SIO 286, Marine Science, Economics & Policy: Approaches to Marine Conservation
Units: 4; Winter 2015, Monday 9am-1pm (only 8 classes so 4 hour block), Hubbs 4500
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This 4-unit course will focus on approaches to marine conservation with a specific focus on traditional strategies and ecological frameworks, including fisheries management and marine protected areas, but broadly covering a number of different approaches from species to ecosystems. The class will be interdisciplinary, with emphasis on science, policy, market-based initiatives and communications. The class will be lecture based and will include guest speakers invited to talk about their specific areas of expertise.

Grading: Letter grade only; 30 pts participation, 30 pts assignment, 40 pts final project
Readings: Weekly readings listed on TED
Assignments: 2 during the quarter
Final paper: due 3/16/15

Week 1 1/5/15: Introduction to approaches; fisheries management for food production and conservation; global fisheries and single species approaches; ecosystem-based management (Doukakis); discussion of final project (Aburto)

REQUIRED READINGS:
- 2014 FAO State of World Fisheries (skim this to gain understanding)
- Fisheries Economics Full Report
- Groundfish FMP (skim to understand components and complexity)
- Linking Fisheries management with marine conservation objectives through ecosystem approaches. Chapter 13 in Roff and Zacharias, Marine Conservation Ecology 2011.
- Pikitch et al. 2004. Ecosystem-based fisheries management. Science 305: 346-347.
- Troell et al. 2014. Does aquaculture add resilience to the global food system? PNAS 111: 13257–13263.
- Worm, B. et al. 2009. Rebuilding global fisheries. Science 325, 578-585.

RECOMMENDED READINGS:
- Magnuson-Stevens Fishery Conservation and Management Act (as reauthorized in 2007) http://www.nmfs.noaa.gov/msa2005/docs/MSA_amended_msa%20_20070112_FINAL.pdf
- Alder, J. et al. 2008. Forage fish: from ecosystems to markets. Annual Reviews in Environment and Resources 33:153-166
- Brown and Treblico. 2014. Unintended cultivation, shifting baselines and conflict between objectives for fisheries and conservation. Conservation Biology, Volume 28, No. 3, 677–688.
- Howarth et al. 2014. The unintended consequences of simplifying the sea: making the case for complexity. Fish and Fisheries 15: 690–711.
- Pikitch, E. K. et al. 2012. The global contribution of forage fish to marine fisheries and ecosystems. Fish and Fisheries 15:43–64.

Week 2 1/12/15: By-catch overview; Using the ESA to protect vulnerable species affected by fisheries: the concept and management of take (Doukakis)

REQUIRED READINGS:

- The Endangered Species Act http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf ,
- Adams, P. B., C. B. Grimes, J. E. Hightower, S. T. Lindley, M. L. Moser and M. J. Parsley. 2007. Population status of North American green sturgeon, *Acipenser medirostris*. Environmental Biology of Fishes 79:339–356.
- 4d rule for green sturgeon
- Hall, M. et al. 2000. By-catch: Problems and solutions. Marine Pollution Bulletin Vol 41: 204-219.
- Lewison, R. L. et al. 2011. Ingredients for addressing the challenges of fisheries bycatch. Bulletin of Marine Science 87.
- Moore , J. E., et al. 2009. A review of marine mammal, sea turtle and seabird by catch in USA fisheries and the role of policy in shaping management. Marine Policy 33(2009)435–451.
- National Marine Fisheries Service (NMFS). 2012. Biological Opinion on the Operation of the Pacific Coast Groundfish Fishery, NMFS, Northwest Region. Dec. 7, 2012.

RECOMMENDED READINGS:

- Davies, R.W.D., et al. 2009. Defining and estimating global marine fisheries bycatch. Marine Policy 33: 661-672.

Week 3 1/19/14 NO CLASS – UCSD HOLIDAY

Week 4 1/26/15: Contrasting goals and strategies in single species management overlapping in time and space (Aburto). Focus on the Vaquita marina in the Upper Gulf of California (Aburto, Catalina López & Andrew F. Johnson)

REQUIRED READINGS:

- Powles, H., Bradford, M. J., Bradford, R. G., Doubleday, W. G., Innes, S., & Levings, C. D. (2000). Assessing and protecting endangered marine species. ICES Journal of Marine Science, 57(3), 669–676.
- Zacharias, M. A., & Roff, J. C. (2001). Use of focal species in marine conservation and management: a review and critique. Aquatic Conservation: Marine and Freshwater Ecosystems, 11(1), 59–76.
- Jaramillo-Legorreta, A., Rojas-Bracho, L., suffix, R. L. B. S. J., Read, A. J., Reeves, R. R., Ralls, K., & Taylor, B. L. (2007). Saving the Vaquita: Immediate Action, Not More Data. Conservation Biology, 21(6), 1653–1655.
- Small, E. (2011). The new Noah's Ark: beautiful and useful species only. Part 1. Biodiversity conservation issues and priorities. Biodiversity, 12(4), 232–247.

