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James C. Foster
President
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Via email and certified mail

RE: Notice of Intent to Sue to Remedy Violations of the Endangered Species Act

Dear Mr. Boyles, Mr. Maier, Mr. Bell, and Mr. Foster,

On behalf of Defenders of Wildlife ("Defenders"), the South Carolina Coastal Conservation League ("League"), and their combined 2.1 million members and supporters, we write to notify Robert H. Boyles, Director of the South Carolina Department of Natural Resources ("SCDNR"), Philip P. Maier, Deputy Director for the Marine Resources Division of SCDNR, Melvin Bell, Director of the Office of Fisheries Management of SCDNR, and Charles

River Laboratories Inc. ("Charles River") that they are violating the Endangered Species Act ("ESA").

SCDNR issues permits that authorize agents of Charles River to contain horseshoe crabs in ponds before they are bled by Charles River for biomedical purposes. These permits contain no restrictions on the number of crabs that can be held in ponds or the amount of time they can be held before bleeding, and no concrete protections to ensure that crabs remain healthy and spawn in their natural habitat. This is significantly depleting a critical food source for threatened *rufa* red knots—horseshoe crab eggs. In so doing, SCDNR's horseshoe crab containment pond permits are causing unlawful incidental take of the threatened red knot, in violation of Section 9 of the ESA, 16 U.S.C. § 1538(a)(1)(B). Charles River is also causing the unlawful incidental take of threatened red knots by removing thousands of horseshoe crabs from the wild and containing them in artificial containment ponds without adequate protections, where red knots cannot access crab eggs, for extended periods of time.

Horseshoe crab eggs are a critical food source for red knots during their stopover in South Carolina on their northbound migration to the Arctic each spring. During their stopover, red knots must consume hundreds of thousands of horseshoe crab eggs from South Carolina beaches to survive the second leg of their journey. Precisely as red knots are arriving in South Carolina, horseshoe crabs are harvested by Charles River for biomedical bleeding, as the crabs begin spawning on South Carolina beaches. At the company's direction, Charles River's agents store thousands of harvested crabs in holding ponds for weeks or months at a time before they are transported to the company's bleeding facility.

SCDNR is responsible for authorizing the use of these containment ponds, a practice only allowed in the State of South Carolina, yet provides virtually no oversight or meaningful restrictions on the ponds' operations. Spawning crabs lay their eggs in these ponds, beyond the reach of beach-foraging red knots. Many horseshoe crabs die while stored in containment ponds, and for those that survive, their health is degraded the longer they remain trapped, meaning that many do not spawn when eventually released back to the environment after weeks or months. Consequently, trapping crabs in containment ponds removes a critical food source for red knots from their foraging grounds during spawning season and diminishes horseshoe crabs' likelihood of survival, reducing future egg laying. SCDNR's authorization of containment ponds, and Charles River's funding of, direction and control over the taking and containment of horseshoe crabs in artificial ponds, are therefore causing a take of red knots by significantly impairing their ability to feed, breed, and survive. *See* 16 U.S.C. § 1532(19); 50 C.F.R. § 17.3.

Pursuant to the citizen suit provision of the ESA, this letter notifies responsible SCDNR officials and Charles River that, unless they remedy their violations of the ESA, Defenders and the League intend to challenge their unlawful conduct in federal district court at the end of this 60-day notice period.

LEGAL FRAMEWORK

"In response to growing concern over the extinction of many animal and plant species, Congress enacted the Endangered Species Act of 1973." *Gibbs v. Babbitt*, 214 F.3d 483, 487 (4th

Cir. 2000) (citations omitted). The purposes of the ESA are "to provide a program for the conservation of . . . endangered species and threatened species" and "to provide a means whereby the ecosystems upon which [such] species depend may be conserved." 16 U.S.C. § 1531(b); *see also Sierra Club v. U.S. Dep't of Interior*, 899 F.3d 260, 268 (4th Cir. 2018) ("Congress enacted the [ESA] . . . 'to protect and conserve endangered and threatened species and their habitats.'" (quoting *Nat'l Ass'n of Home Builders v. Defenders of Wildlife*, 551 U.S. 644, 651 (2007))). "Conservation" and "conserve" mean "to use and the use of all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to [the ESA] are no longer necessary"—i.e., to recover such species from an imperiled status. 16 U.S.C. § 1532(3).

Thus, "[t]he plain intent of Congress in enacting this statute was to halt and reverse the trend toward species extinction, whatever the cost." *Tenn. Valley Auth. v. Hill*, 437 U.S. 153, 184 (1978). To accomplish this objective, "[t]he language, history, and structure of the [ESA] indicates beyond doubt that Congress intended endangered species to be afforded the highest of priorities." *Id*. at 174. The ESA is therefore "'a powerful and substantially unequivocal statute.'" *Loggerhead Turtle v. Cty. Council of Volusia Cty., Fla.*, 148 F.3d 1231, 1246 (11th Cir. 1998) (quoting *Strahan v. Linnon*, 967 F. Supp. 581, 618 (D. Mass. 1997)).

Section 9(a)(1) of the ESA has been referred to as "[t]he cornerstone of the statute." *Gibbs*, 214 F.3d at 487. This section prohibits the taking of any endangered species of fish or wildlife, 16 U.S.C. § 1538(a)(1)(B), and the ESA allows the U.S. Fish and Wildlife Service ("Service") or the National Marine Fisheries Service to extend this same prohibition to the taking of threatened species, *id.* § 1533(d) ("The Secretary may by regulation prohibit with respect to any threatened species any act prohibited under Section 1538(a)(1) of this title, in the case of fish or wildlife . . . .").[1] In listing the red knot as threatened under the ESA, the Service extended the statutory "take" prohibition to the species. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot, 79 Fed. Reg. 73,706, 73,728 (Dec. 11, 2014).

