the migration of endangered avian species, which rely on spawning grounds in the lower Delaware Bay

- To date, no full necropsies have been released for whales stranded in NY/NJ waters dating back to December 2022. As such, "cause of death" has yet to be determined. Why has this been ignored by the government agencies?

- Congressionally authorized GAO study has yet to be released and will in all likelihood result in modification of the approval process.

- Offshore wind industry remains in financial turmoil. Why is NMFS approving wide scale harms to marine life for questionably viable projects?

- There are no permitting rules for marine site characterization surveying for geological and geophysical surveys by, or for, the Bureau of Ocean Energy Management ("BOEM"). The recent BOEM Modernization Rule proposal states:

> *Although BOEM requires a lessee to submit the results of certain surveys to BOEM in order to obtain approval of its COP, those regulations do not require BOEM's approval of a permit for such surveys. Instead, BOEM has provided guidance on conducting such surveys and also includes terms and conditions in renewable energy leases that require lessees to submit survey plans to BOEM for review in advance of their survey activities. BOEM's review of the plans, while not an approval process, does provide BOEM an opportunity to communicate with lessees to ensure the lessees' survey results will meet BOEM's information needs and to ensure certain environmental conditions are met in conducting the surveys.* Federal Register, "Renewable Energy Modernization Rule," Bureau of Ocean Energy Management, Publication Date: 1/30/2023, https://www.federalregister.gov/documents/2023/01/30/2023-00668/renewable-energymodernization-rule.

Given this, it raises more questions about how it was possible that BOEM asserts without question that there is absolutely "no evidence" that offshore wind activities have any connection to the unprecedented number of dead whales that continued to wash-up on beaches in the NY/NJ region starting in December 2022. It is now clear there are no regulations; there is only guidance and suggestions, so interested parties have no recourse if

they are not voluntarily followed. Without such regulations, how can BOEM possibly make such a claim? Is the only requirement for survey vessels currently under the Marine Mammal Protection Act ("MMPA") requiring IHA authorizations, which are limited in scope? In the Proposed Modernization Rule, BOEM admits not having the regulatory authority to govern surveys: "BOEM's existing renewable energy regulations do not expressly govern survey activities." Federal Register, "Renewable Energy Modernization Rule," Bureau of Ocean Energy Management, Publication Date: 1/30/2023, https://www.federalregister.gov/documents/2023/01/30/2023-00668/renewable-energymodernization-rule.

- There is a lack of basic research of the impacts of OSW energy development on large whale species in U.S. waters, particularly in the mid-Atlantic region. It is reckless to move forward without the scientific baseline assessments for what harm may or could occur to whales before issuing any permits and authorizations, including IHAs, ITRs, and associated LOAs including the failure to include crucial scientific assessments and consultations as follows:

  In a May 2022 letter obtained under the Freedom of Information Act by Bloomberg Law, Dr. Sean Hayes, PhD, Chief of Protected Species, NOAA NEFSC, clearly documents and confirms the NARW's fragile hold on existence. First, the Chief of Protected Species notes that there are less than 350 remaining NARW animals. (Letter from Sean A. Hayes, PhD, Chief of Protected Species, NOAA NEFSC, to Brian R. Hooker, Lead Biologist Bureau of Ocean Energy Management, Office of Renewable Energy Programs, dated May 13, 2022.) Again, we note, the Draft North Atlantic Right Whale and Offshore Wind Strategy states that not one animal can be lost.

  In regard to the development phases of offshore wind, Dr. Hayes states in his letter:

  > *"The development of offshore wind poses risks to these species, which is magnified in southern New England waters due to species abundance and distribution. These risks occur at varying stages, including construction and development, and include increased noise, vessel traffic, habitat modifications, water withdrawals associated with certain sub-stations and resultant impingement/entrainment of zooplankton, changes in fishing effort and related potential increased entanglement risk, and oceanographic changes that may disrupt the distribution, abundance, and availability of typical right whale food (e.g., Dorrell et al 2022)."*

  It is clear that any further disturbance of the NARW species will have an impact on this critically endangered species. Some scientists estimate that the species will go extinct within 20 years with current threats. (Pennisi, Elizabeth. "The North Atlantic right whole faces extinction." Science, November 7, 2017, https://www.science.org/content/article/north-atlantic-right-whale-faces-extinction.)

- NMFS approval of the IHA permits contradicts its own guidance about the marine ecosystem. Specifically, about offshore wind development impacts on the marine ecosystem, NMFS says: (National Oceanic & Atmospheric Administration, National Marine Fisheries Service, "Offshore Wind Energy: Protecting Marine Life," https://www.fisheries.noaa.gov/topic/offshore-wind-energy/protecting-marine-life, as seen 5/14/2023),

  > *Scientists around the world are still investigating the potential impacts of offshore wind energy development on marine life. Site assessment, construction, and operations could interact with marine life on the seabed, in the water, and at the surface. For example, offshore wind energy projects could:*
  >
  > - *Increase ocean noise, which could affect the behaviors of fish, whales, and other species*
  > - *Introduce electro-magnetic fields that impact navigation, predator detection, communication, and the ability for fish and shellfish to find mates*
  > - *Change existing habitats by altering local or regional hydrodynamics*

- *Create a "reef effect" where marine life cluster around the hard surfaces of wind developments*
- *Impact organism life cycle stages, including larval dispersal and spawning*
- *Change species composition, abundance, distribution, and survival rates*
- *Increase vessel traffic, which could lead to more vessel strikes*
- *Release contaminants that can be consumed or absorbed by marine life*

Offshore wind, in the current proposed scale, scope, and magnitude significantly added to the threats to marine mammals, including noise, vessel strikes, and impacts to prey. Access to food sources for large whales is essential. The importance of the waters off New Jersey as feeding grounds for all marine mammals is increasing.

NOAA Fisheries is "responsible for the stewardship of the nation's ocean resources and their habitat" (NOAA Fisheries, "About Us," as seen on 7/20/2023); this includes the protection of whales, dolphins, porpoises, seals, and sea lions (NOAA Fisheries, "Laws & Policies: Marine Mammal Protection Act," as seen on 7/20/2023). In addition, under the Marine Mammal Protection Act ("MMPA"), citizens who engage in a specified activity (other than commercial fishing) within a specified geographical region may request authorization for incidental, but not intentional, takes of "SMALL NUMBERS" of marine mammals pursuant to that activity for a period of no more than five years. (U.S.C. § 1362(18) The NMFS, which has been delegated the authority to administer the relevant legal framework, may allow takes under the MMPA only if the agency determines that the total number of authorized incidental takes during the five-year period will have a "negligible impact" on the relevant species or stock. (U.S.C. § 1371(a)(5)(A)(i)(I)). "Negligible impact" is, in turn, defined as an impact that is not reasonably likely or expected to "adversely affect the species or stock through effects on annual rates of recruitment or survival.

The cumulative impact of the number of takes off the New Jersey and New York coast is unprecedented. Never has an ecosystem been under such massive industrial development pressure and impact over a span of less than decade. Given this unimaginable and unprecedented scope and scale of industrial OSW development in the Northeast region, and off NY/NJ coasts in particular, NMFS must provide clarity and due process now and establish accountability.

The current process lacks transparency and accountability for the impacts to the living marine ecosystem from the rapid development of the ocean. Until these questions are answered, how can NMFS continue the IHA application process for Offshore Wind project along the Atlantic Coast?

- At what point will there be too many accumulated Level A and Level B harassments from OSW energy development or other activities?
- What are the guardrails to determine how many takes will be too many?
- How will BOEM ensure that any number of takes do not prove to be more harmful than predicted?
- How will NMFS distinguish between impacts, such as those from the wind industry as compared to those from other shipping traffic, especially as wind facilities are built-out and marine life and ships are concentrated into more narrow corridors?

- Who will be responsible for determining all aspects of the issued IHA are complied with, and how will accountability be managed?
- How will the number of takes be lowered over time to address the additional, cumulative stress to marine life?
- How will population dynamics be measured as species populations decline from stress or injury from offshore wind development? Or food scarcity as migratory fish populations move or as fish structure changes? Or will the agencies simply place blame on "climate change" as a catch-all to lower populations of marine mammals?
- How many marine mammals can be harassed and injured before the populations, and associated ecosystems, collapse, all for the current unfounded benefits of the new offshore wind energy industry?
- How many takes, for individual projects or requests or cumulatively, are too many? Does the current process by which takes are evaluated include cumulative impacts to populations from all incidental take requests and authorizations, and if not, why?

- Offshore wind survey activities in NY/NJ waters have coincided with an unprecedented surge in marine mammal deaths here during the past year.

- There have been 31 whales and 67 dolphins sacrificed during offshore wind survey activity from December 2022 to December 2023.

- Plenty of evidence exists showing the correlation between the survey activities and whale deaths and needs to be addressed by the industry and NMFS. An independent assessment is needed to determine if the unprecedented geotechnical and geophysical activities may be linked to the spike of whale and dolphin strandings in the region of the offshore wind project. The details of this evidence is presented below.

Further evidence that the offshore wind energy vessel surveys are a plausible cause of the recent New Jersey whale & dolphin deaths is as follows:

There has been a spike in recent whale and dolphin deaths off the New Jersey shore. The responsible agencies repeatedly state that the survey vessels are not the cause of that. They say that there is no evidence linking the two, but at the same time present no evidence of their own to support their conclusion of there being no evidence, they just say it.