RECOMMENDED READINGS:

- Mlot, C. (1989). The Science of Saving Endangered Species. BioScience, 39(2), 68–70.
- Pimm, S. L., & Raven, P. (2000). Biodiversity. Extinction by numbers. Nature, 403(6772), 843–845.

Week 5 2/2/15: Fisheries management in practice: catch limits, area concessions (Aburto). Focus on demersal fisheries and trawling (Andrew F. Johnson).

REQUIRED READINGS:

- Hardin, G. (1968). The tragedy of the commons. Science, 162(3859), 1243–1248.

- Costello, C., Gaines, S. D., & Lynham, J. (2008). Can catch shares prevent fisheries collapse? Science, 321(5896), 1678–1681.
- Johnson AF, Gorelli G, Jenkins SR, Hiddink JG, Hinz H. 2015 Effects of bottom trawling on fish foraging and feeding. Proc. R. Soc. B 282: 20142336. http://dx.doi.org/10.1098/rspb.2014.2336

RECOMMENDED READINGS:

- Rognvaldur Hannesson (2006) The Privatization of the Oceans. MIT Press. 214 pp.

Week 6 2/9/15: Market-based mechanisms: seafood choices programs and certification, including MSC. Focus on Gulf of California sardine (Doukakis & Aburto)

REQUIRED READINGS:

- Ababouch, L. 2012. Market-based standards and certification in aquaculture. In R.P. Subasinghe, J.R. Arthur, D.M. Bartley, S.S. De Silva, M. Halwart, N. Hishamunda, C.V. Mohan & P. Sorgeloos, eds. Farming the Waters for People and Food. Proceedings of the Global Conference on Aquaculture 2010, Phuket, Thailand. 22–25 September 2010. pp. 525–547. FAO, Rome and NACA, Bangkok.
- Gutierrez, N. L., et al. 2012. Eco-Label conveys reliable information on fish stock health to seafood consumers. PLoS ONE 7(8): e43765. doi:10.1371/journal.pone.0043765.
- Jonell, M. et al. 2013. Eco-certification of Farmed Seafood: Will it Make a Difference? AMBIO 2013, 42:659–674
- Roheim, C. A. 2009. An evaluation of sustainable seafood guides: Implications for environmental groups and the seafood industry. Marine Resource Economics 24: 301-310.
- MSC Fisheries Standards (skim this to familiarize yourself)
- Additional TBD and on TED

STUDY CASE:

- Velarde, E., Ezcurra, E., Cisneros-Mata, M. A., & Lavín, M. F. (2004). Seabird Ecology, El Niño Anomalies, and Prediction of Sardine Fisheries in the Gulf of California. Ecological Applications, 14(2), 607–615.
- Velarde, E., Ezcurra, E., & Anderson, D. W. (2013). Seabird diets provide early warning of sardine fishery declines in the Gulf of California. Scientific Reports, 3, 1332.

Week 7: 2/16/15 NO CLASS – UCSD HOLIDAY

Week 8 2/23/15: Market-based mechanism: payment for ecosystem services and biodiversity value (Aburto)

REQUIRED READINGS:

- Jackson, J. B., Kirby, M. X., Berger, W. H., Bjorndal, K. A., Botsford, L. W., Bourque, B. J., et al. (2001). Historical overfishing and the recent collapse of coastal ecosystems. Science, 293(5530), 629–637.
- Worm, B., Barbier, E. B., Beaumont, N., Duffy, J. E., Folke, C., Halpern, B. S., et al. (2006). Impacts of biodiversity loss on ocean ecosystem services. Science, 314(5800), 787–790.
- Aburto-Oropeza, O., Ezcurra, E., Danemann, G., Valdez, V., Murray, J., & Sala, E. (2008). Mangroves in the Gulf of California increase fishery yields. Proc. Natl. Acad. Sci. USA, 105(30), 10456–10459.

- Costanza, R., de Groot, R., & Sutton, P. (2014). Changes in the global value of ecosystem services. Global Environmental. doi:10.1016/j.gloenvcha.2014.04.002

RECOMMENDED READINGS:

- Wilberg, M. J., & Miller, T. J. (2007). Comment on "Impacts of biodiversity loss on ocean ecosystem services". Science, 316(5829), 1285–author reply 1285.
- Perrings, C., Duraiappah, A., Larigauderie, A., & Mooney, H. (2011). The Biodiversity and Ecosystem Services Science-Policy Interface. Science, 331(6021), 1139–1140.
- Hein, L., Miller, D. C., & de Groot, R. (2013). Payments for ecosystem services and the financing of global biodiversity conservation. Current Opinion in Environmental Sustainability, 5(1), 87–93.
- Rubio-Cisneros, N. T., Aburto-Oropeza, O., Murray, J., Gonzalez-Abraham, C. E., Jackson, J., & Ezcurra, E. (2014). Transnational Ecosystem Services: The Potential of Habitat Conservation for Waterfowl Through Recreational Hunting Activities. Human Dimensions of Wildlife, 19(1), 1–16.

