Science AMA Series: I'm Lee Smee, Associate Professor of Marine Biology at Texas A&M – Corpus Christi. I'm an ecologist and my research topics include predator-prey interactions on oyster reefs and effects of pesticides on blue crab behavior. AMA!

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the WINNOWER

REDDIT

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Greetings professor.

How is micro-plastic, if at all, influenzing your particular field. Are there any other "under the radar" pollutants affecting what you study?

BadgerBadgerDK

Plastics have been known to be a problem in marine environments for a long time. Studies on micro plastics are relatively new, but suggest effects can be harmful. I am pleased to see governments taking action to ban them.

I have not worked on micro plastics and am not aware of studies testing specific effects on oysters or blue crabs. One of my colleagues is working now to develop a test to measure the amount of micro plastics in blue crabs, which will be a valuable first step in assessing their effects. For oysters, I suspect that they would be able to expel them as feces or pseudo feces (think throwing up), but I don't know for sure. Oysters are amazingly hearty and can easily ingest harmful algae so I do not think plastic to them would be an issue if it doesn't interfere with their feeding and/or they expel it, although they might concentrate it for higher trophic levels. This would be an interesting line of research.

Hi Professor- I grew up in cc and later was a part of the team that built the concert hall there on campus- I know the place quite well!

I grew up in gulf waters eating crab and oysters...then I stopped doing so after the Horizon oil spill, even now I'm hesitant. What did the spill do to the crabs and oysters (if anything) and have they and their environment truly recovered?

Also, you mention the water being turbid eventually affecting the oyster population. So if it is a bad year for tropical storms / hurricanes and the water gets stirred up frequently, does that affect the population to a noticeable degree after the storms roll through?

One more- where specifically do you conduct your studies and observations? In the local waters? In a lab?

Thank you

[deleted]

The concert hall is my favorite building on campus and a real jewel of the city! Most of the effects on oysters from the oil spill resulted from releases of freshwater to try and prevent oil from washing ashore. The rapid decline in salinity caused high oyster mortality. Oysters are pretty tolerant of pollution and are known to consume red tides and other harmful substances. My guess is that small amounts/low concentrations of oil or dispersants would not directly kill oysters, but it might stress them and make them vulnerable to other factors. I have continued to eat oysters and crabs without any problems, and my understanding is that the seafood in affected areas is ok to consume.

We have done both lab and field studies on turbidity and analyzed long term data sets on fisheries landings. The effects of turbidity appear indirect. In turbid waters, fish are less able to see, they prey less on mud crabs that inhabit oyster reefs, leading to an increase number of mud crabs and greater predation on oysters. Turbidity is caused in this area by removal of oysters and seagrasses, which allows the sediment to become resuspended on windy days. Turbidity is also caused by algal blooms. I am trying to gather funding to study effects of different causes, levels, and sources of turbidity to better address this question.

This may be a little outside the topic, but perhaps you may know the answer. What molecule(s) in crustaceans cause people to be allergic to them? I've read iodine can cause allergies, but people allergic to crustaceans can eat iodized salt.

AreWe_TheBaddies

see post below by luruar

latest studies suggest protein is the culprit not iodine, although it might be more than one thing and there may be different things in different combinations that affect people differently

Hi there. I am a recent PhD and as part of my dissertation I did a good amount of field work along the Gulf Coast. Beautiful place, isn't it? I have a few questions.

Have you noticed any unusual, potentially invasive micro- or macroalgae in your area, or any changes to the seaweed community occurring over the years?

Can you share any good links for statistics on the oyster industry in the Gulf of Mexico? I had a tough time finding this in the past. How frequently are oysters imported to mariculture operations in the Gulf?

Cheers, and thanks for your time!

newkscup

I have not noticed any new algae in the area. There has been a persistent brown tide in the Laguna Madre and some colleagues are looking at the causes and consequences of it. Black drum from the area have been malnourished and several folks are researching why.