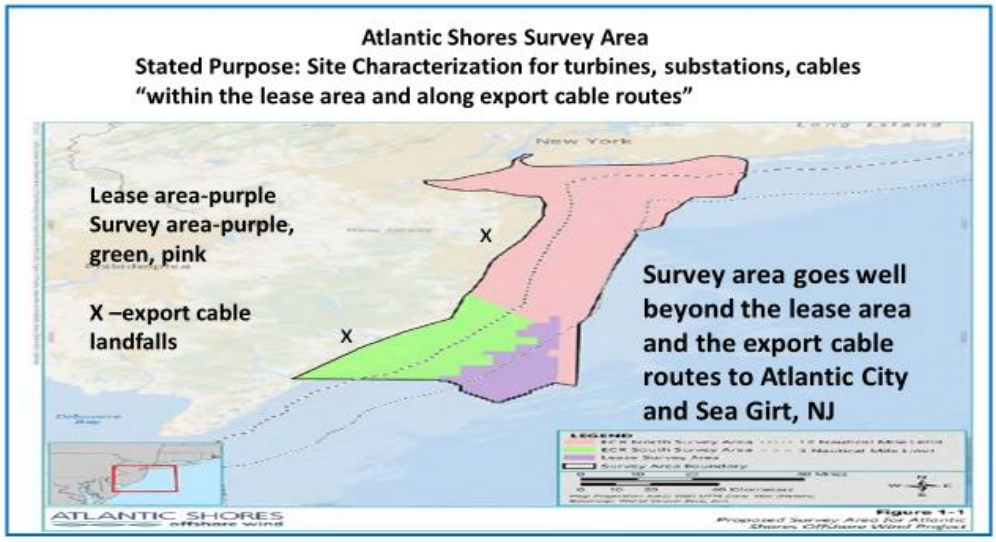
Dr. Bob Stern has many years of work experience in Washington D.C. managing environmental reviews for the Energy Department and has been studying the impact of offshore wind energy projects for years. Defend Brigantine Beach Inc and Downbeach and SaveLBI, Inc agrees with Dr. Stern's and we conclude that there are extraordinary aspects of the wind project locations that should be considered in approving the latest IHA permit for Atlantic Shores as presented in his study, *The Evidence That the Offshore Wond Energy Vessel Surveys are the Cause of the Recent New Jersey Whale & Dolphin Deaths*. See link for full report: (EvidenceUpdated_2024-01-22 (savelbi.org))

The National Environmental Policy Act requires full disclosure and certain impacts are in violation of this requirement. One of those is the impact of the wind project vessel surveys that use high intensity

noise devices to characterize the seabed for installation of the wind turbine foundations and export cables.

Dr. Stern has found that it does exist that there is a correlation between the vessel surveys and the recent whale and dolphin deaths. A presentation of his findings are below.

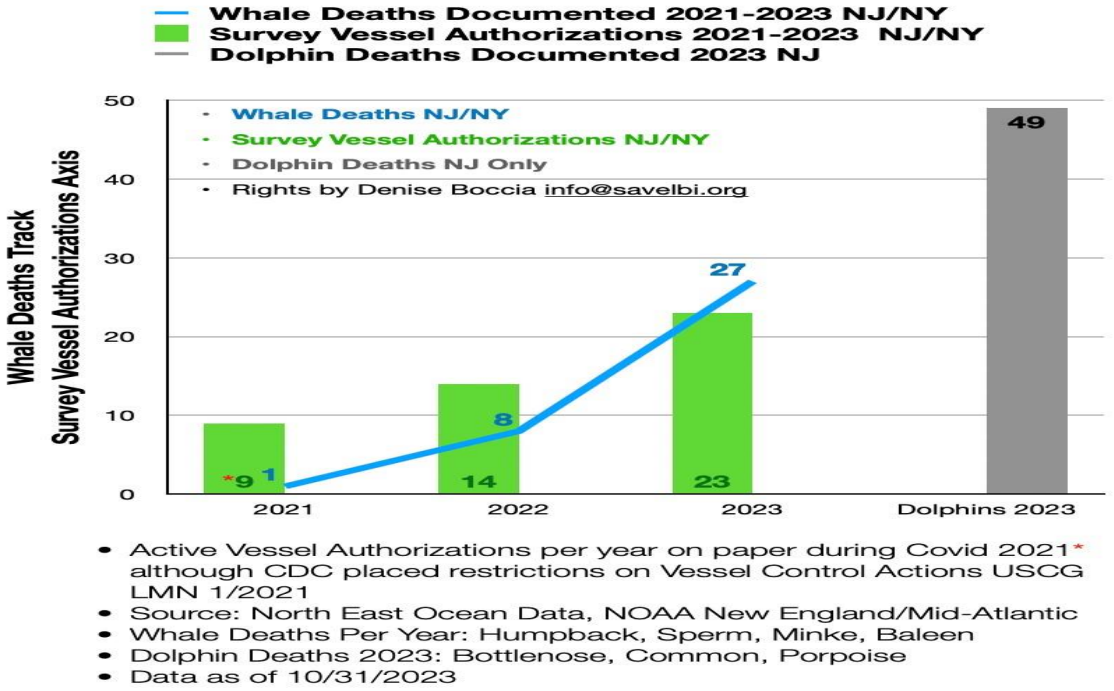
Unnecessarily Large Expanse of Survey Area: The map below shows the survey area for the Atlantic Shores South project. The purpose of this survey is stated at the top of the map, to characterize the lease area, in purple, and its export cable routes whose landfalls are shown by the Xs.



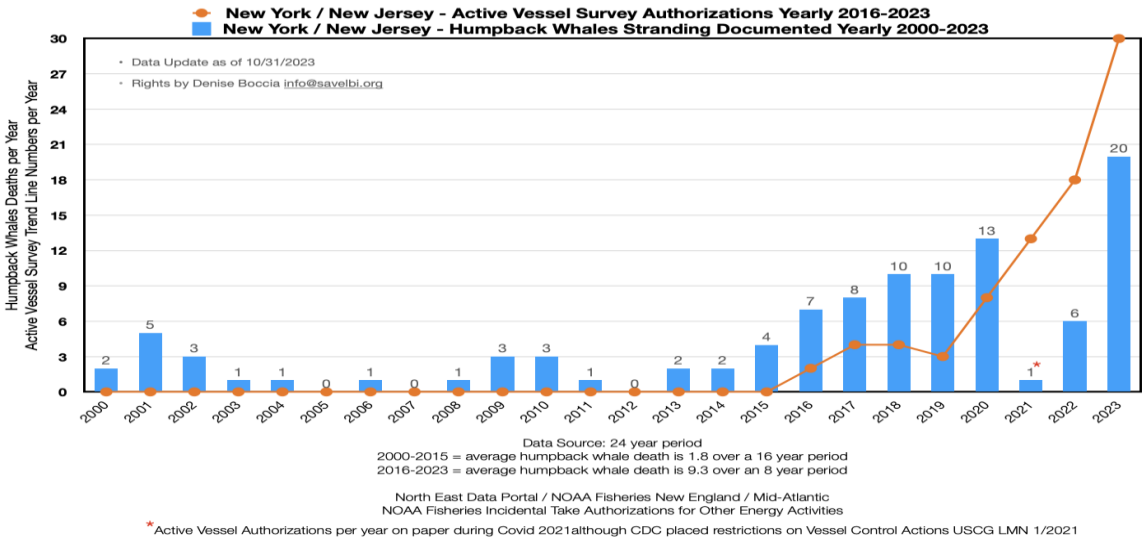
But the whole area, the purple, green and pink, goes far beyond that, all the way up the New Jersey coast and out to Long Island. Similar area extensions exist for the other lease areas in the New York Bight. The survey areas also overlap each other.
The result is a huge area surveyed, in many places repeatedly by different companies. This results in a very large total number of noise disturbances to the animals, and likely repeated disturbances to the same animal. It is not clear why such large survey areas are being approved unless the wind turbine developers and/or BOEM are actually looking for something else, like new turbine locations.

Marine Mammal Deaths and Survey Activity: Based on Coast Guard Mariner reports, the number of survey vessels off New Jersey increased from two in November, 2022 to six in December 2022 when the whale deaths started.

Through March of 2023, there were 27 such deaths in the NJ/NY area. The blue line in the chart below shows the whale deaths reported for the past few years. The green bars show the number of vessel survey authorizations. As you can see, as vessel surveys increase so do the whale deaths. The grey bar shows 49 dolphin deaths in 2023, a very high and unusual number.



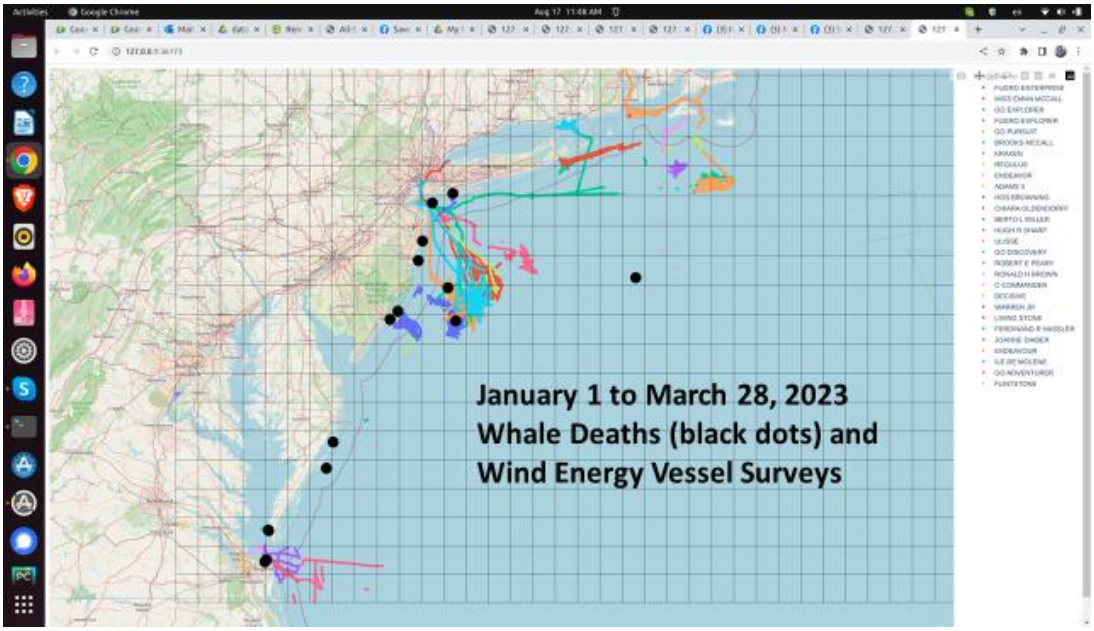
This chart below shows humpback whale stranding and vessel survey authorizations in the NY and NJ area back from 2016 when the surveys began. There is a correlation between the two, the more surveys the more deaths, with a more pronounced effect occurring in the 2021 to 2023 time frame.



