

Coastal Marine Habitats in North Wales

Generic Syllabus¹

Day 1: Depart U.S. for Manchester, UK

Day 2: Arrive Manchester, UK. Travel to Bangor, Wales via vans. Student orientation at School of Ocean Sciences (safety briefing, tour facilities, set up computer access, etc.). Brief field excursion to rocky intertidal habitat in the Menai Straits. Observation and discussion of rocky intertidal zonation patterns.

Day 3: *Lecture:* Processes affecting zonation patterns on rocky shores.

Field exercise: Rocky shore ecology, Part I – Zonation and biodiversity on a sheltered rocky shore. Field excursion to Church Island. Students will collect data on tidal exposure, air and water temperature and fluid forces in different zones in the intertidal and collect flora and fauna from each zone.

Laboratory exercise: Processing and identification of organisms collected from Church Island rock shore. Discussion of the roles of physiological tolerance, wave stress and biological interactions on the formation and maintenance of zonation patterns.

Day 4: *Lecture:* Phenotypic plasticity in response to environmental cues

Field exercise: Rocky shore ecology, Part II – Zonation and biodiversity on an exposed rocky shore. Field excursion to high energy rocky shores at Porth Treacastell and Aberffraw. Collection of field data and organisms. Examination of tide pool diversity in relation to size and exposure.

Laboratory exercise: Phenotypic plasticity in dogwhelks; biometric measurements from a sheltered (Church Island) and exposed (Porth Treacastell) shore.

Day 5: *Lecture:* Processes affecting infaunal biodiversity

Field exercise 1: Geology of shore face and dune features at Newborough

¹ The specific sequence of topics covered and field exercises are determined by tidal stage and weather conditions.

Field exercise 2: Biotic and abiotic factors affecting infaunal distributions at Treath Melynog. Collection of cockles (and other organisms in the community) across a large macro-tidal sand flat. In addition to live cockles, students will collect shells from dead cockles and make estimates of predation and non-predation related mortality. Students will measure elevations across the tidal flat and use this information in conjunction with tide gauge data to estimate exposure times.

Laboratory exercise: Evaluation of factors affecting size, growth, survival and distribution of cockles. Students will use shell band patterns to determine age and growth rates of cockles from different regions of the tidal flat and use these findings together with mortality estimates from recently dead shells to draw inferences about factors controlling population and community structure across macro-tidal flats.

Day 6: *Lecture:* Geological history of the Snowdonia mountains

Field exercise: Observations of geological features and discussion of processes at Cwm Idwal and Nant Ffancon in Snowdonia National Park. These glacially-sculpted valleys contain rocks that formed during the Ordovician in landscapes that reveal the subsequent effects of mountain formation and glaciations.

Day 7: Day off.²

Day 8: *Lecture:* Geology and Paleoecology of Anglesey shorelines

Field exercise: Field excursion to Red Wharf Bay to examine Carboniferous outcrops and associated fossils. Exposed fossils of corals, brachiopods and worm burrows, along with paleokarsts and other geological features, will be used to teach students about the coastal environments in the region 300-350 MYA.

Day 9: *Lecture:* Ecology and carbon flux in a macrotidal salt marsh environment

Field exercise: Observation of floristic ecotones, descriptions and collection of dominant flora and fauna marsh species, and identification of plant and animal morphological adaptations necessary for survival in a tidal

² Dependent upon schedule.

salt marsh habitat. Students will also learn methods for measuring salt marsh gross primary production (GPP) using a portable CO₂ gas analyzer and by collecting above and below ground plant biomass.

Laboratory exercise: Identification of field specimen, preparation of samples for calculations. Calculation of GPP using above and below ground biomass and modeling of CO₂ gas analysis data. Discussion of the ecological links of the carbon flux between a salt marsh and the adjacent estuary water column and benthic community.

Day 10: *Lecture:* Fish diversity: Evolution and ecological of major groups

Field exercise: Sampling cruise aboard the *R.V. Prince Madoc* in the eastern Irish Sea. Collection of demersal fishes, epibenthic invertebrates and oceanographic data.

Laboratory exercise: Identification of specimens from collection. Students will determine fish diversity and abundance from different habitats and relate fish morphometrics to diet and feeding habits.

Day 11: *Lecture:* Invertebrate larval ecology

Field exercise: Plankton sampling the Menai Straits.

Laboratory exercise: Examination and identification of zooplankton specimens. Discussion of larval form and function.

Day 12: *Lecture:* Predator-prey interactions in marine systems

Field exercise: Field excursion to Porth Neigwl, Llyn Peninsula. Among the rocky outcrops on examine predator-prey interactions between gastropods and blue mussels. Students will collect data on size-specific predation rates and the effects of refugia.

Day 13: Exam
Work on student projects

Day 14: Work on student projects

Day 15: Project presentations

Additional field excursion as time permits to Puffin Island

Day 16: Return to U.S.