For stats, someone provided links below, you could also check on the National Marine Fisheries Service and with state agencies for this type of information.

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We have several ongoing projects in the lab now. We are continuing to study effects of turbidity on food webs and are analyzing data from a very, very arduous field study on turbidity. We are monitoring changes in wetland communities as a result of mangrove encroachment in coastal marshes, and my newest doctoral student is examining the chemical signals that mediate parasite/host interactions between sacculinid barnacles and crab hosts.

The most surprising thing personally was that oyster larvae can tell the differences between more genetically diverse, and presumably healthier habitats vs. those of lower diversity. I am always surprised at how interconnected things are and amazed and frustrated at mine and others inability to understand the cascading effects of one change across a food web. But this is also a very exciting area of study too.

Hi professor. I was wondering if ocean acidification may affect the interactions you are describing?

Thanks!

Odysseus5

I have read several recent articles showing that lower pH makes it tougher for organisms to build shells and especially to build stronger/heavier/thicker shells in response to predators. These scientists worked with Pacific oysters (same genus, different species) and with snails. I have measured pH changes in Texas estuaries from 7-9 and back within the same week. The oysters here are incredibly reliant to it. My impression is that coastal species like oysters are probably better able to handle pH changes because they experience them often and are adapted to them as compared to more oceanic species that are adapted to relatively constant pH. For oysters specifically, I think oyster harvesting is a far bigger threat.

Hey professor, I grew up in South Jersey where a lot of Agriculture occurs. Do you find that the pesticide runoff introduced into estuaries and other crab habitats influence their molting process?

sandhol

Recently molted crabs had larger negative effects from pesticide expsoure, but, we did not see a significant change in molting frequency in pesticide trials vs. controls. There are some studies that have suggested molting might be a response to heavy metal pollution, but we used organic pesticides that are quite different. I have a doctoral student who is lead author and will submit this work soon.

Hi Professor,

In what way do you think the behaviour of the crabs is being altered by the pesticides?

Is it the pesticides are altering or overpowering other chemical cues in the system, e.g. masking the a chemical from a damaged conspecific which can be cues to avoid areas with high risk of predation/hide from predators?

Or do you think that the pesticides are altering crab physiologically? I was thinking by inhibiting the crab's ability to detect any cues, whether through a decrease in the functionality of their chemical

detection as a whole, or through behaviour alteration in some other form? Perhaps reduced response to chemical cues because the nervous system is being affected by the pesticides, which I think is how pesticides can function?

I guess my question comes down to whether you think the pesticides are altering the environment itself, or the crabs.

Any insight would be appreciated, this sort of area reminds me a lot of my Undergrad where a few of my lecturers specialised in similar areas of predator-prey interactions and/or crab behaviour. And slightly similar to what I attempted to do for my undergrad dissertation!

miomike

After exposure to low concentrations of pesticides like malathion and resmethrin (i.e. Scourge), blue crabs become lethargic. At concentrations of 100 ppb, which is below the EPA standard for safe drinking water, crab mortality is increased significantly. At 10 ppb, crabs are less able to right themselves when placed on their backs, and in general are less aggressive. Interestingly, after 48 hours or so, they get really hungry and consume more food than crabs not exposed, and do so even when the risk of predation is present. The pesticides we used target acetylcholinesterase in insects. This enzyme is what allows muscles to relax after contraction. Without it, muscles stay rigid and organisms like insects and crabs cannot move, or at least not move as easily. Our observations suggest that the responses are physiological and are consistent with the mode of action of these pesticides. So I would say the pesticides are altering the crabs. Keep in mind that although harmful to crabs, malathion and other pesticides have relatively short half-lives as compared to heavy metals or other contaminants. Our findings also suggest that if crabs survive the initial exposure, then they can recover if placed in water without pesticides.

Islander alumni here, just saying it's good seeing TAMUCC getting some attention. So I've recently picked up recreational diving as a hobby and only recently learned about the invasive Lionfish.