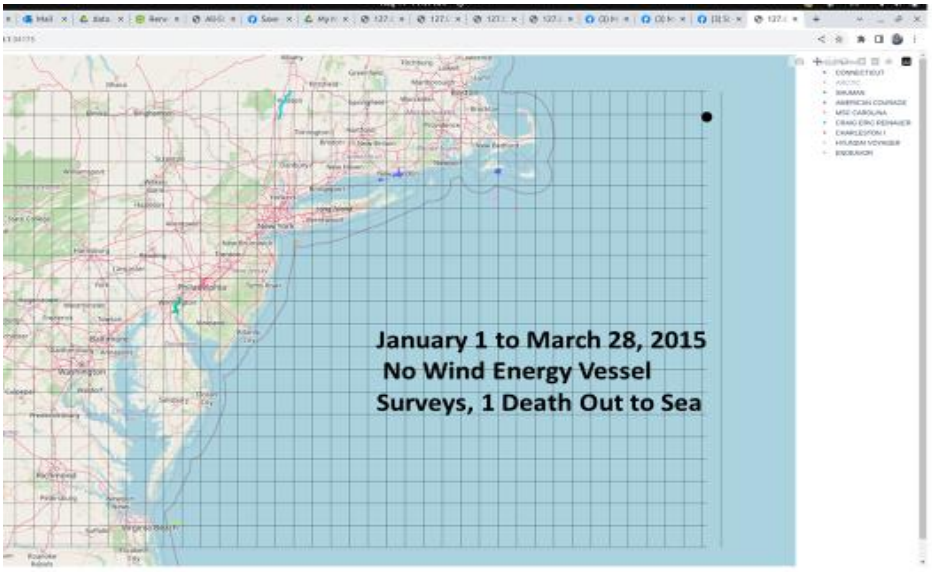
So, time wise the deaths and vessels do correlate.

It is also striking that the places of whale deaths coincide with vessel presence. Here is one chart for the period of January 1 to March 28, 2023 that shows the locations of whale deaths, the black dots,

with the tracks of nearby survey vessels, shown by the colored areas. The vessels are often present where the whales washed up or died.



But going back to that same time period in 2015, before the survey vessels were out there, there was only one death far out to sea, as shown in this map.



Geographically there does appear to be a correlation between whale deaths and vessel survey presence.

Underestimation of Survey Noise and Impact to Marine Mammals: Based on time and place, the surveys and whale deaths seem connected. The connection is related to the high intensity noise devices used by the vessels that affect whales and other marine mammals.

The Agency authorizations for those surveys relied on arbitrary, scientifically unsupported assumptions resulting in a significant underestimation of noise extent. For example, for the Atlantic Shores project's surveys, it relied on an improper low noise source level of 203 dB for the maximum noise controlling Dura-Spark unit, obtained from a much smaller less powerful surrogate device, as opposed to using a higher source level of 211 dB from measured data for the Dura-Spark unit itself.

The measured noise source levels for the Dura-Spark unit, which is the controlling one in terms of noise source level and directionality, are shown in Table 10 below from the Crocker and Frantantonio Report of 2016 that the NMFS often cites. The RMS-root mean square-number is the relevant one to use here for noise propagation. The survey approvals refer to the Dura-Spark unit in the 240- tip mode at energy inputs of around 750 joules. Based on Table 10 that would result in an RMS source level of 211 dB as opposed to 203 dB. Instead of using this data and interpolating between various energy levels, the national marine Fisheries Service (NMFS) uses a 203 dB level obtained from a less powerful, smaller device, the Sig-Electric 820 unit at 750 joules at a 5-meter depth, for all their sparker unit settings and noise inputs. That is technically not justified.

The survey approvals underestimate the distance that the higher noise level extends from the vessel, and therefore the number and frequency of marine mammal disturbances.

Vessel Noise Device –Source Level

Table 10. Applied Acoustics Dura-Spark Acoustic Characteristics

Source Settings		Source Level (dB re 1µPa@1m)				Pulse Width (ms)	Bandwidth 3 dB (kHz)
Energy (Joules)	Tips	Pk-Pk	Pk	RMS	SEL		
100	80	213	207	200	173	2.2	2.6
200 (high)	80	216	212	203	177	2.2	2.8
400 (low)	80	222	218	207	182	2.8	1.9
500 (high)	240	223	219	209	181	1.4	4.4
1,000 (high)	240	228	223	213	186	2.1	3.2
1,250 (high)	240	229	225	214	187	2.3	2.8
500 (high)	400	216	211	203	174	1.1	4.6
2,000 (high)	400	229	224	214	188	2.4	2.8
2,400 (high)	400	229	225	214	188	2.2	2.9
2,400 (high)*	400	226	221	212	185	2.3	2.7
* Source moved closer to side wall							

As shown in the Table below, a number of the other survey vessels have noise source levels even higher than the 211 dB discussed above. This results in even larger distances from those vessels with elevated noise levels that will harm or disturb.

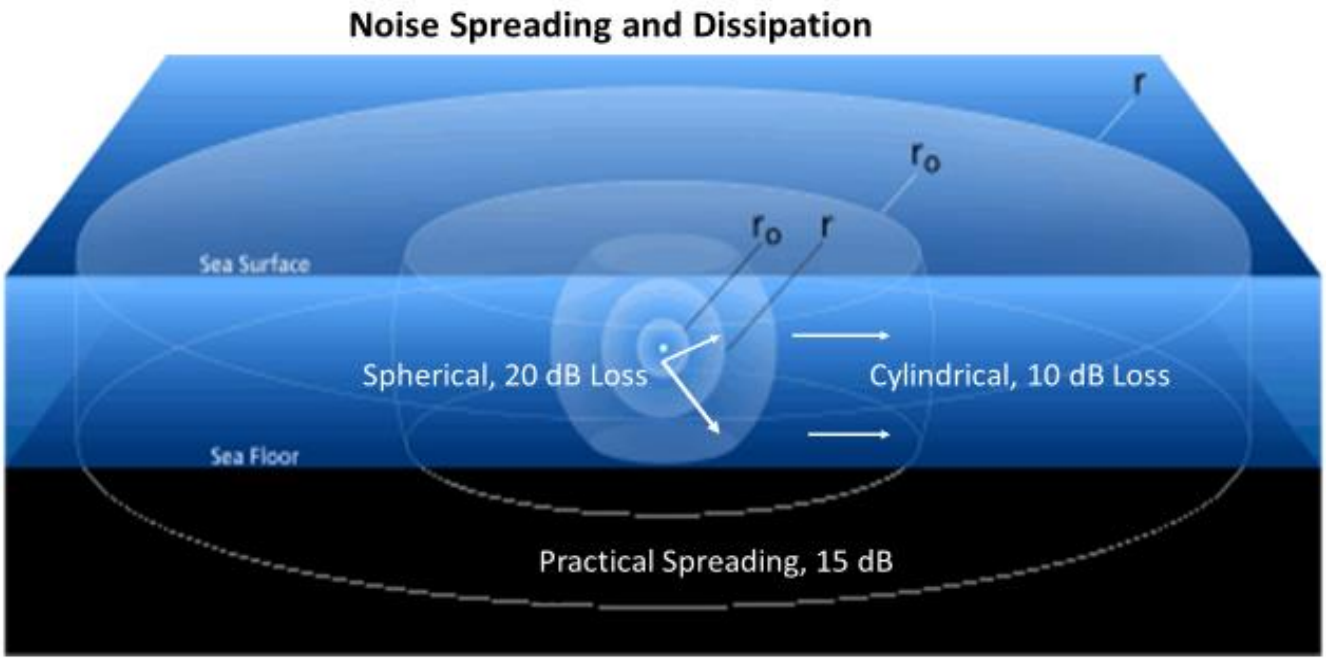
How High are the Vessels Noise Source Levels?

Project/Vessels	Devices, Settings	Source Level(dB)	Range to 160 dB (miles)	Range to 140 dB (miles)
NMFS/All/All	All	203 dB	0.1 @ 20 dB 0.5 @ 15 dB	10
Atlantic Shores Fugro Enterprise, Bella Marie HOS Browning(drilling)	Dura Spark 240, 750 joules Hammering-impl Vibrating-contin	211 (1) 197 (5) 159 (5)	2 0.2	34 4 0.25(to 120 dB)
Community Wind Go Discovery, Go Pursuit Westerly	Dura Spark 400+400, 300 to 1000 joules	210-216(2)	1 -3	29-72
Bluepoint Wind -Gerry Bordelon Go Adventurer, Regulus (new) Time & Tide, Atlantic Surveyor	Dura Spark 400 tip, 500-2000 joules	214 (3)	2.5	53

Project/Vessels	Devices, Settings	Source Level(dB)	Range to 160 dB (miles)	Range to 140 dB (miles)
Attentive Energy Emma McCall, M. Bordelon Regulus(prior drilling)	Dura Spark 400 tip, 500-2000 joules	214 (3) 197/159 (5)	2.5 0.2/NA	53 4/.3(120 dB)
Invenergy/Leading Light Go Explorer Go Seeker- previous	Dura Spark 240 tip, 500 joules or 400+400, 500 joules	209-212 (4)	1-2	25-39
Ocean Wind 1 & 2	Dura Spark 400+400, up to 1000 joules	210-216 (2)	1-3	29-72

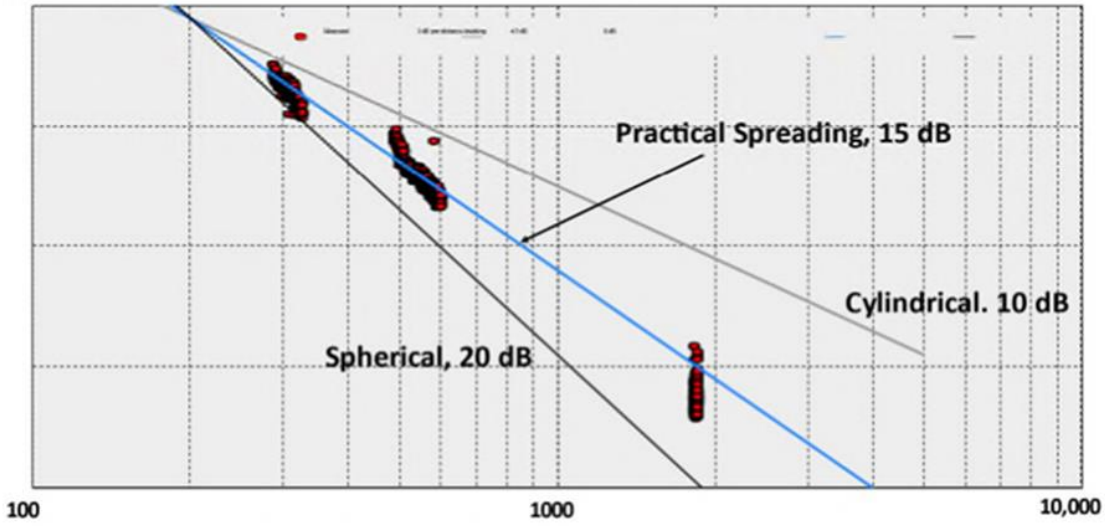
(1) Table 10, Crocker & Frantaninio, 240 tips , interpolation for 750 joules
(2) Table 10, 400 tip, 1000 joules =207 +3 dB for 2 units, operated with 240 tips, 1000 joules = 213 + 3 = 216 dB
(3) Table 10, 400 tip, 2000 joules = 214 dB
(4) Table 10, 240 tip, 500 joules = 209 dB, 400+400 operated with 240 tips, 500 joules = 209 + 3 = 212 dB
(5) From Long-Fei Wong, Underwater Noise Characteristics of Exploratory Drilling, Impact on Marine Mammals.