"Take" is defined broadly and encompasses "harass[ment]," 16 U.S.C. § 1532(19), which is "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering," 50 C.F.R. § 17.3. "Take" also encompasses "harm," 16 U.S.C. § 1532(19), which includes "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including . . . feeding," 50 C.F.R. § 17.3.

Both Congress and the courts insist on a broad interpretation of the ESA's take provision. Congress, in fact, intended the term "take" to be "defined . . . in the broadest possible manner to include every conceivable way in which a person can 'take' or attempt to 'take' any fish or wildlife." S. Rep. No. 93-307, 1973 WL 12683, at *2,995 (1973). The Supreme Court in *Babbit*

[1] The U.S. Fish and Wildlife Service or the National Marine Fisheries Service ("NMFS"), depending on their regulatory jurisdiction, determine whether a species should receive protection under the ESA by adding it to the threatened or the endangered species lists. *See* 16 U.S.C. § 1533(a)(1).

v. Sweet Home Chapter of Communities for a Great Oregon acknowledged that "[t]he Committee Reports accompanying the bills that became the ESA . . . make clear that Congress intended 'take' to apply broadly . . . ." 515 U.S. 687, 704 (1995).

The take prohibition applies to private companies and to government agencies, including state agencies, that direct or authorize private conduct that causes the take of listed species, whether directly or incidentally. Under the ESA, it is unlawful for "any person" to "cause to be committed" any act that Section 9 prohibits. 16 U.S.C. § 1538(g). The statute "not only prohibits the acts of those parties that directly exact the taking, but also bans those acts of a third party that bring about the acts exacting a taking." *Strahan v. Coxe*, 127 F.3d 155, 163 (1st Cir. 1997).

Corporations and private entities fall within the ESA's definition of the term "person." 16 U.S.C. § 1532(13). The ESA also defines "person" to include "any officer, employee, agent, department, or instrumentality. . . of any State . . . ." *Id.* Courts have routinely held government officials and agencies liable under Section 9 of the ESA for authorizing the activities of third parties that result in the unpermitted take of listed species. *See, e.g.*, *Strahan*, 127 F.3d at 163–64 (finding State of Massachusetts liable for taking endangered right whales by authorizing commercial fishing practices that risked ensnaring them); *Loggerhead Turtle v. Council of Volusia Cty.*, 148 F.3d 1231, 1251–53 (11th Cir. 1998), *cert. denied*, 526 U.S. 1081 (1999) (finding county could be held liable for take of ESA-listed sea turtles by authorizing beachfront lighting in turtle nesting areas during all hours); *Palila v. Haw. Dep't of Land & Nat. Res*., 639 F.2d 495, 497–98 (9th Cir. 1981) (holding that state agency's maintenance of feral goats and sheep in endangered bird's habitat constituted an unlawful taking); *Animal Welfare Inst. v. Martin*, 588 F. Supp. 2d 70, 98–100 (D. Me. 2008) (holding plaintiffs were likely to succeed on merits of their claim that state agency trapping license caused unlawful take of incidentally-trapped Canada lynx).

The Service may grant an exemption to the incidental take prohibition by issuing an incidental take permit pursuant to Section 10 of the ESA, 16 U.S.C. § 1539(a). Before receiving a permit, the persons seeking incidental take authorization must prepare a habitat conservation plan which, among other criteria, must describe the likely impacts of the activity causing the incidental take, consider alternatives to the take and why those alternatives were rejected, and discuss how the impacts of incidental take will be mitigated or minimized. 50 C.F.R. § 17.32(b)(1)(iii)(C).

FACTUAL BACKGROUND

I. Red Knots

The *rufa* red knot (*Calidris canutus rufa*) ("red knot") is a medium-sized shorebird that the Service listed as a threatened species under the ESA in 2015. 79 Fed. Reg. at 73,706. The agency extended the Section 9 "take" prohibition to the red knot at the time it was listed. *Id.* at 73,728.

Red knot populations were decimated in the late 1800s and early 1900s by commercial hunting for sport and food. Endangered and Threatened Wildlife and Plants; Proposed

Threatened Status for the Rufa Red Knot, 78 Fed. Reg. 60,024, 60,028 (Sept. 30, 2013). Currently, major obstacles to the species' survival and recovery include significant threats to sources of prey, disturbances, predation, competition with gulls, habitat destruction, poor water quality, and human-caused disasters. Endangered and Threatened Wildlife and Plants; Designation of Critical Habitat for Rufa Red Knot (*Calidris canutus rufa*), 86 Fed. Reg. 37,410, 37,418–19 (July 15, 2021).

Red knots migrate between their breeding grounds in the Canadian Arctic and their wintering locations, which include areas in the Southeastern United States, the Gulf of Mexico, and South America. 79 Fed. Reg. at 73,706. Most red knots stop partway through the northbound portion of their migration along the Atlantic Coast to regain weight and rebuild their organs and muscles. 78 Fed. Reg. at 60,027. When refueling, red knots must consume enough fat and protein to power the latter portion of their journey to the Arctic. Deborah Cramer, *Inside the Biomedical Revolution to Save Horseshoe Crabs and the Shorebirds that Need Them*, NAT'L AUDUBON SOC'Y (2018).[2] These stopovers are time-constrained, requiring red knots to quickly eat food that is easily digested and nutrient-rich—like horseshoe crab eggs. 78 Fed. Reg. at 60,027. Studies show that if red knots do not weigh at least 180 grams after their stopover, they are more likely to die en route to their destination or be unable to reproduce upon arrival. *See id.* at 60,067.

