### THE ECONOMICS OF OCEAN RESOURCES Economics 145 Winter, 2022

Course Hours: MWF 4:00 – 4:50 PM

Classroom: Mosaic (MOS) 0113 Remote Instruction: January 3-17

**Instructor**: Dale Squires dsquires@ucsd.edu **Office**: By appointment Office Hours: Immediately after class or by appointment

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Teaching Assistant Section: To Be Determined.

Instruction Dates:	Monday, January 3 – Friday, March 11
Assignment 1 Due Date:	Friday of week 3, January 21
Midterm Review Session:	Wednesday, February 9, 6pm-9pm
Midterm Exam:	Friday of week 6, February 11, 4:00-4:50pm
Assignment 2 Due Date:	Friday of week 8, February 25
Final Review Session 1:	Friday, March 11, 6pm-9pm
Final Exam:	Friday, March 18, 3:00pm-4:30pm
Holidays:	Martin Luther King, Jr. Monday, January 17
	President's Day Monday, February 21

## **Course Objectives**

The Economics of Ocean Resources is designed to provide students with both the economic theory and management concepts of natural resource use as they apply to ocean resources, and the factual and institutional knowledge necessary for well-informed applications.

The course develops several basic themes and applies them to different resources. First, the common thread running throughout the course is the theme of optimal allocation of ocean resources. Second, property rights for ocean resources are often limited or incomplete, and many resource allocation decisions are inter-temporal in nature. As a consequence, competitive markets for ocean resources often fail to form, or when they do form, they fail to optimally allocate ocean resources among the competing uses. The market failure and subsequent suboptimal use of ocean resources therefore calls into play explicit options of management and public regulation. Third, population dynamics of species forms the basis of bioeconomic models for renewable resources, which combines population dynamics, habitat, biodiversity, and economics. Fourth, the economic concepts of total economic value (use, existence, and option value) and mixed goods (a mixture of private and public goods or common resources) are applied to dolphins, whales, sea turtles, and coral reefs in which management requires attention to both private and public uses and total economic value.

This first section of the course covers issues related to the conservation and management of fisheries. After a review of environmental and resource economics concepts, the course first develops simple population dynamics. The course subsequently integrates the population dynamics with economics to form a bioeconomic model. The basic static bioeconomic model then forms the basis for subsequent discussion of public management of fishing industries. The first section includes one video discussing the current plight of the world's fisheries and discussing various policy measures.

The second section of the course is more applied and broader in nature, covering environmental issues associated with living marine resources. The section first develops an overall economic analytical framework, focusing on management of impure public goods and also called mixed goods (a mixture of private and public goods) and accounting for total economic value. Mixed good management forms one the current "hottest" environmental issue of the oceans, including dolphins, whales, sea turtles, and coral reefs. Specific analytic topics covered include common resources, public and mixed goods, total economic value, biodiversity, habitat, and wildlife management. Ecosystems management and sustainability are also touched upon. Videos and guest lectures will supplement the in-class treatment of several topics. Students are responsible for the readings on their own.

# **Course Requirements and Grading**

1. Midterm examination on last Friday of week six, February 11 -- 40% of course grade.

- Covers the concepts but not the mathematics of the bioeconomic model.
- Review session, Wednesday, February 9, 6pm-9pm

2. Final examination Friday, March 18 -- 40% of course grade.

- Covers all of the course material between the midterm and the class end, but not explicitly the material covered by midterm. The Final exam is **NOT** cumulative.
- Review session, Friday March 11 6pm-9pm

# Midterm and Final Exam Re-grade Requests

- You may request that one or more individual questions be re-graded, but for each question on which you request a regrade that does not result in additional points you may be penalized 0.75 points.
- Requesting a regrade means that we may regrade your entire exam, and your score may increase or decrease.
- If you are requesting a regrade because your score differs from another student with a similar answer, we will email the other student for permission before regrading BOTH exams. This may result in both students getting the lower of the two scores if that is what would be more consistent with the rubric.
- For instructions on how to submit regrade requests through Gradescope, see the following video. https://www.youtube.com/watch?v=6oFVeHvDPYU

3.. Two short assignments for 10% of the grade will be provided during the course and will be graded as good / pass / not pass, with 5 points for Assignment 1 (property rights essay) and 5 points for Assignment 2 (impure public goods and biodiversity conservation).