Secondly, the survey approvals assume that the noise level drops off quickly as it travels away from the vessel. A 20 decibel loss with distance is used everywhere, but that only exists from the vessel until the sound wave hits the bottom, as shown in the picture below. Then the sound travels out between the seabed and surface and doesn't dissipate nearly as much.



Dr. Stern used a rate of 15 decibels for that transition which has been used by the agencies for other survey authorizations. The most compelling evidence for the 15 dB loss is shown below where is provides the closest match to actual noise measurements – the green and red dots.

Measured noise levels versus distance in Figure 6 of the report titled "Underwater noise emissions from offshore wind turbines", 2005, Klaus Betke, also show **a match with a 15 dB loss rate**, as shown below.



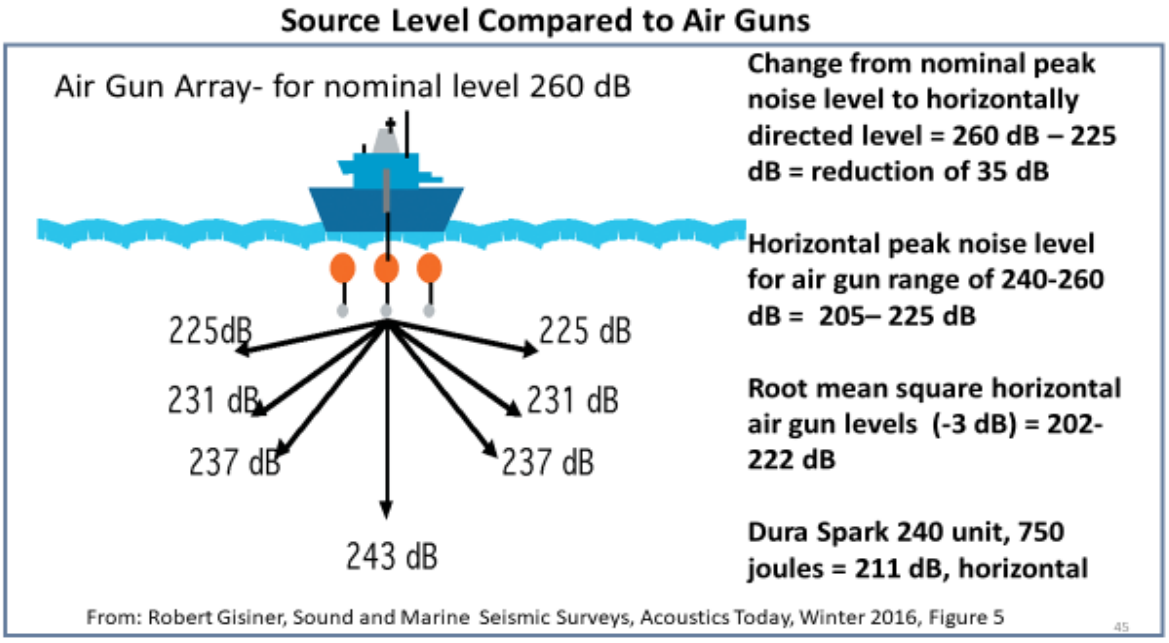
For the vessel surveys, the NMFS applies the spherical spreading factor of 20 dB well beyond the water depths encountered here. This is inconsistent with the physical laws governing noise propagation in a shallow water environment and is also contradicted by existing NMFS and BOEM Guidance documents.

The difference of 5 decibels has a very significant impact on the whales. Because noise is measured in decibels, an increase **of just three means that the intensity of the noise has doubled**. The difference in the distance from the vessel with elevated noise using the Agency's numbers versus Dr. Stern's is striking, **from one-tenth of a mile to 1 and a half miles**, meaning many more animals disturbed.

As a result, the serious harm and fatality to marine mammals that can occur from such disturbances is not adequately addressed. That harm can come from many directions, including the loss of navigation capability, the ability to detect food prey and predator, and the loss of communication e.g., between mothers and calves.

Thirdly, the potential harm to an animal from repeated disturbances is not addressed. Such repeated disturbances to the same animal can occur from close passes of the same vessel, and from multiple companies and vessels surveying the same, large overlapping areas. Perhaps, like us, multiple disturbances in the same day are not readily dealt with.

Finally, many past marine mammal stranding events around the world have been associated with vessel surveys using air guns. Some were concerned with those surveys, but not the surveys for the offshore wind projects off the Atlantic Coast, saying that the air gun noise is louder, and that's true. But most of that energy is directed downward. When you look at the noise going outward between the seabed and surface where the animals are, as shown here, the effects of both devices are similar. Therefore, past episodes are also evidence of the potential cause of marine mammal deaths.



Other marine mammal stranding incidents documented by Dr. Stern are attached to this document in Appendix B

As shown in the device comparisons, the events in Appendix B involving air-guns and mid-frequency sonars have sound levels emanating outward horizontally comparable to or somewhat higher than the Dura Spark 240 unit here. However, the noise source level and all-direction propagation of the noise from the sparker unit is sufficient to require a considerable distance to dissipate down to the 160 or 140-dB criteria, and thus likely to disturb a large number of animals.

In addition, the noise intensity and affected ranges from the sparker units increases exponentially with input power. Although certain power levels are mentioned in the animal Take Authorizations here, there is apparently no record being kept of the electrode settings and power inputs to the devices. Dr. Stern asked for such information from the National Marine Fisheries Service in a Freedom of Information Act request but has received no data.

Therefore, Dr. Stern concludes, and we agree that the units are being operated at higher power inputs and generating higher noise source levels emanating horizontally even closer to those of the air-guns and mid-frequency sonars.

There are differences but also similarities among the air-gun, mid-frequency sonars and sparker units. Therefore, the evidence from the air-gun and sonar events cannot be ignored in assessing the potential for the current surveys as a cause of the recent whale and dolphin stranding.

No Other Plausible Causes for the Deaths Have Been Put Forward: Some say that the recent whale and dolphin deaths are due to vessel strike and entanglements or changed feeding patterns due to climate change. We do not agree with these explanations for the following reasons.

- Commercial vessel activity off the NJ area actually decreased from November 2022 during the time of the whale deaths.
- The NJ Marine Mammal Stranding Center has connected only 20 percent of the whale deaths to “blunt force trauma” and “possible vessel strike”, and even those could have been precipitated by disorientation from the vessel survey noise.
- The agencies often cite a 40 percent number due to vessel strike, but that is actually 40 percent of the whales examined, and only about half are examined.
- Additionally, they jump from “blunt force trauma” which could also come from beach stranding and ”possible vessel strike” to vessel strike.
- In addition, as far as we know, no study shows a change in zooplankton locations here, and even if there were, it would not explain why whales would die from feeding in a new location.

Conclusion and Recommendation There is actually a lot evidence of vessel survey cause of whale deaths, summarized here.

Summary of "The Evidence"

- There have been unprecedented spikes in whale deaths.
- They began locally when the vessel surveys increased.
- The time and place of the whale deaths coincides with survey vessel presence.
- The elevated noise range from the vessel is underestimated.
- The indirect harm and fatality from disturbance level noise is not addressed, nor is the effect of repeated disturbances on an animal from passes from the same vessel, or from overlapping surveys.
- There have been many whale stranding events worldwide with noise devices having similar horizontal noise patterns.
- No other plausible cause has been put forward.

We conclude that the vessel surveys are the likely cause of the whale deaths.

We recommend that in addition to denying the IHA Permit, the NMFS and NOAA should cease all vessel surveys until a proper, thorough, and independent investigation is done, and at a minimum, the following actions are taken:

- The survey areas should be cut back to only what's necessary to characterize the lease area and the export cable routes. Any future turbine locations should be determined by the agency through the proper program and environmental reviews, and not prejudiced by these surveys.

- The energy inputs to the noise devices should be made public, reviewed and as appropriate adjusted downward.

- A coordinated data sharing survey program using fewer vessel surveys should be set up.

Respectfully submitted,

Defend Brigantine Beach, Inc and Downbeach

Katie Finnegan, President
Dr. Suzanne Moore, Treasurer
Tom Jones, Secretary
Sharri Lilienfeld, Downbeach Committee Co-Chair
Margaret Reale, Donwbeach Committee Co-Chair

Dr. Bob Stern, President of SaveLBI, Inc requests that all comments in this document go on the record for him and the SaveLBI Inc organization.

Appendix A.