Many red knots from the Southern wintering population of *rufa* red knots, which migrate from as far south as Tierra del Fuego, Argentina, stopover in South Carolina during their northbound migrations. According to SCDNR, "South Carolina beaches [are] very important for red knot and other shorebirds survival." *Shorebird Research Underscores Importance of South Carolina Beaches*, SCDNR NEWS (June 7, 2018).[3]

Red knots that stopover in South Carolina rely on horseshoe crab eggs to gain sufficient weight to support the second half of their northbound journey. Fletcher M. Smith et al., *Investigating Red Knot Migration Ecology Along the Georgia and South Carolina Coasts: Spring 2019 Season Summaries*, CTR. FOR CONSERVATION BIOLOGY TECHNICAL REP. 17–18 (2019).[4] The horseshoe crab is a marine species that has existed for more than 400 million years, earning it the nickname of "living fossil." Easily digestible horseshoe crab eggs are a crucial food source for red knots because they provide the highest energy accumulation rates in the species worldwide. David S. Mizrahi & Kimberly A. Peters, *Relationships Between Sandpipers and Horseshoe Crab in Delaware Bay: A Synthesis*, BIOLOGY & CONSERVATION OF HORSESHOE CRABS 65, 70 (2009) (citation omitted).[5]

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[2] Available at https://www.audubon.org/magazine/summer-2018/inside-biomedical-revolution-save-horseshoe-crabs.

[3] Available at https://perma.cc/T2K8-4FPQ (permanent link).

[4] Available at https://scholarworks.wm.edu/cgi/viewcontent.cgi?article=1587&context=ccb_reports.

[5] Available at https://www.horseshoecrab.org/research/sites/default/files/DONE%20Mizrahi%20and%20Peters.pdf.

During stopovers, each red knot must consume about **400,000** horseshoe crab eggs to fuel the second leg of their journey. Cramer (2018). The density of spawning horseshoe crabs impacts whether foraging red knots are able to access the crabs' eggs. Fumika Takahashi, *Shorebird Utilization of Horseshoe Crab (Limulus Polyphemus) Eggs at Cape Romain National Wildlife Refuge, South Carolina*, CLEMSON U. TIGERPRINTS, ALL THESES 2577 at 27 (2016).[6] This is because horseshoe crabs lay their eggs underground. *Id.* In order for them to come within red knots' reach, there must be repeated spawning by multiple crabs in the same area, causing eggs to be distributed onto or just below the beach surface. *Id*. Simply put, red knots depend on a super-abundance of horseshoe crab eggs to survive their annual migration and reproduce.

The fate of red knots, including the Southern wintering population, is dire. As noted in the Service's 2020 Species Status Assessment for red knots, the southern wintering population "currently has low resiliency" due to "sharp numerical declines and marked geographic contraction." U.S. Fish & Wildlife Serv., *Species Status Assessment Report for the Rufa Red Knot (Calidris canutus rufa): Version 1.1* at 23 (2020).[7] The average count of this population between 2018 and 2020 was more than 75% lower than the average count between the 1980s and 2000. *Id.* at 21. The Service has highlighted "[t]hreats to the rufa red knot's food supply," including "unsustainable levels of marine crab harvest," and noted that "managing horseshoe crab fisheries . . . could reduce or ameliorate this threat." 86 Fed. Reg. at 37,418.

The amount of available prey in red knot stopover locations along the Atlantic Coast is a limiting factor in the species' survival. Thus, when a stopover location is no longer viable, this reduces the likelihood of survival of red knots that used the defunct stopover location. This decrease in survival could be experienced by red knots that used the former stopover location, as well as red knots in other locations that will face an increase in competition for prey from red knots relocating from the former stopover location. A recent study for which SCDNR and the Service were project partners noted that in South Carolina, "[h]arvest levels are likely unsustainable in the few locations where significant numbers of spawning horseshoe crabs and shorebirds were observed." Smith (2019) at 18.

II. Horseshoe Crab Containment Ponds

Every year, thousands of horseshoe crabs that are harvested in South Carolina are held by Charles River in large, artificial containment ponds, which significantly decreases the number of horseshoe crab eggs that are available to foraging red knots. Contractors are permitted to harvest unlimited numbers of horseshoe crabs in South Carolina on behalf of Charles River, which extracts their blood for biomedical purposes. Charles River is the sole harvester and extractor of horseshoe crabs and their blood in South Carolina. SCDNR documents indicate that up to 75% of horseshoe crabs harvested in South Carolina are held in ponds before bleeding. *See* Ex. A at 2 (June 26, 2017 email from Peter Kingsley-Smith to Kristin Linesch). A synthetic alternative to horseshoe crab blood is available and equally effective if not superior.[8]

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[6] Available at https://tigerprints.clemson.edu/all_theses/2577/.

[7] Available at https://ecos.fws.gov/ServCat/DownloadFile/187781.

[8] Some pharmaceutical companies use blood from horseshoe crabs (known as Limulus amebocyte lysate or "LAL") to test for contamination of certain medical supplies even though a

In South Carolina, the harvest typically occurs between April and June. Dr. Michael R. Kendrick et al., *Evaluating the Metabolic and Nutritional Consequences for American Horseshoe Crabs (Limulus Polyphemus) of Biomedical Holding Pond Practices in South Carolina, USA* at 6 (undated). When horseshoe crabs are harvested, they are either delivered directly to Charles River's bleeding facility, or they are stored in containment ponds by agents of Charles River before arriving at the bleeding facility. SCDNR is charged with issuing permits to any operators of these containment pond facilities. S.C. Code Ann. § 50-5-1330(B)-(C). South Carolina is the only state to permit the use of horseshoe crab containment ponds. *See* Kendrick (undated) at 6. As agents of Charles River, pond operators receive direction, funding, and training from Charles River, which regularly meets with SCDNR about pond safety and mortality. Charles River thus controls the harvest and operation of these containment ponds.

Although SCDNR has refused to disclose the number of containment ponds that have been in operation in recent years, one or more horseshoe crab containment ponds were used this year, and in previous years several have been used. *See* Ex. B (July 20, 2015 Letter from Melvin Bell, Director, SCDNR Office of Fisheries Mgmt., noting four containment ponds were permitted in 2015); Ex. C (July 2, 2014 Letter from Melvin Bell, SCDNR Office of Fisheries Mgmt., noting three containment ponds permitted in 2014). Based on representations from representatives of Charles River, we understand that these containment ponds can hold 10,000–15,000 horseshoe crab each. SCDNR's Horseshoe Crab Possession (No Harvest) Permit HP21-0, *see* Ex. D ("Possession Permit"), does not limit the number of crabs that may be held in ponds, nor the duration of holding during each harvest season.