For each assignment: (1) good = 5 points; (2) pass = 2.5 points; (3) no pass = 0 points). You will have to upload a copy to Canvas (note that Canvas checks for plagiarism, duplicate essays among students, etc.).

- Assignment 1 due date: Friday of week 3, January 21
- Assignment 2 due date: Friday of week 8, February 25

4. Weekly TA session to discuss lectures and readings.

• Dates, times, and location to be determined.

5. Weekly online quizzes, total of 7, for 10% of grade.

- Some questions from online quizzes will be included on the exams.
- Lowest two quizzes dropped
- Questions are directly from lecture notes or conceptual in nature
- These are due 3 p.m. on the relevant Wednesday. Thus, week 1 quiz is due on week 2.
- You will have two attempts. Check the notes to correct any wrong answers.

# **Reading Material**

• All of the required reading is available as PDF files on the class website.

# THE ECONOMICS OF OCEAN RESOURCES READING LIST

# I. INTRODUCTION

### 1. Ocean Resources: An Overview Required Reading Willmann, R. and K. Kelleher. 2010. "Economic • Skim for general idea Trends in Global Marine Fisheries." Chapter 2 in Grafton, Hilborn, Squires, Tait, and Williams, eds., Handbook of Marine Fisheries Conservation and Management. Oxford University Press. • Kropdsma, D. et al. 2018. "Tracking the Global Footprint of Fishing." Science 359: 904-908. **Optional Reading** • Costello, C., et al. 2020. "The Future of Food from the Sea." Nature 588: 95-100. https://doi.org/10.1038/s41586-020-2616-y Selig, E. 2018. "Mapping Global Human • Dependence on Marine Ecosystems." Conservation Letters 12(2): e12617 https://doi.org/10.1111/conl.12617 Optional YouTube Video: https://www.youtube.com/watch?v=BFtrZ0agqtM Can Conservation Save Our Oceans? The *Economist* (27:04 minutes)

# 2. Property Rights, Public Goods, Common Resources, Externalities, and Environmental and Resource Problems

2.1. Property Rights	
Required Reading	Arriagada, R. and C. Perrings. 2011. Paying for International
Read thoroughly	Environmental Public Goods. Ambio 40:798–806. (Discusses
(Lecture 2)	different types of public goods and implications for their
	provision.)
Required Reading	Squires, D. 2010 "Property and Use Rights in Fisheries." In R.
Read thoroughly	Allen, J. Joseph, and D. Squires, editors, Conservation and
(Lecture 3)	Managemnt of Transnational Fisheries. Blackwell Publishing.
PowerPoint Lecture 1	1.Environmental Externalities and Market Failure (1 lecture)
PowerPoint Lecture 2	2.Public Goods and Common Resources (1 lecture)
PowerPoint Lecture 3	3.Property Rights (2 lectures)
Optional: YouTube Video on	Coase Theorem

Coase Theorem	http://www.youtube.com/watch?v=pdz3rvfbNe4&feature=rela
	d
Optional: YouTube Video on	https://www.youtube.com/watch?v=pb4bQWM9-M0
Externalities	
Optional: YouTube Video on	How Markets Fail: Positive and Negative Externalities
Externalities	http://www.youtube.com/watch?v=Jax-
	ZyL7DkI&feature=related
Optional: YouTube Video on	Tragedy of the Commons
Tragedy of the Commons	http://www.youtube.com/watch?v=MLirNeu-A8I

2.2. Law of the Sea	
PowerPoint Lecture 4	4.Law of the Sea (1 lecture)
Optional Reading: History	Finely, C. 2009. "The Social Construction of Fishing, 1949."
of Law of Sea and	Ecology and Society 14(1): 6
Maximum Sustainable	
Yield	
Optional: YouTube Video	https://www.youtube.com/watch?v=3SOqz1Yu8tY
Background, history (I don't	
go into this in class)	
Optional: YouTube Videos	https://www.youtube.com/watch?v=kLkvnLjYmg8
Law of the Sea Maritime	https://www.youtube.com/watch?v=HIYSyBRsK0c
Zones. More detail than	https://www.youtube.com/watch?v=AOB-HsPqf5k
class lecture.	https://www.youtube.com/watch?v=R2luKaxeQvo