Week 9 3/2/15: Eco-regions and hotspots: ways to prioritize marine conservation (Aburto)

REQUIRED READINGS:

- Myers, N., Mittermeier, R. A., Mittermeier, C. G., da Fonseca, G. A. B., & Kent, J. (2000). Biodiversity hotspots for conservation priorities. Nature, 403(6772), 853–858.
- Roberts, C. M., McClean, C. J., Veron, J. E. N., Hawkins, J. P., Allen, G. R., McAllister, D. E., et al. (2002). Marine biodiversity hotspots and conservation priorities for tropical reefs. Science, 295(5558), 1280–1284.
- Spalding, M. D., Fox, H. E., Allen, G. R., Davidson, N., Ferdaña, Z. A., Finalayson, M., et al. (2007). Marine Ecoregions of the World: A Bioregionalization of Coastal and Shelf Areas. BioScience, 57(7), 573–583.
- Rodriguez, J. P., Taber, A. B., Daszak, P., Sukumar, R., Valladares-Padua, C., Padua, S., et al. (2007). ENVIRONMENT: Globalization of Conservation: A View from the South. Science, 317(5839), 755–756.

RECOMMENDED READINGS:

- Vetter, E. W. (1994). Hotspots of benthic production. Nature, 372, 47.
- Reid, W. V. (1998). Biodiversity hotspots. Trends in Ecology and Evolution.
- Olson, D. M., & Dinerstein, E. (1998). The Global 200: A Representation Approach to Conserving the Earth's Most Biologically Valuable Ecoregions. Conservation Biology, 12(3), 502–515.
- Cincotta, R. P., Wisnewski, J., & Engelman, R. (2000). Human population in the biodiversity hotspots. Nature, 404(6781), 990–992.
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Week 10 3/9/15: Network of Marine Protected Areas basics: design, function, effectiveness in practice (Aburto, guest lecture); Marine spatial planning (Mengerink)

REQUIRED READINGS:

- Sala, E., Aburto-Oropeza, O., Paredes, G., Parra, I., Barrera, J. C., & Dayton, P. K. (2002). A general model for designing networks of marine reserves. Science, 298(5600), 1991–1993.

- Aburto-Oropeza, O., Erisman, B., Galland, G. R., Mascareñas-Osorio, I., Sala, E., & Ezcurra, E. (2011). Large Recovery of Fish Biomass in a No-Take Marine Reserve. PLoS One, 6(8), e23601.
- Additional readings TBD and to be posted on TED

Assignments:

1) Due midnight 1/22/15: Fisheries and area management exercises (available 1/5/15)
2) Due midnight 2/9/15: In a two-page summary, present your idea for your final project. Include a written summary of the issue, preliminary references, potential dataset to be accessed and used. The project is to be done with a partner (3 per group maximum). Partnered work can relate to group work of other students. Please provide in your summary an indication of the division of labor among the students involved.

Final project: (due 3/16/15)

Take some of the concepts you learned about in class and analyze available data to explore a relevant question. You will ultimately write up your work as a story for dataMares http://datamares.ucsd.edu/ (it will only be published if passes the editors review, so will get a DOI – Digital Object Identifier), in the style of an open access short scientific story, linked up by data and analysis. Some examples can be found here:

http://datamares.ucsd.edu/wp/projects/fisheries/mexicos-national-fishery-statistics/

http://datamares.ucsd.edu/wp/projects/trackers/fishing-vessel-movement-recording-mexicos-fishermen/

The problem/case study that you choose can be on fisheries, marine resource wildlife trade, protected areas or another marine conservation problem of interest. It should have an interdisciplinary component in so much as you are looking at a marine conservation issue from biological and social parameters. You will create a visualization of your work using specific software that will be available to you. In addition to your short, succinct write-up, you will submit a maximum 5-page paper that includes all of the details behind your work so that we understand 1) the rationale behind your work; 2) supporting literature; 3) any data, graphs or tables that might not have made it into the summary version. This 5-page paper should have enough detail that we can recreate your work. Work with a partner or partners, but groups are limited to three per write-up. You can work with a larger group to explore different aspects of an issue in a certain geography or topic. You do not have to limit yourself to Mexico. Group work projects need to be divided into smaller projects that are accomplished by 2 to 3 people.

Some database you could consider can be found here http://datamares.ucsd.edu/eng/global-data/