SCDNR's Possession Permit contains virtually no requirements regarding the conditions of containment ponds or the treatment of crabs in them. The Possession Permit does not limit the time that horseshoe crabs can be held in ponds before bleeding, which allows operators to store horseshoe crabs for weeks or even months at a time. *See, e.g.*, Kristin Linesch Hamilton et al. *Physiological Impacts of Time in Holding Ponds, Biomedical Bleeding, and Recovery on the Atlantic Horseshoe Crab, Limulus Polyphemus*, Part A, 239 COMPARATIVE BIOCHEMISTRY & PHYSIOLOGY 1 (2020) (horseshoe crabs "can be held in ponds from 1 day to multiple weeks between mid-April and mid-June before biomedical bleeding."); *see also* Kendrick (undated) at 6

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synthetic alternative to LAL, recombinant Factor C ("rFC"), is available. Studies show that rFC is "equivalent or even superior to LAL . . . for routine bacterial endotoxin testing." Maike Piehler et al., *Comparison of LAL and rFC Assays—Participation in a Proficiency Test Program Between 2014 and 2019*, 8 Microorganisms 418, 418 (2020). Scientists from biomedical companies, including Pfizer and Eli Lilly, have come to a similar conclusion. *See, e.g.*, Jay Bolden et al., *Currently Available Recombinant Alternatives to Horseshoe Crab Blood Lysates: Are They Comparable for the Detection of Environmental Bacterial Endotoxins? A Review*, 74 PDA J. Pharm. Sci. & Tech. 602, 602 (2020) ("[U]se of rFC is comparable to the more traditional LAL tests and may be technologically superior," as it can "detect endotoxin more selectively."). In 2018, the U.S. Food and Drug Administration approved a drug tested using rFC. Lonza, *Recombinant Factor C Assay*, https://bioscience.lonza.com/lonza_bs/US/en/recombinant-factor-c-assay (last visited Oct. 27, 2021).

("horseshoe crabs may be retained for a period of up to 6 weeks or more before being 'bled.'"). Based on a recent study in South Carolina regarding the use of containment ponds, horseshoe crabs are not fed and the pond water is not changed when held in ponds. *See* Hamilton (2020) at 2. The Possession Permit also does not ensure that spawning of horseshoe crabs occurs in the wild, where crab eggs would be accessible to migrating red knots, versus in artificial containment ponds.

The use of containment ponds in South Carolina takes a grave toll on horseshoe crabs. One study in South Carolina found that up to 11% of horseshoe crabs die during the holding and bleeding process, *see* Hamilton (2020) at 3. These rates, however, likely underestimate the true mortality rate from holding pond practices, as reported in other studies. According to the lead author of the study the observed mortality rate may have been artificially low compared to industry mortality rates because horseshoe crabs were stored at a far lower density in the experimental ponds than in commercial ponds. Ex. E at 2 (pre-publication draft, noting "study represents a 'low stress' biomedical harvest process in that HSCs were held in ponds at low stocking densities as compared to conditions typically experienced in industry ponds (i.e., hundreds of HSCs per 1000m^2 pond . . .)"); Hamilton (2020) at 2 (noting larger health effects on horseshoe crabs observed in a different study "may be related to the high stocking densities of HSCs employed in their study . . . .").

Research from the Hamilton (2020) study further suggests that, especially at warmer temperatures, "the physiological condition of [horseshoe crabs] deteriorate as a consequence of prolonged holding in captivity." *Id.* at 3. Indeed, the longer that the crabs were held in the ponds, the more their body weight decreased over time. *Id.* at 4. Outside of the study, "unacceptable pond conditions" have been linked to "spikes in mortality" for horseshoe crabs stored in SCDNR-regulated ponds. Ex. F at 2 (comment A16). "The long-lived nature of the species (at least 17–19 years . . .) and the extended time it takes for individuals to reach maturity (9 years for males and 11 for females . . .) put the population at risk" due to mortalities in the harvesting process. Kristin Linesch, *Evaluating Best Management Practices in the South Carolina Horseshoe Crab Fishery: A Field Approach to Determine Physiological Impacts of the Biomedical Bleeding Process* at 2 (2017).

Horseshoe crabs often spawn in containment ponds. Horseshoe crabs are harvested from their natural spawning habitat, beaches, during their spawning ritual, where they come ashore to lay eggs. Thousands of crabs are then taken and held in ponds for weeks or months at a time—SCDNR's Possession Permit imposes no limit on the number of crabs that can be taken and held or the amount of time crabs can be held before bleeding. Media reports have documented substantial numbers of horseshoe crab spawn in containment ponds.[9] This means countless eggs that would otherwise be lain on South Carolina's beaches, where they are accessible to red knots, are instead lain in containment ponds, beyond the reach of red knots. Further, horseshoe crab spawn in containment ponds are less likely to survive and mature into healthy adults than those birthed naturally on beaches. Based on records provided in response to a Freedom of Information Act Request, SCDNR does not impose any meaningful regulatory protections for horseshoe crab

[9] WNYC Studios, *Baby Blue Blood Drive*, Radiolab Podcast at 38:26–39:45 (July 23, 2020), https://www.wnycstudios.org/podcasts/radiolab/articles/baby-blue-blood-drive.

spawn in containment ponds; it does not require that spawn be collected and returned to beaches, or even that containment pond operators record their existence. In fact, SCDNR does not have any idea of the number of spawning female horseshoe crabs held by Charles River in containment ponds.