Level A Takes	TOTAL ANNUAL	US Wind	Park City Wind	Sunrise Wind	SouthCoast Wind (formerly Mayflower Wind)	Atlantic Shores	Empire Offshore Wind
Type		Operation & Const	Operation & Const	Operation & Const	Construction	Construction	Contruction
Lease number		0490	0534,0501 (SW PORTION)	0487	0521	0499	512
Area		MD	MA	NY	MA	NJ	
Renewal/Initial							
Inprocess/Active		Inprocess	Inprocess	Inprocess	Inprocess	Inprocess	Inprocess
Date		1/1/25-12/31/29	3/27/25-3/26/30	11/20/23-11/19/28	2025-2030	2025-2029	1/22/24-1/21/29
NORTH ATLANTIC RIGHT WHALE*	-					-	
BLUE WHALE *	-					-	
FIN WHALE	46	2	1	4	25	-	1
SEI WHALE *	8	1	1	2		-	
MINKE WHALE	68	1	4	27		-	4
HUMBACK WHALE	36	2	1	3		-	
SPERM WHALE*	1		1			-	
ATLANTIC WHITE-SIDED DOLPHIN	29		1			-	
ATLANTIC SPOTTED DOLPHIN	1		1			-	0
PANTROPICAL SPOTTED DOLPHIN	-					-	
BOTTLENOISE DOLPHIN (WN ATLANTIC OFFSHORE)	20		1			-	
BOTTLENOISE DOLPHIN (NORTHERN MIGRATORY COASTAL)	22					-	
COMMON BOTTLENOSE DOLPHIN (S MIGRAT)	-					-	
WHITE BEAKED DOLPHIN						-	
LONG-FINNED PILOT WHALE	10		1			-	
KILLER WHALE						-	
FALSE KILLER WHALE						-	
SHORT FINNED PILOT WHALE	1		1			-	
CUVIER'S BEAKED WHALE	-					-	
MESOPLODONT WHALE	-					-	
RISSO'S DOLPHIN	8		1			-	1
STRIPED DOLPHIN						-	
ROUGH TOOTHED DOLPHIN	-					-	
SHORT BEAKED COMMON DOLPHIN	-					-	
COMMON DOLPHIN	36		1			-	
PILOT WHALE	-					-	
HARBOR PORPOSE	308		56	20	109	-	
GRAY SEAL	62		8	3	14	-	
HARBOR SEAL	95		17	5	30	-	
HARP SEAL	10		8			-	
*Endangered	761	6	104	64	178	-	6

Level A Takes	Dominion Energy	Revolution Wind	Ocean Wind 1	Vineyard Wind 1 llc
Type	Construction	Construction	Contruction	Construction
Lease number	0483	0486	0498	0501
Area	VA	RI	NJ	MA
Renewal/Initial				
Inprocess/Active	Active	Active	Active	Active
Date	2/5/24-2/4/29	11/20/23-11/19-28	10/13/23-10/12/28	5/1/23-4/30/24
NORTH ATLANTIC RIGHT WHALE*				
BLUE WHALE *				
FIN WHALE	4		4	5
SEI WHALE *	1		1	2
MINKE WHALE	8		22	2
HUMBACK WHALE	4	8	8	10
SPERM WHALE*				
ATLANTIC WHITE-SIDED DOLPHIN				28
ATLANTIC SPOTTED DOLPHIN				
PANTROPICAL SPOTTED DOLPHIN				
BOTTLENOISE DOLPHIN (WN ATLANTIC OFFSHORE)			11	8
BOTTLENOISE DOLPHIN (NORTHERN MIGRATORY COASTAL)			22	
COMMON BOTTLENOSE DOLPHIN (S MIGRAT)				
WHITE BEAKED DOLPHIN				
LONG-FINNED PILOT WHALE				9
KILLER WHALE				
FALSE KILLER WHALE				
SHORT FINNED PILOT WHALE				
CUVIER'S BEAKED WHALE				
MESOPLODONT WHALE				
RISSO'S DOLPHIN				6
STRIPED DOLPHIN				
ROUGH TOOTHED DOLPHIN				
SHORT BEAKED COMMON DOLPHIN				
COMMON DOLPHIN				35
PILOT WHALE				
HARBOR PORPOSE	1	49	69	4
GRAY SEAL	1	3	31	2
HARBOR SEAL	1	5	35	2
HARP SEAL				2
*Endangered	20	65	203	115

Level B Takes	TOTAL ANNUAL	Atlantic Shores Takes	Bluepoint Wind	Atlantic Shores	US Wind	Park City Wind	Sunrise Wind	TerraSond	SouthCoast Wind (formerly Mayflower Wind)
		Total	Surveys	Surveys	Operation & Const	Operation & Const	Operation & Const	Surveys	Construction
Lease number			0537	0499,0541,0549	0490	4,0501 (SW PORTI	0487	0545,0546	0521
Area			NY/NJ BIGHT	NY, NJ, DEL, MD	MD	MA	NY	NC/SC	MA
Renewal/Initial			Renewal						
Inprocess/Active			Inprocess	Inprocess	Inprocess	Inprocess	Inprocess	Inprocess	Inprocess
Date			3/1/24-2/28/25	4/1/24-3/31/25	1/1/25-12/31/29	3/27/25-3/26/30	11/20/23-11/19/28	2/1/23-2/1/24	2025-2030
NORTH ATLANTIC RIGHT WHALE*	449	15	11	2	2	19	35	3	119
BLUE WHALE *	13	-					4		
FIN WHALE	1,407	23	63	4	4	11	78	2	400
SEI WHALE *	249	13	15	2	1	6	31		55
MINKE WHALE	3,248	93	149	17	3	41	419		878
HUMBACK WHALE	1,327	27	27	3	3	8	89	2	272
SPERM WHALE*	222	7	5			3	14	1	94
ATLANTIC WHITE-SIDED DOLPHIN	10,084	126	316	21		31	639	628	3,070
ATLANTIC SPOTTED DOLPHIN	5,076	375	162	25	24	31	114		2
PANTROPICAL SPOTTED DOLPHIN	25	-			5				
BOTTLENOISE DOLPHIN (WN ATLANTIC OFFSHOR	24,898	1,784	204	291	847	20	425	631	2,056
BOTTLENOISE DOLPHIN (NORTHERN MIGRATORY	13,694	3,632	730	455					
COMMON BOTTLENOSE DOLPHIN (S MIGRAT)	37,429	-						38	35,807
WHITE BEAKED DOLPHIN		-							
LONG-FINNED PILOT WHALE	1,170	89	50	9	27	18			
KILLER WHALE		-							
FALSE KILLER WHALE		-							
SHORT FINNED PILOT WHALE	501	12				10			
CUVIER'S BEAKED WHALE	58	-						3	
MESOPLODONT WHALE	14	-						3	
RISSO'S DOLPHIN	2,545	128	38	8	9	8	47		1,336
STRIPED DOLPHIN		-							
ROUGH TOOTHED DOLPHIN	29	-						19	
SHORT BEAKED COMMON DOLPHIN	23,371	-			29				
COMMON DOLPHIN	66,477	985	3,456	185		222	7,393	49	
PILOT WHALE	1,123	-					58	26	541
HARBOR PORPOSE	14,818	555	958	97		296	1,008	3	2,537
GRAY SEAL	16,723	1,472	861	207		346	1,099	2	2,818
HARBOR SEAL	23,927	1,662	861	207		776	2,468	2	5,150
HARP SEAL	567	-				346			
*Endangered	249,503	10,998	7,906	1,533	954	2,192	13,921	1,412	55,135

Level B Takes	Atlantic Shores	Empire Offshore Wind	Dominion Energy	Park City Wind	Revolution Wind	Orsted Wind Power NA	Ocean Wind 1
	Construction	Contruction	Construction	Surveys	Construction	Surveys	Contruction
Lease number	0499	512	0483	0534	0486	0486,0487,0500	0498
Area	NJ		VA	MA-NY	RI	NY-MA	NJ
Renewal/Initial				Reissuance		Renewal	
Inprocess/Active	Inprocess	Inprocess	Active	Active	Active	Active	Active
Date	2025-2029	1/22/24-1/21/29	2/5/24-2/4/29	3/1/24-2/28/25	11/20/23-11/19-28	10/6/23-10/5/24	10/13/23-10/12/28
NORTH ATLANTIC RIGHT WHALE*	5	13	6	30	50	17	7
BLUE WHALE *				1	3		4
FIN WHALE	4	136	108	60	101	14	13
SEI WHALE *	5	4	3	5	21	3	3
MINKE WHALE	6	83	51	37	363	13	74
HUMBACK WHALE	3	63	125	46	263	34	66
SPERM WHALE*	3	3	3	5	8	2	9
ATLANTIC WHITE-SIDED DOLPHIN	25	747	15	1,014	312	210	100
ATLANTIC SPOTTED DOLPHIN	200	90	2,042	29	87	29	135
PANTROPICAL SPOTTED DOLPHIN			20				
BOTTLENOISE DOLPHIN (WN ATLANTIC OFFSHOR	225		3,888	399	375	139	1,360
BOTTLENOISE DOLPHIN (NORTHERN MIGRATORY	1,949	4,935					1,394
COMMON BOTTLENOSE DOLPHIN (S MIGRAT)							1,584
WHITE BEAKED DOLPHIN							
LONG-FINNED PILOT WHALE	40			86		52	30
KILLER WHALE							
FALSE KILLER WHALE							
SHORT FINNED PILOT WHALE	12						30
CUVIER'S BEAKED WHALE							
MESOPLODONT WHALE							
RISSO'S DOLPHIN	60	200	25	30	43	30	90
STRIPED DOLPHIN						20	
ROUGH TOOTHED DOLPHIN							
SHORT BEAKED COMMON DOLPHIN		9,870				6,000	
COMMON DOLPHIN	112		1,660	10,176	10,521		
PILOT WHALE		417	54		27		
HARBOR PORPOSE	35	243	22	759	1,283	287	350
GRAY SEAL	155	484	56	400	1,073	118	305
HARBOR SEAL	345	678	56	897	2,669	118	844
HARP SEAL		4					
*Endangered	3,184	17,970	8,134	13,974	17,199	7,086	6,398