# II. THE ECONOMICS AND MANAGEMENT OF RENEWABLE MARINE RESOURCES

# 3. The Theory of Open Access and Bioeconomics

Required Reading	Wilen, J. "Life Histories of Organisms," pp. 77-84,89-94, in
Skim for general idea	"Bioeconomics of Renewable Resource Use," Chapter 2 in
	A.V. Kneese and J.L. Sweeney, eds., Handbook of Natural
	Resource and Energy Economics, Vol. I. New York: Elsevier
	Science Publishers B.V., 1985.
Required Reading	Flaaten. Fisheries Economics and Management. Chapters 2 &
Read thoroughly	3.1-3.2., Chapter 5 through page 76.
Optional Reading	Ahmed, M. et al. 2007. "Overfishing in the Gulf of Thailand:
(Skim for example for	Policy Challenges and Bioeconomic Analysis." Environment
bioeconomic application	and Development Economics 12(1): 145-172. (Example of
and Reference)	bioeconomic application)
	Squires, D. 2005. "Introductory Lecture on Bioeconomics,
	Parts I, II, III." (Reference)
	<ul> <li>Word and pdf files available on class website.</li> </ul>

Optional: YouTube Video: Introduction to Fisheries	https://www.youtube.com/watch?v=Z4AXnZOsrK8
Management	
PowerPoint Lecture	5A. Population Dynamics
PowerPoint Lecture	5B. Bioeconomics
Assignment 1	Required. See below.
Highly Recommended:	https://www.youtube.com/watch?v=7DNhqtYf47E
YouTube Video of	https://www.youtube.com/watch?v=gDfufBUwcgg
Population Dynamics &	
Bioeconomics (15.40	
Highly Recommended:	https://www.voutube.com/watch?v=v4O3imE3LdA
YouTube Video of	
Population Dynamics &	
Bioeconomics (44:30	
minutes) This is really	
excellent.	
Highly Recommended:	https://www.youtube.com/watch?v=DqK5I-9Ufjk
YouTube Video of	
Population Dynamics &	
Bioeconomics (13:22	
nonulation dynamics and	
average revenue –	
average cost Gordon	
model.	
Optional: YouTube Videos	Various types of fishing methods
	Trawlers:
	http://www.youtube.com/watch?v=aAuqBghv1Ck
	nttp://www.youtube.com/watcn?v=/sqv9Xt8YIA&teature=rela
	u Longline:
	http://www.voutube.com/watch?v=err9JXTzvmg
	Purse Seine:
	http://www.youtube.com/watch?v=348apH3pe3k
	Albacore Jig Fishing:
	http://www.youtube.com/watch?v=TUXum0Lnexg&feature=re
	role-and-Line:
	5vl&feature=related
	http://www.voutube.com/watch?v=KlvsDYM0ABI&feature=rel
	ed
	Crab Pots:
	http://www.youtube.com/watch?v=SsfDNNTNdFU&feature=r