How're Texas waters handling the invasion (or impending invasion) of them?

texanengineer

Lionfish are new to Texas and some of my colleagues are trying to get money to study them. Hopefully there will be some research and mitigation dollars to help deal with them when they become established here.

I just graduated from TAMUCC this may!!

What is your favorite part about living in CC? About the college?

Least favorite?

Go Islanders

RedWatchFox

Congrats on finishing up. What was your major? Fall weather is CC is great, and my colleagues at the university are amazing. I miss the mountains of North Georgia and I wish it wasn't so hot and windy here. Makes cycling in to work difficult and miserable too often.

I'm from Maine. The blue crab has become an invasive species, it's harder for me to eat delicious

muscles. What is the future population of the crab going to look like?

drphilthy

The Gulf of Maine is colder than areas south of Cape Cod, and Cape Cod marks a demarcation line for blue crabs and many other species. I believe blue crabs are likely becoming more common in Maine due to warmer water temperatures. Given current warming projections, it is likely that blue crabs and other species would be able to establish populations in Maine and other more northern areas.

Thank you for keeping tabs on oyster health, I love them. I don't know if studying aquatic life makes you not want to eat it, but here goes. 1. Do you eat oysters? If so, how do you like them prepared? 2. Do you eat seafood, and if so, what is your favorite fish or shellfish?

Lemonsniffer

I do eat oysters, shrimp, and all sorts of seafood. Fresh Maine lobster is my favorite, probably because I don't get it too often. The fried fish and chips at Snoopy's, a local place is good. Pretty much if you take it out of the ocean and fry it, I'll eat it. I eat oysters raw, fried, baked, Rockefeller, don't care. Fresh fish is also great, blackened, or plain. Why am I hungry suddenly?

When you said that oysters respond to crabs by enlarging their shells, in turn reducing reproduction rates does this mean the total biomass of oysters remains the same? So if the shells were smaller, the oysters would reproduce more often but put less energy toward shell growth and the total biomass of small shelled oysters would roughly equal the biomass of less numerous, large shelled oyster populations? I just find it neat how nature finds equilibrium like that.

GravitationalSlave

First, let me state that oyster growth is HIGHLY variable and one of my grad students has been studying the relationship between gonad mass, soft tissue mass, and shell density/thickness/size. In general, as shells get thicker, the relative amount of gonad, that is, the amount of gonad standardized by size is reduced. In other words, two oysters of the same size, if one has a thicker shell will have less gonad tissue. The tricky part is finding two oysters of the same size. My student has been working on this analysis for almost a year now, but, we should hopefully be wrapping it up very soon. In general though, when you see an organism, such as an oyster change their morphology in response to a predator, it indicates there is some type of cost, usually in growth and/or fecundity. If there wasn't a cost or trade-off, then the organism should just build the strongest defense possible since there would be not costs not to do so. Make sense?

What is some advice you have for a young zoology major who wants to advocate for wildlife conservation right now?

What kinds of programs could I get involved in while finishing my degree?

bitchtits614

I read the comments below. You will probably need to get a MS degree. Experience will help you get into grad school. Basically find a non-profit or research lab you can volunteer with. Be open to anything. The positions you want are competitive. So don't get discouraged if you are studying plankton now and washing glassware to gain experience. You'll be pulling golf balls out of whales in no time.

Seriously though, any experience you can get, even if not directly what you want to do, can help you

get into grad school or open other opportunities.

There are lots of internships, some paid, like NSF REU programs. You'll need to do some investigation on your own.

Hi professor!

First and foremost, as a Marylander, I want to thank you for your research into blue crabs and I hope my state can utilize it to make our bay healthier.

I was wondering if you have done any research into the effect of micro plastics in an ecosystem, whether in fish, oysters, and/or crabs, and what sort of effect it has on them?

Thanks!

RazorToothbrush

I commented to another redditor above with a similar question. If that doesn't answer your question, message me.

Does your research include looking into alternative methods of pesticide that are less harmful to the Gulf's ecosystem?

