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**Proposal Cover Sheet**

**Term: Fall\_\_X\_\_ Spring \_\_\_\_\_ Year 2011­\_**

**Instructor Nora Demers\_\_\_\_**

Name: Daniel Sabourin

Present Year in Education (e.g., freshman, sophomore, etc.): Junior

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Major Marine Science

Have you identified a research mentor for a senior thesis (if applicable)?

\_\_X\_\_ Yes \_\_\_\_\_ No.

If yes, please identify.

Name: Dr. Gregory Tolley

**Title of Proposal:**

The effect of temperature increase on moon jellyfish, *Arelia aurita*, asexual production of medusa.\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Keywords (3-5)

Jellyfish, Polyp, Temperature, & Reproduction­­­­­\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Checklist:**

All required portions of the first submission are included \_\_X\_\_ Yes \_\_\_\_\_ No

I had an external reviewer read the proposal \_\_\_\_\_ Yes \_\_X\_\_ No

If Yes, who \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ When \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

I authorize the use of this proposal as an example in future courses \_\_X\_\_ Yes \_\_\_\_\_ No

*Abstract*

Blooms in global jellyfish populations, while thought to be the result of changing oceanic conditions that stem from global climate change, aren’t well understood. These blooms create problems for fisheries and power plants that use ocean water for cooling. To better fill this gap of knowledge, samples of moon jellyfishpolyps, *Aurelia aurita*, will be collected and subjected to water temperatures ranging from 26 to 34 degrees Celsius. Over the course of a year, samples will be gathered and tested for temperature’s effect on medusa production.

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*Project Description*

*-Statement of Problem*

In moderate numbers, the common moon jellyfish, *Aurelia aurita,* exhibit mutualistic relationships with some fish, providing them with protection from larger species that would predate them, and predatory relationships with most others through consumption of larvae and indirect competition for resources (Tolley 1987). When jellyfish start to overpopulate in proportion to nektonic fish, it becomes harmful for the fisheries as these gelatinous organisms syphon off the flow of nutrients into “trophic dead ends” (Brodeur, Sugisaki, & Hunt 2002). These medusae are produced by the polyp stage of their lifecycle. In optimal conditions, the individual polyps can bud clones of themselves, which are capable of producing even more medusa.

In oceans around the world, jellyfish have been increasing in population density (Shoji et al. 2005(a&b)). Like most jellyfish species, *A. aurita’s* life cycle alters between the pelagic medusa stage and the benthic polyp stage, the medusa being sexual and the polyp asexual (Shick 1975). Jellyfish are also capable of tolerating a wide range of dissolved oxygen content in water (Shoji et al. 2005(a&b)). With rising ocean temperatures as a result of global climate change (Walther et al. 2002), water capacity for dissolved oxygen will decrease as the average temperatures increase, creating a hypoxic environment in which jellyfish can easily predate fish and larvae (Shoji et al. 2005).

With this rise in oceanic temperature, knowing what effect it has on *A. aurita* reproductive success would provide useful foresight as to how global climate change will affect the fishing industry and the ocean’s ecological balance. Kawamura and Kubota (2008) examined the effect of temperature and salinity on hydromedusa reproduction success, but there is still a gap in how temperature affects scyphomedusa in their polyp stage. To fill in this gap of knowledge is the goal of this proposed research by gathering *A. aurita* polyp samples and subjecting them to a range of temperatures, keeping all other conditions consistent so as to observe the effect of temperature alone on their production of medusa.

*-Research Objective*

The purpose of this study is to examine the effect of temperature on the asexual production of medusa and polyps in moon jellyfish polyps, *Aurelia aurita*.

*Methods*

*-Study Design*

*-Animal Field Sampling*

*A. aurita* samples will be collected either through vertical tows from 2m above the bottom to the surface using plankton nets at a haul speed of 1m per second, (Kawamura and Kubota 2008) or from a self-sustaining aquatic tank in Marco Island with the Marriott’s permission. Scyphistoma will be maintained in order to sustain life and prevent strobilation (Appendix 1) in order to induce polyp budding (Shick 1975).

*-Lab Experiment Design*

Animals will be kept at room temperature (21-24**°**C) in iodine-free, 30psu artificial seawater. Roughly 200 will be kept at controlled temperatures via microplate submersion in temperature-controlled water baths (Fitt and Costley 1998). 100-200 asphyxiated *Artemia* nauplii to feed each polyp (Kawamura and Kubota 2008). Maintenance methods call for feeding twice weekly, having food residue removed after feeding; the polyps will be given 20 minutes to feed before residue removal (Kawamura & Kubota 2008) and water will be changed after each feeding on the day of feeding (Fitt and Costley 1998). Salinity of experiment medium will be maintained at 30psu salinity while temperature will range from 26 to 34 degrees Celsius in intervals of four degrees.