Although South Carolina law requires that horseshoe crabs in containment ponds "must be handled so as to minimize injury to the crab" and "must be returned unharmed to state waters," S.C. Code Ann. § 50-5-1330(C), SCDNR imposes virtually no requirements to enforce those provisions and SCDNR documents obtained through open records' requests reveal no routine monitoring or inspection by the agency, *e.g.*, Ex. G (SCDNR FOIA response letter, indicating "[n]o records exist" of "[m]onthly inspection, compliance, and enforcement records" for containment ponds, "water quality analysis of holding ponds," "[r]equirements for size, capacity, infrastructure, and technology of holding ponds," "records pertaining to the amount of time horseshoe crabs spend in holding ponds," "horseshoe crab spawning in holding ponds," or "monthly mortality data" for containment ponds). SCDNR's Possession Permit includes largely administrative conditions, such as recording "the number [of crabs] that die during the time of possession." Possession Permit at 2. The few conditions related to safety lack any specificity, such as stating that the department "may direct permit holders to take measures to minimize or reduce mortality," without explaining what those measures would be or what would trigger them, and that horseshoe crabs must be "promptly released," without including any deadlines. *Id*. Indeed, harvested horseshoe crabs can be held for infinite amounts of time *prior to* bleeding. Spawn, moreover, are totally unprotected. Under SCDNR's Possession Permit, containment ponds could even be operated as crab *farms*, with spawn held until they reach maturity, and perhaps even lay eggs themselves, before being transported to Charles River for bleeding. Operators have every financial incentive to exploit this.

In sum, containment ponds, as permitted by SCDNR and operated by Charles River's agents under the direction, funding, and control of Charles River, deplete horseshoe crab populations and egg availability in multiple ways.

VIOLATIONS

SCNDR is causing the unlawful take of *rufa* red knots by authorizing the containment of unlimited numbers of horseshoe crabs in artificial ponds for unlimited periods of time during their spawning season, with virtually no protections for the health of crabs or crab spawn, much less for red knots that depend on crab eggs for their survival. Charles River is causing the unlawful take of red knots by funding, directing and controlling its agents to harvest horseshoe crabs by the tens (if not hundreds) of thousands and contain them in artificial ponds for weeks and months at a time.

Many red knots migrating north from their wintering grounds stopover in South Carolina, and two thirds of those birds fly directly to their Arctic breeding grounds from South Carolina. Foraging red knots in South Carolina rely on horseshoe crab eggs as their most important source of food. Red knots require a super-abundance of crab eggs created by multiple spawning events, which push deposited eggs up to the beach surface, where they become available to the birds. If red knots do not consume several hundred thousand horseshoe crab eggs during their stopovers,

they are more likely to die during the latter part of their migration or be unable to reproduce at its terminus. The amount of available horseshoe crab eggs in red knot stopover locations along the Atlantic Coast is a limiting factor in the species' survival.

SCDNR and Charles River are causing the removal and containment of thousands of spawning horseshoe crabs and millions (if not billions) of eggs from red knot foraging grounds in South Carolina. The actions of SCDNR and Charles River also cause horseshoe crab mortalities and diminished physiological conditions, and reduce the number of spawning horseshoe crabs in the future. SCDNR and Charles River are causing a significant decrease in a critical food source for red knots, which harasses and harms the species in violation of Section 9 of the ESA.

CONCLUSION

As detailed above, the actions of SCDNR and Charles River regarding the removal from the wild of horseshoe crabs and their containment in artificial ponds in South Carolina, thereby significantly decreasing a critical food source for red knots, is causing the unlawful take of red knots in violation of the ESA. To remedy these legal violations, SCDNR must immediately suspend its authorizations of horseshoe crab containment ponds. Further, Charles River must direct its agents to immediately cease receiving and containing horseshoe crabs in artificial ponds. Undersigned counsel are available to discuss this matter, but if remedial actions are not taken to terminate the authorization and operation of horseshoe crab containment ponds within 60-days of receipt this letter, we intend to pursue legal action.

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Exhibit A

SCDNR Internal Emails, Provided in FOIA Disclosures to S.C. Coastal Conservation League

RE: Defense feedback and moving forward...

Jeff Brunson <BrunsonJ@dnr.sc.gov>
Mon 7/3/2017 8:36 AM

To: Peter Kingsley-Smith <KingsleySmithP@dnr.sc.gov>; Michael R. Kendrick <KendrickM@dnr.sc.gov>; Mike Denson <DensonM@dnr.sc.gov>

Peter,

Thank you for passing along this information. I regret that that I was not able to attend Kristin's defense, but I look forward to hearing more about how it went.

Jeff

From: Peter Kingsley-Smith
Sent: Monday, June 26, 2017 8:41 AM
To: Michael R. Kendrick <KendrickM@dnr.sc.gov>; Jeff Brunson <BrunsonJ@dnr.sc.gov>; Mike Denson <DensonM@dnr.sc.gov>
Subject: FW: Defense feedback and moving forward...

Forwarding you on this email, to keep you in the loop. Jeff/Michael – no action needed on your part, just FYI as members of her section and supervisor.

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http://www.dnr.sc.gov/marine/mrri/shellfish.html
http://marinebiology.cofc.edu/about-the-program/faculty-listing/kingsley-smith-peter.php

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From: Peter Kingsley-Smith
Sent: Monday, June 26, 2017 8:39 AM
To: Kristin Linesch <LineschK@dnr.sc.gov>
Subject: Defense feedback and moving forward...

Good morning Kristin,

Congratulations on your successful defense and I hope you had a good weekend celebrating with your family.

Overall, you did a fine job in your defense, but I need to let you know that I spent some time on Friday afternoon talking to Brad Floyd and Wally Jenkins, who had some concerns about some of the content of your presentation.
Here I am providing a list of items/statements that arose from those discussion that I need you to help me with as we move forward. As you are well aware the horseshoe crab fishery in South Carolina in a sensitive one, and as you move forward as an SCDNR employee (as compared to a College of Charleston graduate student) you need to keep at the front of your mind the relationships, roles and responsibilities of Institute researchers and OFM fishery managers.

