UNIVERSITY of WASHINGTON

Undergraduate Research Symposium May 18, 2012 Mary Gates Hall

Online Proceedings

Poster Session 1

MGH 241, Easel 174

12:00 PM to 1:30 PM

Behavior of Ghost Shrimp (*Neotrypaea californiensis*) Following Exposure to Imidacloprid: Implications for the Control of Burrowing Shrimp on Oyster Beds in Willapa Bay, WA

Andrew Alexander (Andrew) Annanie, Senior, Biology (General)
Levi Rex (Leviticus) Hay, Senior, Aquatic & Fishery Sciences
Mentor: Christian Grue, Aquatic & Fishery Sciences

Imidacloprid (IMI) may be a viable alternative to carbaryl for controlling burrowing shrimp that destabilize sediments, resulting in poor survival and low yields of Pacific oysters. However, efficacy varies among substrates and laboratory tests indicate the shrimp are relatively insensitive to IMI (24-h LC50's > 12,000 ppb active ingredient [ai]) and 10x greater than those in sediment pore water following application of 4x the desired application rate. These results contrast sharply with observed efficacy in the field, with significant mortality occurring 72-96 h post application in sandy substrate at 0.5 lbs ai/ac. Reasons are not known, but an understanding of the factors governing efficacy in the field may improve control within muddy substrates and those with eelgrass. We exposed adult *N. californiensis* in seawater to IMI (Nuprid®2F) simulating concentrations reported in sandy substrate following application of 0.5 lbs ai per acre. Concentrations were the means from a pore-water fate curve: 0-6 h = 150 ppb ai, 6-24 h (24), 24-48 h (10), 48-72 h (6), and 72-96 h (4.3) plus negative controls with 10 shrimp at each time interval (5 IMI, 5 controls), a loading of 0.31 L/g, and water exchanges at the end of each time period. Water quality and overt effects were monitored. At the end of each exposure, the ability of shrimp to burrow in sandy substrate was evaluated. All IMI-exposed shrimp survived, were overtly affected, and none burrowed. In contrast, all controls appeared normal and 96% exhibited burrowing behavior. Results suggest applications of IMI (0.5 lbs ai/ac) will not directly kill shrimp, exposed shrimp may not be able to maintain their burrows, and death may result from burrow collapse. Factors that maintain burrow integrity (mud/organic matter, eelgrass roots) may explain differences in observed efficacy. Laboratory tests with shrimp exposed to IMI within burrows are needed.

Session 1A

Searching for Sustainability: Human-Environment Interactions and Potential Management Strategies

Session Moderator: Edward Miles, School of Marine and Environmental Affairs

Mary Gates Hall 228

1:00 PM to 2:30 PM

* Note: Titles in order of presentation.

Will Pacific Salmon Still Be Here in 2100? Evolutionary Potential of Columbia River Chinook to Keep Pace With Climate Change

Sheila Renee (Sheila) Thomas, Senior, Biology (Ecology, Evolution & Conservation)
Mary Gates Scholar
Mentor: Daniel Schindler, School of Aquatic & Fishery Sciences

With global temperature predicted to increase by 1-6 degrees C by 2100, the question of how species will adapt to such a rapidly changing environment is becoming increasingly urgent. Some of the most widely observed responses to climate change have been changes in phenology, or the timing of life-history events such as the timing of migration, flowering, or mating. These apparent adaptations may be the result of genetic evolution or plasticity, and while both can prevent a species from extirpation during rapid environmental shifts, they vary markedly in their long-term effects on population viability. The Pacific salmon, *Oncorhynchus*, are one group of organisms whose survival is intimately linked to climate conditions. Because salmon die after they spawn, their entire life cycle depends on the success of one spawning season, which in turn depends on their ability to migrate up rivers to spawn during months favorable to their survival. Even small increases in water temperature and flow rates can greatly increase pre-spawning mortality for these fish. Using existing knowledge of Chinook life-history and fine-scale climate projections for the Columbia River Basin, together with an eco-evolutionary model, we assess the potential for Chinook salmon to shift their migration timing to adapt to future climate change. We hypothesize that Chinook are likely to

have the evolutionary potential to allow them to avoid spawning during the warmest times on a long-term scale. While this is reassuring for the survival of pacific salmon, in general the extent of adaptability will depend on the life-history of the organism of interest.

identify any consistent trends from the data that may be helpful in determining monitoring strategies to enhance marine spatial planning and conservation for those particular species in this region. ArcGIS will be used in order to illustrate the results and produce further geostatistics on the data.

SESSION 1A

SEARCHING FOR SUSTAINABILITY: HUMAN-ENVIRONMENT INTERACTIONS AND POTENTIAL MANAGEMENT STRATEGIES

Session Moderator: Edward Miles, School of Marine and Environmental Affairs
Mary Gates Hall 228
1:00 PM to 2:30 PM

* Note: Titles in order of presentation.