Are you excited for the new Life Sciences and Engineering building on campus, or is most of your work done over in the Harte Research Institute?

thecrunchcrew

I am very excited about the new building. I have only looked at pesticide effects on crabs and not on other methods. I would hope that policy makers would consider both the pros and cons of pesticide use though when deciding when, how much, and how often they should be applied.

How do you feel about eating crabs and such? If you could make the public aware of one thing in your field what would it be?

YELLIO

Crabs are delicious, and I enjoy eating seafood. I would like the public to understand the delicate balance of nature and the effects overharvesting, pollution, and climate change will have on it and on us both in terms of health, recreation, and monetarily.

How much chemistry is involved in your job, or marine biology in general?

Pohatu_

I specifically do not do alot of chemistry, but, there are marine biologists who do chemistry almost exclusively. This is hard to admit, but, some of the best marine biologists are chemists, mathematicians, and engineers. They are successful because they can bring tools and knowledge from other fields to solve problems and approach problems in unique ways. I advise students who want to go into marine biology to consider a double major or at least a minor in math and/or chemistry.

Greetings, Professor. As someone interested in the effect of pesticides on organisms outside their intended targets, what is your position on leveraging GMOs to reduce their use? Are sterile mosquitos a viable solution to reduce spraying? Do you worry about the effect of bt plants to control other pests? What evidence is there to validate either your fears or faith in these methods?

ErixTheRed

All evidence to date suggests GMOs are safe, and using them to reduce pesticides in my opinion would be a good alternative. Using sterile males has worked effectively for other insects such as screwworm flies. I am not sure how much research has been done on using sterile mosquitoes but it would be worth studying and trying I think.

As a marine biologist, how many people get excited and assume you work with dolphins?

I've heard/read of larval settling cues used in other species - eg, coral larvae target coralline algae and some fish fry swim towards the smell of decomposing mangrove leaves. Have you identified the chemical(s) that larval oysters use to find healthy reefs? Do you know if they, like the fish, lose the ability to home in on chemical cues under ocean acidification conditions?

Oysters are expert bioaccumulators of toxins, eg brevetoxin, saxitoxin, and other harmful algal secondary metabolites. Have you looked at whether oysters accumulate anti-mosquito compounds at higher concentrations than surrounding water, and if this in turn serves to protect them from crab predation? Or if it makes the oysters toxic to crabs, even if they aren't deterred by the chemicals' presence?

Thank you

Decapod73

What a bunch of great questions! I was literally shocked at how often I get asked about dolphins and what to do to work on dolphins and if I have seen the Seinfeld whale episode.

In short, I don't know the answers to these questions. We know there is a cue of some kind that oyster larvae use to select where to settle and that genetically diverse reefs get more larvae so presumably they smell better or are more likely to contain the compound(s) a particular larvae is looking for. There is some great work by Danielle Dixon and Mark Hay looking at preferences of coral larvae and all sorts of coral reef species to water collected from protected reefs vs. degraded reefs. In short, everything prefers the healthy coral reef. As far as if other oyster reef species can distinguish between diverse and less diverse reefs, we haven't tested that (yet). I did read some articles recently that fish did lose some ability to orient under OA.

The pesticides we use have very short half-lives and do not bioaccumulate. I don't know that crabs or other animals can tell if oysters have toxins or not. There are several studies looking at death of otters and other species consuming shell fish during red tides.

Did you have my baby brother in your classes? His name is Wesley and he's deaf. I'm so very proud of him!!

wildcat83

Wesley was great, smart, very funny and personable. He took a graduate marine ecology class with me a few years ago.