		elated
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Required Assignment 1	
Due Date	Friday of Week 3, January 21
Conceptual Background	Read Hardin and either (1) Wade or (2) Seabright (more
	theoretical than Wade; Seabright uses theory of repeating
	cooperative and noncooperative games).
Application.	Read either (1) Acheson or (2) Cinner
Either one is required of all	
students.	
Conceptual Assignment	Hardin, G. 1968. "Tragedy of the Commons." Science, 162: 1243-
Reading.	1248.
Required of all students.	
Conceptual Assignment	Wade, R. 1987. "The Management of Common Property Resources:
Reading.	Finding a Cooperative Solution." World Bank Research Observer
Read this or Seabright.	2(2): 219-234.
	<ul> <li>pdf file is available on class website.</li> </ul>
Conceptual Assignment	Seabright, P. "Managing Local Commons: Theoretical Issues in
Reading.	Incentive Design." Journal of Economic Perspectives 7(4): 113-134.
Read this or Wade.	
Application Assignment	Acheson J. 1975. "The Lobster Fiefs: Economic and Ecological
Reading.	Effects of Territoriality in the Marine Lobster Industry." Human
Read this or Cinner.	Ecology 3:183-207.
Application Assignment	Cinner, J. 2005. "Socio-Economic Factors Influencing Customary
Reading.	Marine Tenure in the Indo-Pacific. <i>Ecology and Society</i> 10(1):1-36.
Read this or Acheson.	
Assignment	4-page paper (typed, double spaced, 12 Arial font, 1" margins)
	discussing the possible use of common property to address the
	commons problem.
	Please develop your discussion within the context of either (1)
	Acheson and the lobster fiefs or (2) Cinner and customary marine
	tenure in the Indo-Pacific. Note: you don't have to read Acheson
	if you read Cinner and vice versa, but in either case, you should
	show evidence of having read Hardin and either Wade or
	Seabright.

# 4. Regulation and Public Policy within a Bioeconomics and Property Rights Framework

Poquired Peeding	Elector Eicherics Economics and Management
Read thoroughly	Chanter 3 3-3 4 Chanter 5
Read including Required Reading	Grafton at al. 2006 "Incontive Based Approaches to
Skim for gonoral idea	Sustainable Eisbories " Canadian Journal of
Skill for general luea	Fisheries and Aquatic Sciences 63: 600 710
Dequired Deeding	Piskenhash A 2017 "Cotch Sharaa Slow the
Skim for gonoral idea	Dirkenbach, A. 2017. Calch Shares Slow the
	Race to FISH. Nature 344, 223-220.
DewerDoint Lecture	1111ps.//doi.org/10.1030/11ature21720
	5.11QS
Ontional Reading	• Available of class website.
Optional Reading	Costello, C. allo D. Ovalloo. 2019. Status, Presencete, and Presencete for Clobal Canture
	Frospects, and Prospects for Global Capture
	Pisnenes. Annual Review of Environment and
Ontional Deading	Resources 44: 177-200.
Optional Reading	Hilborn, R. et al. 2020. Effective Fisheries
	Management Instrumental In Improving Fish Stock
	Status. Proceedings of the National Academy of
	Scieces USA 117: 2218–2224.
	https://doi.org/10.1073/pnas.1909726116
Optional Reading	Naylor, Rosamond L. 2021. "A 20-Year
	Retrospective View of Global Aquaculture." Nature
	591: 51–563. https://doi.org/10.1038/s41586-021-
Ontine al De adia a	U33U8-0 Daltan Dan 0000 "Eamainn Eiste is tha Osa Will
Optional Reading	Belton, Ben. 2020. Farming Fish in the Sea Will
	Not Nourish the World." <i>Nature Communications</i>
	11: Article Number 5804.
Ontine of Department	nttps://doi.org/10.1038/s41467-020-19679-9
Optional Reading	Duarte, Carlos M. et al. 2020. "Rebuilding Marine
	Life." Nature 580: 39-51. https://hal.archives-
	ouvertes.fr/hal-02502619
Highly Recommended: YouTube	https://www.voutube.com/watch?v=pvQk786TCoQ
video on ITQs (10:22 minutes)	specific states and post-
Lecture 5	
Optional: YouTube video on ITQs	https://www.youtube.com/watch?v=iLe-Zz5SvC4
(8:19 minutes) Lecture 5	
Video	Empty Oceans Empty Nets
Highly Recommended: YouTube	https://www.youtube.com/watch?v=YsDvxir7YsI
video on Taxes and Subsidies (7:10	
minutes)	
Highly Recommended: YouTube	https://www.youtube.com/watch?v=mPkEIVRgmkc
video on Territorial Use Rights in	
Fisheries (5:17 minutes)	