Level B Takes	Atlantic Shores Offshore Wind Bight	Vineyard NE	Ocean Wind II	Invenergy Wind Offshore (NY Bight)	Community Offshore Wind (NY Bight)	Attentive Energy (NY Bight)	Atlantic Shores Offshore Wind
	Surveys	Surveys	Surveys	Surveys	Surveys	Surveys	Surveys
Lease number	0541	0522,0544	0532	0542	0539	0538	0499,0549
Area	NJ,NY	MA-NJ	NJ	NJ, NY	NJ, NY	NJ, NY	NJ, NY
Renewal/Initial							
Inprocess/Active	Active	Active	Active	Active	Active	Active	Active
Date	8/10/23-8/9/24	7/27/23-7/26/24	7/21/23-7/20/24	7/31/23-7/30/24	7/1/23-6/30/24	6/20/23-6/19/24	6/9/23-6/8/24
NORTH ATLANTIC RIGHT WHALE*	5	12	2	6	24	12	3
BLUE WHALE *		1					
FIN WHALE	9	20	4	18	76	38	6
SEI WHALE *	4	5	1	7	24	12	2
MINKE WHALE	46	46	8	92	304	179	24
HUMBACK WHALE	16	12	4	13	46	24	5
SPERM WHALE*	2	2	3	2	10	3	2
ATLANTIC WHITE-SIDED DOLPHIN	63	129	50	101	427	207	17
ATLANTIC SPOTTED DOLPHIN	100	29	15	42	320	89	50
PANTROPICAL SPOTTED DOLPHIN							
BOTTLENOISE DOLPHIN (WN ATLANTIC OFFSHOR	179	169	2,221	611	1,316	1,746	1,089
BOTTLENOISE DOLPHIN (NORTHERN MIGRATORY		45		795	115	389	1,228
COMMON BOTTLENOSE DOLPHIN (S MIGRAT)							
WHITE BEAKED DOLPHIN		30					
LONG-FINNED PILOT WHALE	20	17	20	15	78	21	20
KILLER WHALE		4					
FALSE KILLER WHALE		5					
SHORT FINNED PILOT WHALE							
CUVIER'S BEAKED WHALE							
MESOPLODONT WHALE							
RISSO'S DOLPHIN	30	9	30	10	59	23	30
STRIPED DOLPHIN							
ROUGH TOOTHED DOLPHIN							
SHORT BEAKED COMMON DOLPHIN		7,472					
COMMON DOLPHIN	588		400	888	5,572	2,056	100
PILOT WHALE							
HARBOR PORPOSE	281	347	72	950	1,912	1,095	142
GRAY SEAL	374	418	13	950	1,955	1,596	736
HARBOR SEAL	374	939	13	950	1,955	1,596	736
HARP SEAL							
*Endangered	2,091	9,711	2,856	5,450	14,193	9,086	4,190

Level B Takes	TerraSond Limited (NYBight)	SouthCoast Wind Energy	Orsted Wind Power NA	Bluepoint Wind (NY Bight)	Vineyard Wind 1 llc
	Surveys	Surveys	Surveys	Surveys	Construction
Lease number	0539,0541,0542, Central Atlantic Call Area	0521	0482,0519	0537	0501
Area	NJ, NY	MA, RI	DE	NJ, NY	MA
Renewal/Initial			Reissued		
Inprocess/Active	Active		Active	Active	Active
Date	4/1/24-3/31/25	5/12/23-5/11/24	5/10/23-5/9/24	3/1/24-2/28/25	5/1/23-4/30/24
NORTH ATLANTIC RIGHT WHALE*	15	6	11	14	20
BLUE WHALE *					
FIN WHALE	105	7	7	86	33
SEI WHALE *	13	2	1	20	4
MINKE WHALE	98	13	2	204	98
HUMBACK WHALE	52	55	4	36	56
SPERM WHALE*	32	2	3	6	5
ATLANTIC WHITE-SIDED DOLPHIN	345	28	50	432	1,107
ATLANTIC SPOTTED DOLPHIN	1,196	29	15	221	
PANTROPICAL SPOTTED DOLPHIN					
BOTTLENOISE DOLPHIN (WN ATLANTIC OFFSHOR	3,005	152	2,752	702	96
BOTTLENOISE DOLPHIN (NORTHERN MIGRATORY				1,659	
COMMON BOTTLENOSE DOLPHIN (S MIGRAT)					
WHITE BEAKED DOLPHIN					
LONG-FINNED PILOT WHALE	480	8	20	68	91
KILLER WHALE					
FALSE KILLER WHALE					
SHORT FINNED PILOT WHALE	449				
CUVIER'S BEAKED WHALE	55				
MESOPLODONT WHALE	11				
RISSO'S DOLPHIN	339	7	20	52	12
STRIPED DOLPHIN					
ROUGH TOOTHED DOLPHIN	10				
SHORT BEAKED COMMON DOLPHIN					
COMMON DOLPHIN	11,225	2,094	400	4,734	4,646
PILOT WHALE					
HARBOR PORPOSE	514	83	82	1,312	150
GRAY SEAL	993	167	4	1,179	414
HARBOR SEAL	822	74	4	1,179	214
HARP SEAL					217
*Endangered	19,759	2,727	3,375	11,904	7,163

Appendix B

II. Stranding Incidents Associated with Nearby Seismic Surveys

There have been a number of stranding incidents worldwide associated with the air gun and sonar systems, some of which are presented below.

Given that the US agencies and stranding networks and other international networks as well rarely engage in comprehensive and detailed investigation of stranding events occurring in the vicinity of seismic surveys or naval exercises, it can be argued that the connection between the seismic surveys and stranding is seriously underestimated.

The first five events of multiple-animal stranding (mass standings) described just below were associated with the use of high intensity sonar during naval operations and with the use of air guns during seismic reflection profiling. They predominantly involved beaked whales particularly Cuvier's beaked whales [(2) Table 7.5] An increasing number of such stranding from 1950 to 2000 can be correlated with the increasing use of mid frequency anti-submarine warfare (ASW) sonar [(2)], figure 7.1. As mentioned above the mid frequency sonar has similarities to the sparker units being employed off the New Jersey coast.

Event six a mass-stranding on Kauai, Hawaii on July 3 and 4, 2004 where an estimated 150-200 melon-headed whales packed into shallow Hanalei Bay for a period of about 28 hours. While not conclusively proven, NOAA acknowledged a correlation with sonar in the mass stranding of melon-headed whales that occurred there. At the time of the stranding, the Navy was conducting exercises involving loud sonar in the area. "Sound propagation models suggest that sonar transmissions were likely detectable over a large area around Kauai for many hours on the day prior to the stranding, as well as within Hanalei Bay when the animals were there," said Brandon Southall, NOAA Fisheries Service's Acoustics Program Director. They were finally gently herded out by members of the community including the Hanalei Canoe Club, local and federal employees, and volunteers and staff with the Hawaiian Islands Stranding Response Group.

Event seven involving a large group of melon headed whales (Peponocephala electra) was reported to be deep within the Loza Bay mangrove system in northwest Madagascar, May 31, 2008.

While aspects of this event will remain unknown, the ISRP noted that a high-power 12 kHz multi-beam echo sounder system (MBES) operated intermittently by a survey vessel moving in a directed manner down the shelf-break the day before the event, to an area ~65 km offshore from the first known stranding location. The ISRP deemed this MBES use to be the most plausible and likely behavioral trigger for the animals initially entering the lagoon system. This conclusion is based on:

(1)Very close temporal and spatial association and directed movement of the MBES survey with the stranding event. The MBES vessel moved in a directed manner transmitting sounds that would have been clearly audible over many hundreds of square kilometers of melon-headed whale deep-water habitat areas (and extending into some shallower waters along the shelf break) from 0544 until 1230 local time on 29 May and then intermittently in a concentrated offshore area (located ~65 km from the mouth of the lagoon) between 1456 and 1931 on 29 May; these preceded the first known stranding during the day of 30 May and sighting of live animals within the lagoon at 2300 on 30 May.

(2)The unusual nature of this type of stranding event coupled with previous documented apparent behavioral sensitivity in this pelagic species (albeit to other sound types - discussed in more detail below) [(4)]

(3)The fact that all other possible factors considered were determined by the ISRP to be unlikely causes for the initial behavioral response of animals entering the lagoon system.

Quoting from the Exxon EIA (2008):

"ExxonMobil Exploration and Production (Northern Madagascar) Limited (EMEP (NM) L), plans to carry out a high resolution 2D seismic survey over prospective drilling locations of the Sifaka Prospect, take sea floor and water samples in the prospect area for an Environmental Baseline Study, conduct a multi-beam bathymetry study and survey the upper slope to identify shallow water features in the Ampasindava Block, offshore Madagascar. The work will be conducted in May to June, 2008 for a period of approximately 30 days."

Event eight includes a lawsuit filed by Public Employees for Environmental Responsibility (PEER) regarding the largest recorded mass beaching of rare Stejneger's beaked whales (also known as Bering Sea beaked whales or saber-toothed whales) that took place in August 2018 on the beaches of the Aleutian island of Adan. While the final cause of these deaths has not been determined, this type of mass stranding has been known to follow active acoustic (sound generating) activity by naval or other ships that can scare these deep-diving whales quickly to the surface, causing fatal decompression impacts.

Just prior to the 2018 beaked whale mass stranding, recording devices from the Alaska Volcano Observatory in the region recorded distinct anthropogenic acoustic sources, repeating at regular intervals, for hours at a time. The source of these sonic pulses remains unknown, and Professor Richard Steiner sought to identify potential sources. Through FOIA inquiries with NOAA, the U.S. Navy, and the U.S. Geological Survey (all of which were answered in a timely fashion), Prof. Steiner was able to determine that no domestic vessels were permitted to operate any active source sonic equipment in that area during that time. We understand from the Research Application Tracking System (RATS) that State requires the following: "If the research involves the study or incidental take of marine mammals or species listed under the Endangered Species Act, include the appropriate authorization from the NOAA Office of Protected Resources (i.e., Research Permit or an Incidental Take Permit/Authorization)." NOAA confirms that no Incidental Harassment Authorizations (IHAs) were issued for such activity in the Aleutians that year.

From those FOIA requests, and the Alaska Marine Exchange's Automatic Identification System (AIS) tracking data, Prof. Steiner learned that three Japanese research ships had operated in the area during the period in question. One of these was the Yushin Maru #2, a notorious Japanese whaling ship (owned and operated by the Japan Institute for Cetacean Research), that had been permitted to deploy as many as 240 acoustic sonobuoys in the water for its cetacean research in the Bering Sea/Aleutian Islands that summer.

Significantly, later that year, after a long, tense diplomatic dispute with the U.S. and other anti-whaling nations, Japan withdrew from the International Whaling Commission (IWC) in order to resume commercial whaling. Prof. Steiner was trying to determine precisely what these, or other, foreign research ships were doing in those waters at that time, and whether they may have conducted acoustic activities, permitted or not, that caused the mass stranding – and the State MSR consent letters appear to be the only source of this information.

A new scientific paper suggesting that seismic activity may have been involved in a mass stranding death of whales along the Aleutian Islands. The 2018 event on Adak is the largest known mass stranding of Stejneger's beaked whales.

When whales strand along the shores of Alaska's remote and far-flung Aleutian Islands, they may never be discovered by humans. The chain of small, sparsely populated islands arc from the tip of the Alaska Peninsula west 1,100 miles to Attu Island.