Okay doc, give it to me straight. Are we actually fucked? I hear things about acidification of the oceans, fish population dwindling, and reefs bleaching and dying.

nut-sack

Here is a comment I copied from above. The news isn't good. And the media and intentional ignorance is frustrating, but, I remain hopeful. from above:

Jim McClintock, a personal friend, in his book, Lost Antarctica, offers a ray of hope. The world pulled together to ban CFCs because they were destroying the ozone layer, and he hopes for a similar outcome for climate change. There is plenty of reason to be pessimistic. When I started college in 1992, the idea was for biologists to find pristine ecosystems to study how nature really works. 10 years late biologists have accepted that man's influence is everywhere and that pristine ecosystems don't exist. Instead, we have to understand how human's fit into the ecosystem. That was a big shift in thinking. Yet, I do remain optimistic. President Obama was working with China, fishing regulations are implemented, micro beeds are being banned, and I read recently about the creation of devices to remove plastic from the oceans. With education, more and more people want to protect the planet, and I suspect it can and will be done. I hope that the road back isn't too hard though and that my kids and grandkids will still be able to experience nature like I did.

I live near Corpus, glad to have you. I have noticed a vast increase in blue crabs around all the Corpus area bays. Is there a known reason for this? I wade alot and can't remember ever seeing so many.

MightyBrand

Yes, the heavy rainfall for the past 2 years has lowered salinity making conditions ideal for crabs. In this part of Texas, rainfall is infrequent, meaning that estuaries can experience high salinity and then have a flood that drops salinity to 0. There is little water exchange with the Gulf and bays can stay salty or fresh for weeks to months, and sometimes longer. Think of the flood as a forest fire that resets the system, and now we are in the sweet spot of recovery. As drier conditions return and El Nino subsides, salinity will likely rise and crab numbers will decline.

Do runoff pesticides gradually sink? I'm not sure if you can answer this, but also discharged waste water...sink or float? And in the case that either do sink, will upwelling bring them back to the beach? I live in Tampa bay and we have had torrential rains, major runoff and waste water discharge in the actual bay, I'm wondering if I'm far enough away from an inlet, if the waste and runoff will make it to the beach, even after prolonged hard offshore winds. Thanks!

bocaciega

I would suspect that some things in the waste water will sink and others will float and some will make it off shore while others may return with currents. It really depends on the particular substance you are referring to and the environmental conditions and currents in the area. The pesticides I work on have relatively short half-lives so I would think that a week or more after a rain they would not be detectable, although this could change depending upon temperature and other factors.

How do you feel about big oil and their large donations to many of Texas's marine centers and aquariums? Do you feel like this is a conflict of interests?

anonymous_being

Oil and gas are a large part of the Texas economy and of the global economy in general. I always think

it is better to work together to solve problems, even with folks you may disagree with. In reality, we need to work with oil and gas because they have deep pockets and we will need their cooperation if we are going to battle climate change effectively in the near future. And while I am glad to see green technology gaining ground, for the foreseeable future oil and gas will be a major play in Texas and really everywhere. This is an overly optimistic approach I know, but in reality, we have to tap into renewable resources but at the same time, we cannot kill the economy to do so. Fortunately I can leave this up to policy makers to figure out. If companies are donating money for education and research, I think this is a good thing, even if it probably is a pure PR move on their part. The conflict I think comes in when companies fund research and then have a stake in the outcomes of those findings. This is not a problem unique to oil and gas. This could be solved by funding research in public labs where results are transparent and then letting the data and not short term economics or ideology dictate future steps.

Hello and thank you for your work. My question: is there any hope for the oceans? Pollution, climate change, over fishing, debris

pdxpoker

Jim McClintock, a personal friend, in his book, Lost Antarctica, offers a ray of hope. The world pulled together to ban CFCs because they were destroying the ozone layer, and he hopes for a similar outcome for climate change. There is plenty of reason to be pessimistic. When I started college in 1992, the idea was for biologists to find pristine ecosystems to study how nature really works. 10 years late biologists have accepted that man's influence is everywhere and that pristine ecosystems don't exist. Instead, we have to understand how human's fit into the ecosystem. That was a big shift in thinking. Yet, I do remain optimistic. President Obama was working with China, fishing regulations are implemented, micro beeds are being banned, and I read recently about the creation of devices to remove plastic from the oceans. With education, more and more people want to protect the planet, and I suspect it can and will be done. I hope that the road back isn't too hard though and that my kids and grandkids will still be able to experience nature like I did.

