

# International Research Experiences for Students (IRES): *Imminent change in a European marine reserve* 18 Aug - 21 Sep 2013

Application forms available at  
<http://pages.uoregon.edu/oimb/Faculty/Trowbridge.htm>

**Objectives:** No-take marine reserves are important tools to learn about marine systems and to protect areas for future generations. These ideas, encapsulated by national and regional marine reserve programs, offer an ideal opportunity to train young marine scientists about international marine reserves: their structure, function, and management. Four outstanding American students per year (2 undergraduate and 2 graduate students) will conduct marine ecological research with foreign colleagues at Europe's first statutory marine reserve (Lough Hyne Marine Reserve in Co. Cork, Ireland) that is faced with imminent change due to large-scale alterations in the lough biota. IRES students will participate in a pre-trip 5-day orientation workshop at the Oregon Institute of Marine Biology and then will travel together to Cork, Ireland for the 4-week project period between summer and fall academic terms. Students will work at the University College Cork Renouf Lab, a small field station accessible by boat, and live in a nearby cottage. Each IRES student will take the lead on one aspect of the rapid, community-level changes of lough biota. All projects will involve intertidal shore surveys and shallow-water snorkel surveys. Graduate students will also conduct plankton tows and field experiments to investigate larval abundance and settlement.

**Projects:** **Project 1:** IRES participants will document the population structure and dynamics of juvenile and adult benthic stages of the purple urchin *Paracentrotus lividus*. Students will estimate urchin population size, measure spatial variation in size structure, and conduct cohort analyses for different areas of the lough. **Project 2:** Students will sample planktonic urchin larvae and conduct settlement experiments to evaluate the "larval limitation" and "post-settlement mortality" hypotheses to determine the basis for the recent dramatic urchin decline. **Project 3:** Students will investigate experimentally whether the invasive brown alga *Sargassum muticum* alters invertebrate recruitment patterns (barnacles, bryozoans, sacoglossans, etc.)—either enhancing settlement or blocking larvae from the substrate—through a series of field experiments in and around dense *Sargassum* beds. **Project 4:** Students will document the dramatic proliferation of the native brown alga *Cystoseira foeniculacea* and conduct field transplant experiments to determine whether declining urchin herbivory is the primary causal factor.

**Intellectual Merit: Projects 1&2:** The urchin *Paracentrotus lividus* is one of the most important species structuring the lough benthic communities. Elucidating the mechanism of urchin decline will determine whether or not urchin populations will eventually increase without human intervention (the NPW management team's preferred approach). Past research concluded low temperature, causing low larval production, is the primary reason for the urchin decline. Yet, low larval availability has not been demonstrated and alternative hypotheses have not been tested. **Project 3:** Incursions of the invasive brown alga *Sargassum muticum* have strongly affected the British Isles. The recent (2003-present) incursions at Lough Hyne have the potential to alter invertebrate recruitment patterns; however, understanding whether *Sargassum* will physically block recruits from the sea floor or enhance their settlement through reduced water flow is unclear. These diametrically opposed outcomes will determine the consequences of the alga's proliferation. **Project 4:** The dramatic proliferation of the native brown alga *Cystoseira foeniculacea* throughout the lough, except where the remaining urchins occur, suggests that declining herbivory may permit algal establishment and spread although eutrophication may be significant as well. All four projects will document patterns and test causal mechanisms which are widespread on Irish shores and of considerable ecological, economic, and conservation concern.

**Broader Impacts:** IRES students will participate in crucial conservation efforts (eradicating *Sargassum*) and long-term monitoring (24 invertebrate and 21 seaweed target species) at historical sites surveyed annually since 1994 and originally in the 1950s. Baseline studies, experimental results, conservation and eradication work, and project products will contribute to the education of 12 American students and the local Irish stakeholders as well as assist the Irish NPW agency in its management objectives. Students will create an online blog, produce electronic identification sheets for Irish schools and visitors, give an oral presentation to UCC colleagues, and share their unique experiences with peers at their home institutions.





Gate House



Inside the Gate House



***Details:*** The grant will provide (1) stipend, (2) airfare and ground transportation to OIMB for pre-trip workshop, (3) dorm and meal costs at OIMB, (4) international airfare to Ireland, and (5) airport hotel and meal costs on day of arrival in and departure from Cork, Ireland. In addition, covered subsistence during the project will include (6) lodging at 4-person self-catering rental at Lough Hyne, (7) health and accident insurance, and (8) bench fees at the UCC Renouf Lab. Additional details (as they become available) will be posted at the following website <http://pages.uoregon.edu/oimb/Faculty/Trowbridge.htm> under the Lough Hyne or IRES links.