Clarification provided by Brad Floyd and Wally Jenkins in response to remarks made during the defense.

1. Females are not targeted, 3x the number of males are bleed as females.
2. All sizes are not bleed, animals deemed too small to bleed are rejected.
3. Crabs in poor condition are not bleed.
4. Epibionts are removed at the bleeding facility as per FDA protocols.
5. Suppliers stay at the lab until bleeding is finished and must immediately return animals to the wild. They also bring multiple batches over the course of a day to reduce cumulative time out of water.
6. 25% of the HSC bled never enter a holding pond. They are harvested, delivered directly to bleeding facility, and immediately returned to the wild after bleeding.
7. The entire bleeding season last about two months (8 weeks). As Jerry Gault stated the vast majority of HSC will not spend more than 3 weeks in a holding pond. In fact, one facility rotates among multiple ponds using the first in first out approach while the other stockpiles crabs during the spawning events and liquidates inventory during the intervening days prior to the next spawning period.
8. Crabs are not carried in open vehicles but must be transported in a covered conveyance, as a condition of permit (see attached).

Something else that arose from my discussions with Brad and Wally on Friday was their support of your project related to the acquisition of two YSI data loggers and the industry pond water quality data. You made the remark that the conditions in your ponds at the WMC reflected those of industry ponds, but you did not present the industry pond data to support that. I think in hindsight that is something that you could have added. These industry pond data have also been specifically requested by Brad Floyd so please provide those data to them at your earliest convenience.

I realize that I was not a committee member for your MS project, and that you were representing the College during your defense, but moving forward, now that you are Wildlife Biologist at the Institute, when you come to publish your research, you will be representing the SCDNR, and therefore I have responsibility to ensure that data collected by the SCDNR and published reflect our Agency in the most accurate and responsible manner possible.

In order to allay some of the concerns from OFM, and in order for me to make sure that I do my due diligence, I will be requiring that I get to see drafts of any manuscripts derived from your MS thesis, and have agreed that we will share those with OFM for them to review, prior to their submission to the journal. I am not suggesting that we change anything related to authorship (although I might suggest that you acknowledge independent reviewers, and that you should acknowledge OFM support of equipment, all funding support etc.). It is important that we maintain effective and harmonious relationships between the Institute and OFM, and this review process will help me to achieve that and serve you well moving forward.

Please acknowledge that you are on board with this last paragraph, and please feel free to stop by and talk if you have questions. Again, you did a nice job in your defense, there are just some additional considerations moving forward that we need to address from a SCDNR perspective.

Talk to you soon.

Peter Kingsley-Smith
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http://www.dnr.sc.gov/marine/mrri/shellfish.html
http://marinebiology.cofc.edu/about-the-program/faculty-listing/kingsley-smith-peter.php

Exhibit B

Letter from Melvin Bell, Director, SCDNR Office of Fisheries Mgmt.
(July 20, 2015), Provided in FOIA Disclosures to
S.C. Coastal Conservation League

South Carolina Department of
Natural Resources

DNR

Alvin A. Taylor
Director

Robert Boyles
Deputy Director for
Marine Resources

July 20, 2015

[redacted]

Dear [redacted],

South Carolina state law (Section-50-5-1330) requires permitting through the South Carolina Department of Natural Resources (DNR) for any collection and/or holding of horseshoe crabs (*Limulus polyphemus*), with no removal of these animals allowed from the state. This law also allows very limited collection for use in scientific or educational purposes and imposes very strict protocol for both commercial harvest and retention. The only commercial fishery for horseshoe crabs allowed in South Carolina is for biomedical processing, and all captures for this purpose "must be handled so as to minimize injury". Animals from this fishery are to be returned to state waters immediately after bleeding for limulus amebocyte lysate (LAL) reagent processing.

The DNR's Office of Fisheries Management (OFM) monitors the individuals and facilities that hold, deliver, and then return these animals to state waters. Four sites were permitted by the OFM Permitting Section to hold horseshoe crabs for timely supply to your facility during the 2015 season. No significant issues with regard to handling crabs and holding facilities arose during this season.

The preseason meeting of [redacted] DNR staff was very productive and we would like to hold a similar meeting in March of 2016. We will continue to work with [redacted] next season to research ways to decrease mortality associated with handling/bleeding horseshoe crabs.

Sincerely,

Melvin Bell

Melvin Bell
Director,
Office of Fisheries Management

Exhibit C

Letter from Melvin Bell, Director, SCDNR Office of Fisheries Mgmt.
(July 2, 2014), Provided in FOIA Disclosures to
S.C. Coastal Conservation League

South Carolina Department of
Natural Resources

DNR
Alvin A. Taylor
Director

Robert Boyles
Deputy Director for
Marine Resources

July 2, 2014

[redacted]

Dear [redacted],

South Carolina state law (Section-50-5-1330) requires permitting through the South Carolina Department of Natural Resources (DNR) for any collection and/or holding of horseshoe crabs (*Limulus polyphemus*), with no removal of these animals allowed from the state. This law also allows very limited collection for use in scientific or educational purposes and imposes very strict protocol for both commercial harvest and retention. The only commercial fishery for horseshoe crabs allowed in South Carolina is for biomedical processing, and all captures for this purpose "must be handled so as to minimize injury". Animals from this fishery are to be returned to state waters immediately after bleeding for limulus amebocyte lysate (LAL) reagent processing.

The DNR's Office of Fisheries Management (OFM) monitors the individuals and facilities that hold, deliver, and then return these animals to state waters. As in the past few years, three sites were permitted by the OFM Permitting Section to hold horseshoe crabs for timely supply to your facility during the 2014 season. No significant issues with regard to handling crabs and holding facilities arose during this season.