Are there lasting effects of the BP oil spill that you have seen in your research? I enjoy eating seafood when I visit the gulf but I worry about the pollution and lasting effects on the environment. I have heard that part of the cleanup process was adding a substance that made the oil sink to the bottom of the ocean floor where these creatures live. Is there still a concern about the toxicity of these chemicals in our food supply?

luckduck89

Great questions. There were no effects of oil in this part of Texas so I was not personally affected. I believe the food is now safe, and that the oil is mostly on the bottom of the Gulf of Mexico. I don't mean to minimize the spill nor suggest that the ocean bottom destruction isn't important, but, the blue crabs, red fish, and oysters you are probably thinking of should be fine. I continue to eat them. And yes, chemicals were added to help break up the oil and cause it to sink away from shore and yes, these chemicals are toxic to many species. I would have to do more research about the toxins in long lived pelagic species like Tuna, but, I would also trust the agencies responsible for verifying food safety.

Do you think the opening of Cedar Bayou is showing signs of success yet?

I think that paired with the rain had a huge impact already, especially on Crab populations, which your work seems to indicate would mean more and better Oysters. I think a lot of people underestimate the

impact of altering the natural water exchange.

3kindsofsalt

I do think the better water exchange probably helps Mesquite Bay and the local area. I am not sure how far the actual benefits go or if the costs is worth the benefit. Several studies are underway to investigate it. My understanding is that Cedar Bayou was intentionally closed to protect the area for the Ixtoc spill and that CCA was restoring it, so I think the idea was good.

When you get suncream in your eyes it hurts. Is there evidence to show that pesticides cause pain to the marine animals?

MassiveLazer

Ouch, yes, sunscreen in the eyes sucks. There is debate about whether crabs and other invertebrates feel pain. For fish and vertebrates, they certainly do and I would think death caused by poisoning would be painful.

What got you to study Biology? Was it an ordinary hobby or interest you chose to develop?

That_One_Engi

I tried to answer that in the intro. It was really just an interest in nature from a young age. Really cultivated through boy Scouts and camping and a desire to help protect natural areas.

Thank you for taking questions. Assuming your research has some greater negative impact on oyster populations, how does this influence compare to other human related influences such as overharvesting, reduced freshwater inflow, etc.?

ElCooCooi

Overharvesting is the biggest threat to oysters. I jokingly told some who asked about climate change that we'd eat all the oysters long before climate change could take them out. Changes in freshwater is a big one too, especially in TExas and other arid areas, but globally, harvesting is the big one.

Hi!!! My dream job ever since I was a child was to become a marine biologist, and TAMUCC was my dream school. I'm 18 now and just graduated, and I gave that up a while ago as I did some research and it seemed really hard to get a job in the field and I wasn't sure if it was worth it. Would you agree it's hard to get a career as a marine biologist these days? Thank you!!!

meatknife

Yes, it is very competitive. But, if you work hard and plan on going to grad school, you can do it. If you are local, stop by to discuss.

How did you get into blue crabs?

TheRoyalTart

Met Dr. Weissburg who was studying them as his model organism. It went from there. Plus, eating your

study animals is a giant plus.

Hello Professor! Im from corpus and my mom works at the University for the Center for Coastal Studies, and she studied under Wes Tunnel when he was still teaching there.

My question to you is this: what kinds of changes can we expect to see in the blue crab and oyster populations in the next 10 to 20 years as the Oyster Fest and Blue Crab are both important parts of South Texas and Gulf Coast Culture?

cckike

Wes is a fantastic guy! His efforts really helped get research off the ground here. It is really hard to say. I think populations of both will be at this level or lower moving forward, and, I am particularly concerned about oysters given the dredging practices used in Texas.