

Coastal Physical Oceanography and Marine Ecosystems

Working Syllabus – 23 June – 12 July 2008

This course is a concentrated 3-week course. We will meet 6 days each week (M – Sat) for 3 weeks (23 June 2006 – 12 July 2008)

This graduate-level class will focus on both physical and biological oceanography to further our understanding of how marine ecosystems function.

Topics to be covered.

- A: processes on scales less than 1km (e.g. biology and boundary layers; vertical structure and biology of the mixed layer).
- B: processes on scales from 1-1000 km (e.g. coastal upwelling regions; fronts and the accumulation of biological material; tides and waves and their effect on larval transport).
- C: Processes on scales of 1000 km and greater (e.g. ocean basin circulation, the biology of major currents, rings and eddies; variability in ocean circulation and its biological consequences; the global ocean and climate change physical and biological aspects).

Our anticipated schedule is given below.

| Date | Location | Time | Instructor(s) | Text Chapter | Topics |
|----------------|----------|-------------------------------------|---|--------------|---|
| June 23 | Lecture | 0830-0845 | Dr. Brock Woodson Dr. Jack Barth Dr. Margaret McManus Dr. Pete Raimondi Dr. Libe Washburn Dr. Jack Barth | | Introductions |
| | Lecture | 0845-0900 | Dr. Jack Barth | | Why oceanography is important to marine ecosystems? Why should marine ecologists be concerned with oceanography? Overview of syllabus, guest lecturers, labs, equipment and boat Student introductions Tour of Long Marine Lab Student Projects, Field day logistics |
| | | 0900-0915 | Dr. Pete Raimondi | | |
| | | 0915-0930 | Dr. Brock Woodson | | |
| | | 0930-1000 1030-1115 1115-1200 | Dr. Brock Woodson Dr. Pete Raimondi Dr. Brock Woodson | | |
| | Lab | 1330-1500 | Dan Hoover/ Brock Woodson | | CTD, Thermistors, ADCP |
| | Lab | 1530-1700 | Dan Hoover/ Brock Woodson | | Tutorial math and matlab |
| June 24 | Lecture | 0830-1000 | Dr. Brock Woodson | Chapter 2 | Biology at small scales |
| | Lecture | 1030-1200 | Dr. Brock Woodson | Chapter 2 | Biology at small scales cont. |
| | Field | 1330-1700 | Construct moorings and visit site | | Construct phys and bio moorings: ADCP Thermistors SMURFs Plates |
| June 25 | Lecture | 0830-1000 | Dr. Margaret McManus | Chapter 3 | Vertical structure of the open ocean; biology of the mixed layer MATLAB exercises |
| | Lab | 1030-1200 | Dr. Brock Woodson | Chapter 3 | |

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| | Field | 1330-1700 | Construct moorings cont. | | |
| June 26 | Field | | Deploy moorings | | Field study: instrumentation |
| June 27 | Field | | CTD surveys Plankton tows | | Field study: instrumentation |
| June 28 | Lecture | 0830-1000 | Dr. Margaret McManus | Chapter 4 | Vertical structure in coastal waters; freshwater run-off and tidal mixing Vertical structure in coastal waters: Coriolis and upwelling regions. Informal Discussion of Reading #1 |
| | | 1030-1200 | Dr. Libe Washburn | Chapter 5 | |
| | Lab Discussion | 1330-1500 1530-1700 | Guest Speaker #1 Dr. Brock Woodson | | |
| June 29 | OFF | | | | |
| June 30 | Lecture | 0830-1000 | Dr. Jack Barth | Chapter 6 | Fronts in coastal waters |
| | | 1030-1200 | Dr. Jack Barth | Chapter 6 | Fronts – continued |
| | Lab Discussion | 1330-1500 1530-1700 | Guest Speaker #2 Dr. Brock Woodson | | Informal Discussion of Reading #2 |
| July 1 | Lecture | 0830-1000 | Dr. Jack Barth | Chapter 7 | Tides, tidal mixing |
| | | 1030-1200 | Dr. Libe Washburn | Chapter 7 | Internal waves |
| | Lab | 1330-1500 1530-1700 | Guest Speaker #3 Dr. Brock Woodson | | Informal Discussion of Reading #3 |
| July 2 | Field | | CTD Biosampling collection | | CTD survey Plankton tow Collect SMURFs, larval traps, plates Acrobat |
| July 3 | Field | | Biosampling collection and analysis | | CTD survey Plankton tow Collect SMURFs, larval traps, subtidal plates Acrobat |
| July 4 | OFF | | | | |
| July 5 | Lecture | 1330-1500 | Dr. Libe Washburn | Chapter 8 | Ocean basin circulation; the biology of major currents |
| | | 1530-1700 | Dr. Libe Washburn | Chapter 8 | Ocean basin circulation – continued |
| | Lab Discussion | 1330-1500 1530-1700 | Dr. Brock Woodson Dr. Brock Woodson | | Informal Discussion of Reading #4 Informal Discussion of Reading #5 |
| July 6 | OFF | | | | |
| July 7 | Lecture | 0830-1000 | Dr. Margaret McManus | Chapter 9 | Variability in Ocean Circulation: Its Biological Consequences Final Projects |
| | | 1030-1200 | Dr. Dan Hoover/Dr. Brock Woodson | | |
| | Lab | 1330-1500 1530-1700 | Guest Speaker #5 Guest Speaker #6 | | |