*-Data Collection*

Over the course of a year, polyp samples will be checked every other day for signs of strobilation over a period of thirty days. Should strobilation occur, the number of released ephyra will be tallied and removed from the medium. Asexual budding polyps will also be noted and removed once separated from the parent polyp.

*-Data Analysis*

Statistical significance of the correlation between this data and temperature will be examined using the Pearson product-moment correlation coefficient (Kobayashi & Kubota 2009). Then, only data possessing a strong correlation to temperature (*r* = 0.5 or greater) will be further examined using a One-way Analysis Variance (ANOVA) to identify significance between the data and temperature.

*Broader Implications*

Understanding the triggers that influence jellyfish population blooms affects two major industries, fishing and power. The more jellyfish there are in the oceans, the more there are to predate on larval fish, harming the fishing industry. Additionally, large populations also get caught in currents created by nuclear power plants that use water for cooling, shutting down the power plant until the intake is cleared. Finding the factors that promote jellyfish blooms will allow for steps to be taken to prevent future blooms, thus improving conditions for nuclear plants and the fishing industry.

*Equipment Needed*

For conduction of this experiment, the necessary equipment includes: one plankton net of 0.33mm mesh size, 24-well microplates, a supply of asphyxiated *Artemia* nauplii (Kawamura & Kubota 2008), Instant Ocean seawater mix, and temperature-controlled water baths (Fitt & Costley 1997).

*Tentative Timeline*

At the start of the Fall 2012 semester, the Marriott in Marco Isle will be contacted. If polyp samples cannot be obtained from their *Aurelia* tank, arrangements will be made to obtain samples in field. Over the course of one year, samples will be collected and maintained for temperature experiments. At the conclusion of one year, Fall 2013, all data pertaining to temperature experiments on asexual polyp production will be compiled for data analysis.

*References Cited*

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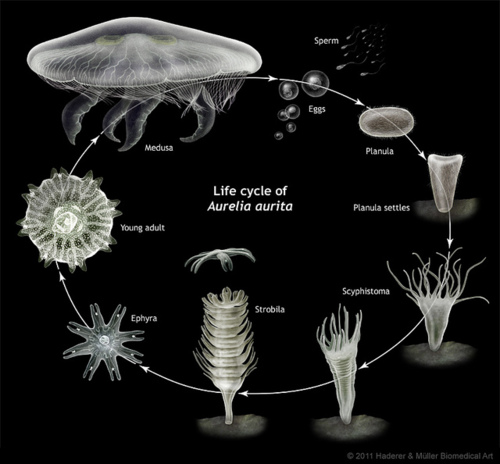
(b)Shoji. J., R. Masuda, Y. Yamashita, M. Tanaka. 2005. Effect of low dissolved oxygen concentrations on behavior and predation rates on red sea breams *Pagrus* *major* larvae by the jellyfish *Aurelia aurita* and by juvenile Spanish mackerel *Scomberomorus niphonius*. *Marine Biology*. Vol:147. 863-868.

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Walther. G.R., E. Post, P. Convey, A. Menzel, C. Parmesan, T.J.C. Beebee, J.M. Fromentin, O. Hoeg-Guldberg, F. Bairlein. 2002. Ecological responses to recent climate change. Nature. Vol:416, 389-395.

*Appendix 1*

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*Curriculum Vitae*

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**GOALS**

I’m a deliberative, focused, intelligent learner and achiever (Clifton StrenthsFinder Test), and my plans are to study more about phylum Cnidaria and understand the reasons for global jellyfish blooms.

**EDUCATION**

B.S. Marine Science Florida Gulf Coast University, (anticipated graduation 2013)

Associated Courses:

Marine Ecology Fall ‘11

Invertebrate Zoology Fall ‘11

Behavioral Ecology Spring ‘11

Tropical Island Biology Summer ‘11

**PROFESSIONAL SOCIETIES**

FGCU Registered Student Organization: Eco-Action – 3rd year active member participating in local waterway cleanups and events to raise awareness of environmental conservation

**SERVICE**

Community Service:

- Coral Spring’s Sawgrass Nature Center and Wildlife Hospital (Summer 2010)

My responsibilities included maintaining of cages and the feeding of hospitalized animals as well as permanent residents that cannot be released. Such animals included raccoons, opossums, gators, various bird species, turtles, iguanas, skunks, prairie dogs, snakes, and any other injured or abandoned animal that gets brought in.

-Coral Spring’s Community Emergency Response Team (CERT) 2006-2009

Received training from police and fire departments to be prepared to lend aid whenever necessary should an emergency require more manpower. Such emergencies include, but aren’t limited to, fires, floods, hurricane damage, and missing persons.

**SCIENTIFIC SKILLS**

I’m a fast learner and am able to easily learn, understand, and replicate procedures with strict precision.