Highly Recommended: YouTube	https://www.youtube.com/watch?v=pyQk786TCoQ
video on ITQs (10:22 minutes)	
Lecture 5	
Optional: YouTube video on Marine	https://www.youtube.com/watch?v=n6_JLZnQe6Y
Protected Areas	
Optional: YouTube video on	https://www.youtube.com/watch?v=mPkEIVRgmkc
Territorial Use Rights in Fisheries	
Optional: Troubled Waters Video on	https://www.youtube.com/watch?v=YACTNvuijQY
Overfishing (Environmentalist	
Perspective) (47:23 minutes)	
Optional: YouTube video: The	https://www.youtube.com/watch?v=eff-Z0NdwzY
Future of Seafood (Aquaculture)	
(27:17 minutes)	

# 5. Global Fisheries Issues (Optional: If Sufficient Time, is after Midterm)

Required Reading Skim Worm and Watson for general idea You have already read Willmann and Watson and Tidd Lecture 6	<ul> <li>Worm, B. et al. 2009. "Rebuilding Global Fisheries." <i>Science</i> 325: 578-585.</li> <li>Watson, R. and D. Pauly. 2013. "The Changing Face of Global Fisheries: The 1950s to the 2000s. <i>Marine Policy</i> 42:1-4.</li> <li>Willmann, R. and K. Kelleher. 2010. "Economic Trends in Global Marine Fisheries." Chapter 2 in Grafton, Hilborn, Squires, Tait, and Williams, eds., <i>Handbook of Marine</i> <i>Fisheries Conservation and Management.</i> Oxford University Press.</li> <li>Watson, R. and A. Tidd. 2018. "Mapping Nearly a Century and a Half of Global Marine Fishing: 1869-2015." <i>Marine</i> <i>Policy</i> 93: 171-177.</li> </ul>
PowerPoint Lecture	6.Global Fisheries Issues (1 lecture)
Optional: Video Global Fishing Watch	https://www.youtube.com/watch?v=fn2JXmCUo30
Optional: YouTube	State of World Fisheries Parts 1,2,3 – Ray Hilborn
Video	http://www.youtube.com/watch?v=frfOi2P0wIo
	http://www.youtube.com/watch?v=etSjm0zZs9U&feature=related
	http://www.youtube.com/watch?v=J49rCgFo1Ko&feature=related
Optional: Video	Ray Hilborn
	http://www.uwtv.org/video/player.aspx?dwrid=2515

MIDTERM EXAMINATION Friday of Week 6, Friday February 11

# III. THE MANAGEMENT OF IMPURE PUBLIC GOODS IN AN ECOSYSTEMS FRAMEWORK: DOLPHINS, WHALES, SEA TURTLES, AND CORAL REEFS

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Required Reading	"Total Economic Value," pp. 129-137 in D. W. Pearce and
Read thoroughly	R.K. Turner, 1990. Economics of Natural Resources and the
Lecture 7	Environment. London: Harvester Wheatsheaf.
Required Reading	Arriagada, R. and C. Perrings. 2011. Paying for
Read thoroughly	International Environmental Public Goods. Ambio 40:798–
Lecture 8	806. (Discusses different types of public goods and
	implications for their provision.)
Required Reading	Squires, D, L.T. Ballance, L. Dagorn, P.H. Dutton, R. Lent
Read for basic ideas of	2021. "Mitigating Bycatch: Novel Insights to
voluntary (private), direct	Multidisciplinary Approaches." Frontiers in Marine
regulation, incentive-based,	Science. https://doi.org/10.3389/fmars.2021.613285
and hybrid approaches to	
marine conservation	
Lecture 9	
PowerPoint Lecture	7.Conservation and Markets
	(Reconciling Biodiversity Conservation with Markets and
	Resource Use) (1.5 lectures)
Optional Reading	Squires, D. and S.M. Garcia. 2018. "Economic Efficiency
Questions conservation's	and the Biodiversity Mitigation Hierarchy with a Focus on
biology biodiversity	Marine and Fishery Issues." <i>Conservation Biology</i> 32(5):
mitigation hierarchy	989-997.
PowerPoint Lecture	8.Impure Public (Mixed) Goods and Public Bads (2 lectures)
PowerPoint Lecture	9.Policies for Externalities (2 lectures)
Optional: Biodiversity,	https://environment.yale.edu/teeb/foundations/barker/
Ecosystems, & Ecosystem	
Services (Lecture 7)	
Optional: YouTube	http://environment.yale.edu/teeb/policymakers/bruner/
Economics of Protected	
Areas (Lecture 9)	
Optional: YouTube	http://environment.yale.edu/teeb/policymakers/rosenberg/
Payments for Ecosystem	
Services) (Lecture 9)	
Optional: Connecting	https://environment.yale.edu/teeb/policymakers/rosenberg/
Biodiversity to Ecosystem	
Services in Ocean	
Ecosystems and Fisheries	
(Lectures 7 & 9(	