The U.S. State Department approves foreign vessels to conduct scientific research in U.S. waters without public notice or ensuring they obtain the same permits domestic researchers must or monitoring their activities. Pointing to the largest

recorded beaching of rare Bering Sea beaked whales while Japanese whaling "researchers" operated nearby, Public Employees for Environmental Responsibility (PEER) is calling for system-wide reform.

In March 2021, Professor Steiner submitted FOIA requests to NOAA, the Navy, and the U.S. Geological Survey. All were answered in a timely fashion and indicated that there were no domestic vessels, military or research, permitted to conduct active acoustic activity in the area in 2018.

However, Professor Steiner then learned that there had been three Japanese research ships in the Bering Sea in the summer of 2018, including the Yushin Maru #2, a notorious whaling outlaw, that had been approved to conduct cetacean "research" using acoustic sonobuoys in the Bering Sea/Aleutian Islands for the International Whaling Commission. Such research activities are required to obtain Incidental Take/Harassment Authorizations, but NOAA confirms that no authorizations were issued for such work in Alaska that year. To date, the source of the recorded (illegal) underwater sounds waters that may have caused the mass stranding remains undetermined.

1. Kyparissiakos Gulf, Greece 1996 (2)

One mass stranding of Cuvier beaked whales in the Ionian Sea coincided with tests of
ASW sonar by NATO. The stranding coincided with a four-day period when the vessel R/V Alliance was towing an acoustic source in the vicinity. The source generated both low and mid-frequency sound at source levels of 226 dB projected horizontally. The Greek government temporarily stopped seismic surveys as a result.

Along 56 km of coastline, 14 Cuvier beaked whales were stranded during 12–13 May 1996. Twelve of 14 animals stranded alive, with no apparent disease or pathogenic cause. These stranding corresponded with a four- day period (12–16 May) when the vessel *NRV Alliance* was towing an acoustic source in the vicinity. The acoustic source generated both low-frequency and mid-frequency sound at source levels of 226 dB re 1µPa @ 1m. The transmitted low-frequency signal included a 2 sec upsweep at 450-650 Hz, and a 2 sec cw tone at 700 Hz. The midfrequency signal included a 2 sec upsweep at 2.8-3.2 kHz and a 2 sec tone at 3.3 kHz. Both sources projected horizontally directed beams of sound with vertical beam widths of about 23 degrees. Three source tows of about 2 hours duration were conducted each day; and the stranding occurred most closely in time with the first two source runs of May 12th and the last two source runs of May 13.

The association of stranding locations and acoustic source tracks in space and time is compelling evidence that these animals were affected by the ASW sonar. There is a general correlation between the offshore source track locations and the inshore stranding locations. The May 13th source tow track is shifted northward from the May 12th track, and likewise some of the May 13th stranding locations are farther north. Correlation of stranding times and source track locations for May 12 th suggests that at least three of the six animals with known stranding times were affected by the 0600-0800 source tow (run 9) as their stranding times precede the 1100-1300 source tow (run 10). Assuming that they were near the source when they were exposed to a high sound level, their swimming distances were approximately 30 nm to reach the shore, covered at speeds of approximately 10 knots. The two stranding in the afternoon of May 12th with known times likewise required swimming distances of 20-30 nm

2. The Bahamas March 15 -16th, 2000 (2)

Sixteen cetaceans were found stranded along the providence channel in the Bahamas
Islands during a two-day period in March, 2000 and the episode was correlated with ta US Navy training exercise using mid frequency ASW sonar. Gross necropsy results on five of the dead whales suggested that they were in good body

condition, none showed evidence of debilitating disease. The five Navy ships operating ASW sonars in the area showed a close correlation in space and time with the stranding locations as shown in Figure 7.3 [(2)] The noise source levels were 235 dB with operating frequencies between 2.6 and 3.3 kHz.

The stranded animals were predominantly beaked whales. At least two minke whales *were* also found stranded. One dolphin stranded at a somewhat distant location and may have died of unrelated causes. Eight of the beaked whales died, and the remaining animals were re-floated and their fate is unknown. None of these animals has been recognized as re-stranded or re-sighted. Tissue samples were collected from five of the dead beaked whales. Gross necropsy results suggested that all five were in good body condition; none showed evidence of debilitating disease. Some kind of auditory damage was found in four of the beaked whales examined.

Hemorrhages were found in the acoustic fats of the head, the inner ears, and some spaces around the brain, with no evidence of external blunt force trauma. The pattern of injury in the freshest specimens suggested that the ears were structurally intact and the animals were alive at the time of injury.

Four U.S. Navy ships were operating hull-mounted ASW sonars in the area, two SQS-53C and two SQS-56. The SQS-53C sonars were operated at 2.6 and 3.3 kHz with a source level of 235 dB re 1µPa @ 1 m or higher, and 0.5 - 2 sec ping lengths alternating between tones and frequency-modulated sweeps. The SQS- 56 sonars were operated at 6.8, 7.5, and 8.2 KHz at 223 dB re 1µPa @ 1 m. Integrated sound exposure levels greater than 160 dB for 10-30 sec were found throughout much of the Providence Channel during March 15th 2000.

The association of stranding locations and acoustic source tracks in space and time is compelling evidence that these animals were affected by the high-intensity sound sources. The acoustic source tracks and stranding locations divided into the morning (0700-1100) and afternoon (1200-1430). During the morning two source ships were in the Providence Channel off the southwest end of Abaco Island and moving toward the west, and the other two source ships were entering the channel from the east.

A cluster of stranding occurred at the south end of Abaco Island during this time, at minimum ranges of 10-30 nm from the ships' closest points of approach. During the afternoon, the source ships moved northwestward, approaching Grand Bahama Island. A cluster of noon and afternoon stranding occurred on the south coast of Grand Bahama Island, again with minimum source-to-shore ranges of 2030 nm. Assuming that these animals received peak sound exposures at locations near the source tracks, then immediately following exposure they would have swum toward the stranding sites at high speed (~ 10 knots). Alternatively, lower exposure levels more distant from the source tracks and closer to the stranding sites would imply slower swim speeds.

3. Madeira, May 2000 [(2)]

A stranding of three Curvier beaked whales occurred in May 2000 on the Madeira Archipelago, in the northeastern Atlantic (Luis Freitas, Madeira Whale Museum, pers. comm.). The deep-water channel between islands has been the site of repeated observations of live animals. The animals that stranded in May 2000 consisted of two sub adults (one male, one female) and a female of unknown age. The two sub adults were examined and found to have hematomas, eye hemorrhages, pleural hemorrhages, and lesions of the lung. The third animal was found in an advanced state of decomposition and did not receive a detailed examination. The presence of a NATO exercise was signaled by naval vessels and aircraft in the deep-water channel, coincident with the stranding events. Details of the acoustic sources in use during this exercise are lacking at this time.

4.Canary Islands, September 24, 2002 [(2)]

A mass stranding of 14 to 19 beaked whales occurred in the Canary Islands on September 24-25, 2002 that were associated with naval maneuvers by Spain and other NATO countries. Necropsies and dissections revealed no visible signs of traumatic lesions physically caused by a ship strikes, fishing activities or blunt trauma generally. Considerable hemorrhaging was observed along acoustic paths in the head and in the brain and spinal cord. The source levels of the sonars were approximately 223 dB at middle frequencies from 3,000 to 10,000 Hz.

On 24 September a total of 14 animals were found stranded; five were dead, three were alive and subsequently died, and six were pushed back to sea. Five more animals were found dead and in a state of decomposition between 25 and 28 September. It is possible that these included animals that had been pushed out to sea and subsequently stranded. Preliminary necropsy results for six of the beaked whales suggest that they were healthy. The stranding occurred at dawn or in the early morning, and the animals that were found alive all appeared disoriented. Those that were found dead had been feeding recently.

Necropsies and dissections revealed no visible signs of trauma. Hemorrhages were observed along acoustic paths and in the brain and spinal cord. All animals were bleeding profusely in the eyes. Multifocal petechial (pinpoint) hemorrhages were observed, similar to decompression sickness. Fat embolism was observed, which could have been responsible for hemorrhages in the macrovascular system. Degeneration (in vivo) of vestibucochlear portions of the ear were noted, specifically, degeneration and resorption of some hair cell bundles and associated nerve fibers. This may suggest a chronic condition, and that some damage to the cochlea had occurred prior to this stranding event.

The stranding occurred along the southeastern coast of the islands of Fuerteventura and Lanzarote. At the time of the September 24 -25 stranding, 10 NATO countries — Germany, Belgium, Canada, France, Greece, Norway, Portugal, Britain, Turkey, and the United States — were conducting a multinational naval exercise; however, the acoustic sources employed during the exercise are not known at this time. There have been seven mass stranding of curvier beaked whales *in* the Canary Islands since 1985, and naval exercises have been recorded as associated with five of them (Table 5).

5. *Gulf of California September 24, 2002* [(2)]

Two beaked whales were stranded on Isle San Jose in the Gulf of California, Mexico on September 24, 2002 coincident with seismic surveying by the R/V Maurice Ewing operated by Columbia University. The vessel had an effective broadband source level of 256 dB, or approximately 236 dB in the horizontal directions, with maximum energy at low frequencies of 40 to 90 Hz.

On September 24th at about 2 to 4 PM local time (2100–2300 GMT), fishermen discovered two live stranded whales and unsuccessfully attempted to push them back out to sea. A group of marine biologists found the whales dead on September 25th. By September 27th, when one carcass was necropsied, the advanced state of decomposition did not allow the cause of death to be determined.

On September 24th the *R/V Ewing* had been firing an array of 20 air guns with a total volume of 8500 cubic inches. These air guns have an equivalent broadband source level of 256 dB re 1µPa @ 1m, with peak energy frequencies at 40-100 Hz.

Source levels at mid-frequencies (1-5 kHz) may be diminished by 20 to 40 dB (Goold and Fish 1998). The air guns were fired with an approximately 20 sec repetition rate (50 m distance between shots). Figure 3 indicates the ship track for 24–25 September; the *R/V Ewing* was on a transect line directed toward the stranding site and reached the closest point-of-approach (within 22 km) at 1400 local time (2100 GMT) range.