Monitoring Strategies for Adaptive Management in Marine Spatial Planning
Hannah Lorraine (Hannah) Linder, Senior, Aquatic & Fishery Sciences
Mentor: Miles Logsdon, School of Oceanography

Marine Spatial Planning (MSP) has become a critical framework for the adaptive management of marine conservation. MSP incorporates the entire ecosystem into management practices in order to sustain healthy fisheries as well as a thriving environment. The MSP process includes creating an optimal monitoring strategy in order to yield the most positive results for the well-being of the ecosystem. In my capstone I explored the importance of spatial and temporal trends for making effective monitoring strategies for adaptive management within the MSP framework. The research relied upon GIS (Geographic Information Systems), which is regarded as a vital tool for creating MSP strategies. In order to examine the effect of spatial zonation on management decisions I used copper rockfish (*Sebastes caurinus*) data from the San Juan Islands from 1994, 1999, and 2000. This data was used to create a map illustrating the influence different spatial zones have on the information management obtains in order to form adaptive management strategies. Furthermore, in order to investigate the effect of temporal binning on MSP I used killer whale (*Orcinus orca*) data from the same relative location from 1996-2001. I categorized the data into different periods, or "bins" of time, and analyzed how these bins impact management decisions. In both examples a threshold was created from the given data that would in theory trigger management action in order to quantitatively prove that the spatial and temporal way in which a species is monitored does affect regulatory and marine spatial planning decisions. Hopefully, by proving this statement with specific case studies I will also

SESSION 1A

SEARCHING FOR SUSTAINABILITY: HUMAN-ENVIRONMENT INTERACTIONS AND POTENTIAL MANAGEMENT STRATEGIES

Session Moderator: Edward Miles, School of Marine and Environmental Affairs
Mary Gates Hall 228
1:00 PM to 2:30 PM

* Note: Titles in order of presentation.

Increased Interactions with Fisheries? Return of the Short-tailed Albatross
Anne Franklin (Annie) Johns, Senior, Aquatic & Fishery Sciences
Mentor: Julia Parrish, Aquatic & Fishery Sciences
Mentor: Jane Dolliver, Aquatic & Fishery Sciences
Mentor: Shannon Fitzgerald, Resource Ecology Fisheries Management, Alaska Fisheries Science Center NOAA

The Short-tailed Albatross (*Phoebastria albatrus*) is listed as endangered under the US Endangered Species Act (ESA) due to small population size, and limited breeding range. The Short-tailed Albatross (STAL) breeds on Torishima and Minami-kojima Islands off Japan and migrates to Alaskan waters during the summer. The NOAA Alaska Fisheries Science Center's Observer Program, in collaboration with the USFWS, instructs observers to carry out seabird monitoring activities in addition to their recording of bycatch during fishing operations. Using Observer Program seabird sightings and vessel-bird interaction data from 1993-2009, we examined potential vessel interaction threats to the recovery of the population, as well as the frequency and geographic expansion of Short-tailed Albatross sightings. Our data indicate that Short-tailed Albatross sightings increased more than the Short-tailed Albatross population during this time period (6.5% population growth per year), with observer days remaining relatively stable. We also found that incidences of discard feeding and/or vessel following are not increasing disproportionately to population size as the population continues to grow, thus it is unlikely that vessel interactions threaten the STAL population recovery. Lastly, we found that the sightings of Short-tailed Albatross show an eastward expansion since 1993, thus suggesting an expansion of this species within their historic range.

POSTER SESSION 3

Commons West, Easel 25

4:00 PM to 5:30 PM

Extracting Data from Polar Bears Remotely Tracked by Satellite

Hannah Marie (Hannah) Director, Junior, Mathematics, Statistics
Mentor: Kristin Laidre, Polar Science Center/APL and School of Aquatic and Fishery Sciences
Mentor: June Morita, Statistics

The development of satellite technology has enabled scientists to develop a greater understanding of the movement patterns of various animals. Specifically, the movement of polar bears in Greenland is of ecological interest due to sea ice loss in the Arctic. Researchers tag polar bears with satellite collars and collect various samples and measurements such as age, sex, body mass, and body condition. Bears are tracked using polar-orbiting satellites and the data are collected and transmitted by Advanced Research and Global Observation Satellite (ARGOS). The large volumes of data are reported in coded text files that are difficult to analyze and contain error. I developed a program to extract data from ARGOS written using the statistical programming language R. This program allows for covariates on individual bears to be merged with satellite location data. I created two error checked databases (filtered and unfiltered) on movement of polar bears in Greenland. This program will facilitate data analysis of the movement patterns of polar bears.