The preseason meeting [redacted], the possession permit holders, and DNR staff was very productive and we would like to hold a similar meeting in March of 2015. We will continue to work with [redacted] next season to research ways to decrease mortality associated with handling/bleeding horseshoe crabs. We do not at this time recommend any further changes to current protocol. It is our opinion that the holding ponds and the suppliers' employees again met holding and handling criteria to minimize mortalities. All permitted sites were properly depopulated at season's end.

Sincerely,

Melvin Bell

Melvin Bell
Director,
Office of Fisheries Management

Exhibit D

SCDNR Horseshoe Crab Possession (No Harvest) Permit HP21-0,
Provided in FOIA Disclosures to S.C. Coastal Conservation League

South Carolina Department of

Natural Resources

Robert H. Boyles, Jr.
Director
Philip P. Maier
Deputy Director for
Marine Resources

HORSESHOE CRAB POSSESSION (NO HARVEST) PERMIT HP21-0

PERMITTEE:

FROM: SC DEPARTMENT OF NATURAL RESOURCES
MARINE RESOURCES DIVISION, OFFICE OF FISHERIES MANAGEMENT

DATE:

Under authority of Section 50-5-1330, S. C. Code of Laws, you are hereby granted permission to possess horseshoe crabs harvested from areas under jurisdiction of the State of South Carolina subject to the specifications and conditions set forth below. Horseshoe crabs are only to be in possession only for biomedical purposes as regulated by the FDA. This permit is only authorized at the location listed in the specifications below. The signature of the permittee is required for this permit to be valid. Major permit conditions are indicated in the conditions section of the permit.

Melvin Bell

Melvin Bell, Director
Office of Fisheries Management

PURPOSE

The purpose of this activity is to receive and possess or hold live horseshoe crabs (Limulus polyphemus) to be used in production of Limulus Amebocyte Lysate (LAL) Reagent.

SPECIFICATIONS

Effective: _____ Expiration: June 30, 2021

Holding Location: _____

CONDITIONS

1. The permittee may receive horseshoe crabs taken from areas under jurisdiction of the State of South Carolina only from individuals permitted by the Division to harvest or hold them. This is not a harvest permit.

2. The permittee must maintain and, upon request, make available to authorized Department personnel records of the numbers of horseshoe crabs received by date and harvester. Records must include the number that die during the time of possession, which is from receipt from harvesters through release after biomedical processing. The permittee must submit a monthly report of total mortality by number to the Fisheries Statistics Section of the Office of Fisheries Management on forms provided by the Division on or before the 10th of each month. Biomedical processing facilities are excluded from this reporting requirement.

3. This permit in full, or a copy thereof, must always be at the location where horseshoe crabs are held and with those individuals without permits transporting them to and from LAL processing facilities.

4. The permittee must allow authorized officials of the Department to inspect horseshoe crab holding facilities and transporting conveyances to determine if they are adequate and properly utilized to minimize injury, as required by law. The department may direct permit holders to take measures to minimize or reduce mortality if deemed necessary during the permitting period.

5. Horseshoe crabs must be maintained and promptly released into coastal salt waters of the state after LAL processing. During land transit they must be covered or within an enclosed conveyance both going to LAL processing facilities and returning to coastal salt waters of the state. They must not be dumped in mass from a conveyance or dropped more than ten feet into water. The permittee may employ permitted harvesters for this activity. (MAJOR)

6. Permittee must notify DNR within 48 hours of FDA pulling registration for the biomedical facility, or if the facility otherwise ceases production, and this permit will be void.

7. Failure to comply with any of the above conditions can result in revocation of this permit. The Division may cancel this permit at any time upon notification of the permittee.

I have read and will abide by the specifications and conditions of this permit.

_____ _____

DATE PERMITTEE

Exhibit E

Excerpts from Draft of Hamilton et al., *Physiological Impacts of Time in Holding Ponds, Biomedical Bleeding, and Recovery on the Atlantic Horseshoe Crab, Limulus Polyphemus*, Provided in FOIA Disclosures to S.C. Coastal Conservation League

Physiological Impacts of Time in Holding Ponds, Biomedical Bleeding, and Recovery on the Atlantic Horseshoe Crab, *Limulus polyphemus*

Kristin Linesch Hamilton [a,b,*], Louis Burnett [c], Karen Burnett [c], Rachel Kalisperis [d], Amy Fowler [a,1]

[a] *Marine Resources Research Institute, South Carolina Department of Natural Resources, Charleston, South Carolina 29412*

[b] *Environmental Studies Graduate Program, College of Charleston, Charleston, SC 29424*

[c] *Grice Marine Laboratory, College of Charleston, Charleston, SC 29412*

[d] *South Carolina Aquarium, Charleston, SC 29401*

[1] *Department of Environmental Science and Policy, George Mason University, Fairfax, VA, 22030*

[*] Corresponding author. *Email address:* lineschk@dnr.sc.gov

hemolymph, the HSCs are often returned to the ocean environment. ~~Actual m~~Mortality estimates due to biomedical bleeding range from ~~6~~8% (Walls and Berkson 2003~~Thompson & Wenner, 1999~~) to nearly 30% or higher (Hurton and Berkson, 2006). In addition, sublethal effects have also been associated with the biomedical bleeding of HSCs (James-Pirri et al., 2012; Anderson et al., 2013), but relatively few data are available to document mortalities or sublethal effects associated with individual steps of the bleeding process (i.e., collection, transport, holding conditions, hemolymph extraction, return), either alone or in combination.