6. *Kauai, Haw Hawaii, 2004* [(4)] [(5)]

While not conclusively proven, NOAA acknowledged a correlation with sonar in a mass stranding of melon-headed whales that occurred in Hanalei Bay, Kauai, Hawaii in 2004.

The military has already been forced by a federal judge to limit deployment of a different sonar project -- a $350 million cutting-edge, low-frequency sonar system it wants to deploy worldwide. The judge concluded last year that the government had not properly considered environmental effects before allowing the Navy to use the new sonar. That led to an agreement between the Navy and environmental groups to restrict the sonar to a limited section of the Pacific Ocean off East Asia, but the Navy has appealed several aspects of the decision.

At the time of the stranding, the Navy was conducting exercises involving loud sonar in the area. "Sound propagation models suggest that sonar transmissions were likely detectable over a large area around Kauai for many hours on the day prior to the stranding, as well as within Hanalei Bay when the animals were there," said Brandon Southall, NOAA Fisheries Service's Acoustics Program Director. "Active sonar transmissions on the 2nd and 3rd of July are a plausible, if not likely, contributing factor to the animals entering and remaining in
the bay." more than 100 melon-headed whales became stranded on the coast of Madagascar. A study published in the journal "Aquatic Mammals" suggested that the stranding may have been linked to a seismic survey that was being conducted in the area at the time.

The melon-headed whale was first identified in Hawaii off the coast of Hilo on Hawaii Island's eastern side in 1841. As the name indicates, the front of the head is rounded which gives it a melon-shape. These marine mammals, which are actually members of the dolphin family, grow to nine feet and weigh over 200 pounds, use echolocation, are gray in color except for darker hues around their face.

Melon-headed whales are not usually seen by many because the majority of their time is spent in the deep ocean far from shore. Social animals by nature, they travel in groups of over 1,000 and play, rest, hunt and socialize together. They've been known to follow boats to catch waves off the wake. Their dorsal fin has a pointed tip which helps with identification. As one of the many special creatures in the Pacific Ocean that cradles our beautiful islands, they are beloved by many.

There's been no conclusive evidence why this atypical behavior happens although some hypothesize sonar may be the cause. Low frequency sonar (LFA) is the loudest sound known to be put in the ocean. It's an unnatural sound in the sea. At over 240 dB it's been introduced, by the Navy, despite being documented as surpassing verified pain levels in some marine mammal. Echolocation, a primary navigation tool of many marine mammals, when distorted may cause loss of direction, shatter eardrums and create unusual behavior.

The standing of the melon-headed whales should be investigated through further research, community outreach, education, and dialogue, solutions in order to protect the lives of the ocean, which sustains our lives in many ways.

7. Madagascar, 2008 [6]

An independent scientific review panel has concluded that the mass stranding of approximately 100 melon-headed whales in the Loza Lagoon system in northwest Madagascar in 2008 was primarily triggered by acoustic stimuli, more specifically, a multibeam echo sounder system operated by a survey vessel contracted by ExxonMobil Exploration and Production (Northern Madagascar) Limited.

WCS and IFAW support these conclusions that add to a mounting body of evidence of the potential impacts of anthropogenic noise on marine mammals," said Dr. Howard
Rosenbaum, Director of the Ocean Giants Program for WCS. "Implications go well beyond the hydrocarbon industry, as these sonar systems are widely used aboard military and research vessels for generating more precise bathymetry (underwater mapping). We now hope that these results will be used by industry, regulatory authorities, and others to minimize risks and to better protect marine life, especially marine mammal species that are particularly sensitive to increasing ocean noise from human activities.

Madagascar ISRP Final Report considered all known causes of previous marine mammal stranding and assessed the relative strength of evidence regarding whether each factor could have played a role in either contributing directly or secondarily to the stranding. This segregation within the assessment was important given that this event apparently involved an initial response that caused the animals to clearly depart their natural habitat en masse in such an unusual manner, and a number of secondary, interacting factors that ultimately contributed to later stranding and mortality once the animals were compromised in an outof-habitat situation.

The seismic survey was “utilizing an air gun source” and planned to be conducted “in the southwest part of the Ampasindava block… approximately 35 km northwest of Nosy Lava” and it was “anticipated [that] the vessel will not come closer than 15 km to the Madagascar coast, remaining in water depths exceeding 200 meters.” In addition to the seismic survey, two forms of bathymetry mapping using sonar sources were planned. A side-scan sonar survey using “a fish towed behind the vessel close to the seabed” which was to be conducted “along the upper edge of the slope measuring the water depths as shallow as 30 meters” and “for the most part remain more than 10 kilometers from the Madagascar mainland.” In addition, a “multi beam echo-sounder bathymetry survey” was conducted, with the “echo-sounder…mounted to the hull of the vessel and…operated simultaneously [with the seismic survey operation] to supplement the seismic and side scan sonar bathymetry data.”

The EIA provides some detail for operations and sound sources used. Air guns sound level output was expected to be between 190-200 dB re: 1µPa and predominant energy in the frequency range of 10-300 Hz; side scan sonar (EG&G model 260TH Recorder and Model 272-T tow fish) operated at 100kHz and/or 500kHz, with no source level provided; and the multi-beam echo-sounder (SIMRAD EM1002, mounted to hull) specified with a sound pressure level of 235 dB re: 1µPa and peak frequency of 12 kHz. In is noted in Figure 5.1 of the EIA, that the side scanning sonar bathymetry survey would be conducted along the shelf edge and shelf break immediately offshore of Nosy Lava and the Loza Lagoon system.

The EIA notes the likely presence of P. electra in the Ampasindava block, described in
Table 5.4 as occurring in all three of the sub-divided regions (Mid-channel, Offshore and Coastal) in “substantial numbers”. The EIA also acknowledges that “key potential impacts with respect to underwater noise” include:

- Pathological effects (lethal or sub-lethal injuries): potential injury or fatality of marine fauna from exposure to significant noise levels.

Behavioral disturbance leading to behavioral changes or displacement.

8. Alaska, 2018 (7) (8) (9) (10) (11)

A new scientific paper suggesting that seismic activity may have been involved in a mass stranding death of whales along the Aleutian Islands. The 2018 event on Adak is the largest known mass stranding of Stejneger's beaked whales.

When whales strand along the shores of Alaska's remote and far-flung Aleutian Islands, they may never be discovered by humans. The chain of small, sparsely populated islands arc from the tip of the Alaska Peninsula west 1,100 miles to Attu Island.

NOAA Fisheries marine mammal experts contacted the U.S. Navy shortly after the 2018 mass stranding. It confirmed that they had not conducted training or testing activities using sonar or explosives anywhere in Alaskan waters since May 2017.

However, the U.S. Geological Survey's Alaska Volcano Observatory's monitors had detected human-caused seismic survey activity at regular intervals for hours at a time along the Aleutian Islands between July 5 and 20, 2018. Based on triangulation of data from multiple seismometers, the observatory determined the source of the noise likely centered about 40 miles northwest of Adak. Scientists still do not know the source of the seismic activity. Fourteen days passed between the last detection of the seismic activity and the discovery of the first whale that was part of the 2018 Adak mass stranding event. However, a link between the Stejneger's beaked whale mass stranding and the seismic activity cannot be ruled out.

Additional events are presented below, but the list is by no means exhaustive.

9. Brazil, 2019 (12)

In September 2019, over 80 false killer whales were found stranded in the Arraial do Cabo region of Brazil. While the cause of the stranding is not entirely clear, some experts have suggested that seismic surveys in the area may have contributed to the event.

10. Scotland, 2011 (13)

In 2011, 16 pilot whales stranded themselves in the Firth of Forth in Scotland. An investigation by the Scottish government found that the whales had likely been exposed to underwater noise from a seismic survey being carried out by an oil and gas exploration company in the area.

11. Gulf of Mexico, 2012 (15)

In 2012, a group of researchers published a study in the journal "Conservation Biology" suggesting that the use of air guns in seismic surveys in the Gulf of Mexico may be contributing to a higher rate of stranding of several species of whales and dolphins in the area.

12. New Zealand, 2017 (18)

In February 2017, more than 400 pilot whales become stranded on the coast of New Zealand. While the cause of the stranding is not entirely clear, some experts have suggested that it could be linked to a nearby seismic survey that was being conducted around the time of the event.

13. Chile, 2014 [19]

In April 2014, more than 300 sei whales were found stranded along the coast of Chile. While the exact cause of the stranding is not clear, some experts have suggested that a seismic survey that was being conducted in the area may have played a role

Summary of Beaked Whale Stranding Events

Repeated mass stranding of beaked whales following high-intensity sound exposure demonstrate a pattern of events. Cuvier's beaked whales are, by far, the most common species involved in these stranding events; they make up 81 percent of the total number of stranded animals. Other beaked whales comprise 14 percent of the total, and other species are sparsely represented. It is not clear whether (a) *the Cuvier beaked whale* is more prone to injury from high- intensity sound than other species, (b) its behavioral response to sound makes it more likely to strand, or (c) it is substantially more abundant than the other affected species in the areas and times of the exposures leading to the mass stranding. One, two, or three of these possibilities could apply. In any event, it has proven to be the "miner's canary" for high-intensity sound impacts. The simultaneous deployment of naval ASW sonars in the 1960s and the coincident increase in *its* mass stranding suggest that lethal impacts of anthropogenic sound on cetaceans have been occurring for at least several decades.

The settings for these incidents are strikingly consistent: an island or archipelago with deep water nearby, appropriate for beaked whale foraging habitat. The conditions for mass stranding may be optimized when the sound source transits a deep channel between two islands, such as in the Bahamas incident. When exposed to high sound levels, beaked whales rapidly swim to the nearest beach. The animals appear on the beach not as one tight cluster of individuals but rather distributed over miles of coastline. Hypothermia ensues, and the animals die if they are not returned to the sea by human intervention. The fates of those animals that are returned to the sea are unknown. Necropsies of stranded animals suggest internal bleeding in the eyes, ears, and brain, as well as fat embolisms.

The implicated sound levels involve long-duration (~ 1 sec) and high-intensity (235 dB re 1µPa @ 1 m) sonar pings or equivalent air gun blasts. Mid-frequency (1-6 kHz) sound is clearly implicated in the sonar- induced stranding incidents. It is unclear whether low-frequency sound also causes injury to beaked whales. Although air guns create predominantly low-frequency energy, they also have ample mid - frequency energy, which may be related to the associated injuries.

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