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|----------------|----------------|--|---|--|--|
| July 8 | Field | | | | Retrieve moorings |
| July 9 | Lecture Lab | 0830-1000 1030-1200 1330-1500 1530-1700 | Guest Speaker #7 Guest Speaker #8 Dr. Dan Hoover/Dr. Brock Woodson Dr. Brock Woodson | | Final Projects Informal Discussion of Reading #6 |
| July 10 | Lecture Lab | 0830-1000 1030-1200 1330-1500 1530-1700 | Dr. Leslie Rosenfeld Dr. Leslie Rosenfeld Dr. Dan Hoover/Dr. Brock Woodson Dr. Dan Hoover/Dr. Brock Woodson | | California Current California Current – continued Help with final projects Help with final projects |
| July 11 | Lecture Lab | 0830-1000 1030-1200 1330-1500 1530-1700 | Dr. Brock Woodson Dr. Dan Hoover/Dr. Brock Woodson Dr. Dan Hoover/Dr. Brock Woodson Dr. Dan Hoover/Dr. Brock Woodson | | Course synthesis – what does it all mean Help with final projects Help with final projects Help with final projects |
| July 12 | Lecture | 0830-1200 | Student Presentations | | Student Presentations (30 min + 5 min discussion) |

* Required text. The Dynamics of Marine Ecosystems. 1996. Mann KH and Lazier JRN. Blackwell Scientific Publications. 432 pp.

Confirmed Guest Speakers

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|----------------------|---|
| Dr. Chris Edwards | Assistant Professor, Earth and Marine Sciences, University of California – Santa Cruz |
| Dr. Mimi Koehl | Professor, University of California – Berkeley |
| Dr. Jeff Paduan | Associate Professor, Naval Postgraduate School |
| Dr. Leslie Rosenfeld | Associate Professor, Naval Postgraduate School |
| Dr. John Ryan | Research Scientist, Monterey Bay Aquarium Research Institute |

Text and all readings will be provided 1 month prior to course commencing.

Proposed Informal Readings

1. Woodson, C.B., D.R. Webster, M.J. Weissburg, and J. Yen. 2005. Response of copepods to physical gradients associated with structure in the ocean. *Limnol. Oceanogr.* 50(5) 1552-1564.
2. Deksheniaks MM, PL Donaghay, JM Sullivan, JEB Rines, TR Osborn and MS Twardowski. 2001. Temporal and spatial occurrence of thin phytoplankton layers in relation to physical processes. *Marine Ecology Progress Series.* 223: 61-71.
3. Graham WM and JL Largier. 2007. Upwelling shadows as nearshore retention sites: the example of northern Monterey Bay. *Continental Shelf Research.* Vol 17(5) 509-532.
4. Pineda J. 1999. Circulation and larval distribution in internal tidal bore warm fronts. *Limnology and Oceanogr.* 44(6): 1400-1414.

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5. Pfeiffer-Herbert AS, MA McManus, PT Raimondi, Y Chao and F Chai. 2007. Dispersal of barnacle larvae along the central California coast: A modeling study. *Limnology and Oceanography*.
6. Barth JA, BA Menge, J Lubchenco, F Chan, JM Bane, AR Kirincich, MA McManus, KJ Nielson, SD Pierce and L Washburn. 2007. Delayed upwelling alters coastal ocean ecosystems in the northern California current. *Proceedings of the National Academy of Sciences*.

Note: Schedule, guest speakers, and readings subject to change