Some evidence supports the idea that the conditions under which HSCs are held between initial harvest and hemolymph extraction can be detrimental both alone and in combination with the bleeding process (James-Pirri et al., 2012; Anderson et al., 2013; Smith et al., 2017). The South Carolina fishery is distinct in that HSCs can be held in ponds for anywhere between 1 day and multiple ~~months~~ weeks between mid-April through mid-June before ~~the actual~~ biomedical bleeding occurs. In South Carolina, harvesters are required to mechanically aerate holding ponds, report pond mortalities, and release all HSCs by the end of the harvest season (as per permits "Horseshoe Crab Hand Harvest Permit HH14" and "Horseshoe Crab Possession (No Harvest) Permit HP12"). Although abiotic conditions in holding ponds are not monitored, it is well known that changes in water quality, such as temperature, dissolved oxygen and salinity, can be harmful to marine organisms (reviewed by Burnett and Stickle, 2001; Fotedar, 2011). For example, ~~L~~laboratory studies have documented adverse effects of temperature fluctuations on HSC physiology (Coates et al., 2012). Furthermore, Hurton and Berkson (2006) provided evidence that HSCs bled after being held for two days under "high-stress" harvest conditions, involving ~~(~~prolonged air exposure and~~,~~ increased air temperature, ranging from 20°C to 36°C~~,)~~ had higher mortality rates than HSCs bled after a comparable period of holding under "low-stress" harvest conditions.

In the present study, we tested whether the length of time that HSCs are kept in outdoor holding ponds prior to bleeding, biomedical bleeding, and recovery from bleeding can separately or synergistically affect HSC physiological condition and mortality. Our study represents a "low-stress" biomedical harvest process in that HSCs were held in ponds at low stocking densities as compared to conditions typically experienced in industry ponds (~~100s~~ i.e., hundreds of HSCs per 1000 m^{-2} pond, Hamilton, pers. obs.). The physiological condition of individual animals was monitored by quantifying body weight, along with the

Commented [MRK6]: They are not always returned to the ocean. In some states, bled HSCs are subsequently used in the bait industry.

Commented [MRK7]: I suggest you email this sentence to Brad before including it in your ms. This has very real potential for disclosing industry secrets. The Radiolab podcast may be your best bet for 'publicly-available information. While you can't cite that episode, if they say it in the podcast, you can feel more comfortable about printing it.

Commented [KL8R7]: I emailed Brad and Wally this sentence. Brad said that he "has no issues with the wording".

Exhibit F

Excerpts from Draft of Hamilton et al., *Physiological Impacts of Time in Holding Ponds, Biomedical Bleeding, and Recovery on the Atlantic Horseshoe Crab, Limulus Polyphemus*, Provided in FOIA Disclosures to S.C. Coastal Conservation League

Title Page

Names of the Authors

Kristin Hamilton, Louis Burnett, Karen Burnett, Rachel Kalisperis, Amy Fowler

Paper title

Physiological Impacts of Time in Holding Ponds, Biomedical Bleeding, and Recovery on the Atlantic Horseshoe Crab, *Limulus polyphemus*

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and June before the actual biomedical bleeding occurs. In South Carolina, harvesters are not required to feed HSCs in holding ponds, monitor how long HSCs have been in holding ponds, or monitor or regulate standard levels of environmental abiotic conditions in holding ponds (as per permits "Horseshoe Crab Hand Harvest Permit HH14" and "Horseshoe Crab Possession (No Harvest) Permit HP12"). HarvestorsHarvesteers are required to provided constant mechanical aeration and report all mortalities. It is well known that changes in water quality, such as temperature, dissolved oxygen and salinity, can be harmful to marine organisms (reviewed by Burnett and Stickle, 2001, Fotedor; Fotedar, 2011). Laboratory studies have documented adverse effects of temperature fluctuations on HSC physiology (Coates et al., 2012). Furthermore, Hurton and Berkson (2006) provided evidence that HSCs bled after being held for two days under "high-stress" harvest conditions (prolonged air exposure, increased air temperature ranging from 20°C to 36 °C) had higher mortality rates than HSCs bled after a comparable period of holding under "low-stress" harvest conditions.

In the present study, we tested whether the length of time that HSCs are kept in outdoor holding ponds prior to bleeding, biomedical bleeding, and recovery from bleeding can separately or synergistically affect HSC physiological condition and mortality. Our study represents a "low-stress" biomedical harvest process in that HSCs were held in ponds at low densities for a relatively brief periods of time as compared to industry standards (see below).). The physiological condition of individual animals was monitored by quantifying body weight, along with the concentration of the respiratory pigment hemocyanin and hemocyte density in hemolymph. Hemocyanin concentration and hemocyte densities have been used to monitor the physiological condition of many marine species, including HSCs (Coates et al., 2012; James-Pirri et al., 2012,; Anderson et al., 2013; Kwan et al., 2014). The experimental design employed in this study also allowed us to test whether HSC body size was related to the volume of hemolymph extracted by biomedical bleeding and whether the physiological responses to bleeding might be related to epibiont density on the HSC carapace. Taken together, the data gathered during this study are intended to clarify our understanding of the potential impacts on the health and the survival of wild populations of HSCs which are collectedharvested for biomedical purposes.

Commented [A14]: Any thoughts on why you may not want to put food in these ponds? What are the food requirements of HSC being held for short periods? Are there naturally occurring food sources in the ponds?

Commented [A15]: No crabs will be in the ponds more than 2 months.

Commented [A16]: They are required to aerate ponds. We can access these ponds anytime we want and check pond conditions. There is no incentive for killing HSC in poorly maintained ponds. No money will be made off a dead crab. Also, we receive monthly mortality reports for the ponds. Spikes in mortality will and do inform OFM of unacceptable pond conditions.

Commented [WJ17]: This is misleading as they are required under SCDNR permit conditions to mechanically aerate the ponds 24/7 while horseshoe crabs are present.

Commented [A18]: We worked with CRE to condense the bleeding season so it ends by early June to avoid the heat of summer and reduce heat related deterioration of pond conditions resulting in increased mortality.

Commented [MRK19]: Relative to industry standards, 8 weeks is not a brief period of time for holding HSCs in ponds.

Commented [PK20]: Where do you define what "low stress" means, and is there a better way to quantify and/or characterize industry standards? Perhaps it would be better to state something like "compared to conditions typically experienced in industry ponds (Hamilton, pers. obs.).

Commented [PK21]: Is this analysis included in the manuscript?