UCC Renouf Lab





### Eligibility of students:

Applicants should be:

- U.S. citizens or permanent residents
- Undergraduate or graduate students at a U.S. university or college
- Enrolled in a degree program at the time of application and program participation

### Selection of students:

Because of the intense nature of working at Lough Hyne (with group living, communal cooking, and daily cold-water snorkeling), we will screen eligible candidates based strongly on letters of reference and personal telephone interviews. Students will need to be in excellent physical condition for daily cold-water snorkeling, rowing, turning boulders, and plankton tows. Applicants with coursework in phycology, invertebrate zoology, fish biology, or marine ecology will benefit most from the experience, given the extraordinary biotic diversity in the marine reserve. Because the goal of the IRES program is to provide international research experiences to students, applicants with little to no previous international experience will be considered most favorably.

### Pre-trip workshop:

IRES participants will come to OIMB for a 5-day pre-trip orientation after summer term ends. Students will be housed in the OIMB dorm and will attend a workshop about the habitats and ecologically important organisms they will see. Furthermore, we will discuss sampling techniques, field experiments, and research papers about marine reserves, highlighting Lough Hyne work and discussing it in the context of other studies. Additional topics to be covered include:

- Boat safety, boater's card, & nautical knots
- Tidal patterns, tidal tables, waves, and tidal currents
- Designing a research plan: hypotheses, controls, replication, sample size, etc.
- Sampling: transects, quadrats, random numbers tables, etc.
- Best practices keeping a notebook: documenting, transcribing, and backing up data
- Data analysis & presentation: statistics, image analysis, and constructing graphs
- Finding and reading primary literature in marine ecology
- Scientific ethics: integrity, values, conflicts of interest, and openness
- Working in a sensitive habitat: conservation issues in a marine reserve

### International travel:

Trowbridge will handle travel arrangements (from students' homes to OIMB, from OIMB to Ireland, and from Ireland to home) and travel insurance. We will all travel together to Cork Airport in Ireland. We will spend the night in an airport hotel, enabling IRES students to contact their families about their safe arrival. The following day, we will rent a vehicle, drive to Cork to meet the research coordinator (McAllen), and then drive to the lough to get set up for our work.

### IRES Period:

We will work at the UCC lab which can accommodate 5-6 people total. We will do communal cooking with all students participating in food shopping, preparation, clean-up, etc. Students will start their projects immediately and work on them or the group activities for the 4-week international period. For safety reasons, all fieldwork will be done in pairs (or larger groups) and walkie-talkies will be used for contact (due to limited cell phone coverage due to surrounding hills). Each evening, we will discuss our progress and plan the following day's work. We will have regular group discussions of recent papers about the lough or the region. We will also have regular evening discussions on the follow topics:

- Scientific writing in marine ecology (format, content, style, grammar)
- Graduate school: how to choose and gain entry into graduate school, expectations, experiences, peer support, and networking
- How to present research work as a poster, oral presentation, and paper
- Scientific ethics: authorship, credit, acknowledgment, error, negligence, & misconduct

We will work with each student daily to discuss how to analyze his/her data, how to make the next step in the project, etc. Given the few external distractions (no TV or internet, limited radio), students would be fully immersed in research, scientific discussions, or exploration of the lough and environs. Regular trips to town and field trips further afield will be made to ensure cultural enrichment, internet access, and social harmony.



- Past Student Excursions:*
- Alter Wedge Tomb
  - Balledehob
  - Baltimore
  - Bantry Bay
  - Bonane Heritage Park
  - Bunratty Castle & Folk Park
  - Castletownbere
  - Cape Clear Island
  - Cliffs of Moher
  - Derreen Gardens
  - Drombeg Stone Circle
  - Dunboy Castle
  - Fastnet Lighthouse
  - Glandore Harbour
  - Glengariff
  - Healy Pass
  - Kenmare
  - Kinsale
  - Mizen Head
  - Ring of Kerry
  - Ring of Beara
  - Ross Castle
  - Skellig Islands
  - Skibbereen Heritage Centre
  - Spanish Point
  - Timoleague
  - Toe Head
  - University College Cork
  - etc.





# Lough Hyne Students

**2006**

Alix Laferriere (OIMB) & Stephanie Schroeder (OIMB)



**2007**

Katie Bennett (OIMB) & Maya Wolf (OIMB)



**2009**

Josh Lord (OIMB) & Laura Garlie (PSU/OIMB)



**2010**

Brittney Dlouhy (OIMB)



**2011**

Marissa Paulling (OIMB) & Brittney Dlouhy (OIMB)