## 6. Common Resources, Impure Public Goods, Total Economic Value, Biodiversity, Ecosystems

# **Required Assignment 2**

Due Date	Friday of Week 8, February 25
Conceptual Background	Read Arriagada and Perrings. 2011. "Paying for International
	Environmental Public Goods." Ambio 40:798–806
	Bulte, E., G. van Kooten, and T. Swanson. 2003. "Economic
	Incentives and Wildlife Conservation." Working paper.
<u>Assignment</u>	4-page paper (typed, double spaced, 12 Arial font, 1" margins) discussing incentives to conserve marine biodiversity conservation within the framework of impure public goods. The intent of the assignment to ensure that you understand the conceptual framework for the rest of the class. Discuss what an impure public good is, the types of externalities associated with impure public goods, the technology of public good supply (best shot, weakest link, etc.), and the types of economic incentives (positive and negative) that are created for impure public goods with different technologies of public good supply.

# 7. Sea Turtles

Required Reading Read thoroughly Lectures 14A & 14B	Dutton, P. and D. Squires. 2008. "Reconciling Fishing with Biodiversity: A Holistic Recovery Strategy for Pacific Sea Turtles," <i>Ocean</i> <i>Development and International Law</i> 39:200–222.
Optional Reading Lectures 14A & 14B	Squires, D., V. Restrepo, S.M. Garcia. 2018 "Fisheries Bycatch Reduction within the Least-Cost Biodiversity Mitigation Hierarchy: Conservatory Offsets with an Application to Sea Turtles." <i>Marine</i> <i>Policy</i> 93: 55-61.
Guest Lecture	Peter Dutton unless scheduling conflict
PowerPoint Lecture	14A.Sea Turtles Econ 145 (3 lectures total)
PowerPoint Lecture	14B.Sea Turtles Econ 145
Video	https://www.dropbox.com/s/lmtgv22vlwr2uu4/saving%20sea%20turtles. mov

# 8. Whales

Required Reading:	Schneider, V. and D. Pearce. 2004. "What Saved the Whales? An
Read thoroughly	Economic Analysis of the 20 <sup>th</sup> Century Whaling." <i>Biodiversity and</i>
(Important for Final	Conservation 13(3): 543-562.
Exam) Lecture 12	
Required Reading:	Costello, C., L. Gerber, and S. Gaines. 2011. "A Market Approach
Skim for general idea	to Saving the Great Whales." Nature 481: 139-140.
Lecture 12	

Required Reading:	Butler-Stroud, C. 2016. "What Drives Japanese Whaling
Skim for general idea	Policy?" Frontiers in Marine Science 22 June 2016
Lecture 12	http://dx.doi.org/10.3389/fmars.2016.00102
Optional Reading	Chami, R., T. Cosimano, C. Fullenkamp, and S. Oztosun.
	2019. "Nature's Solution to Climate Change: A Strategy to
	Protect Whales and Limit Greenhouse Gases and Global
	Warming." Finance & Development 56(4): 34-38.
PowerPoint Lecture	12.Whales (1-2 lectures)
Optional Video on	http://panopto.uw.edu/Panopto/Pages/Viewer.aspx?id=0512ca7b-
Scientific Whaling by	0a3a-4929-8397-a9d1f03963f6
Marc Mangel	

# 9. Coral Reefs

PowerPoint Lecture	13.Coral Reefs
Required Reading Read for general idea Lectures 13A & 13B	McClanahan, T.R., M.J. Marnane, J.E. Cinner, and W.E. Kiene. 2006. "A Comparison of Marine Protected Areas and Alternative Approaches to Coral Reef Management." <i>Current Biology</i> 16(14): 1408-1413.
	Cinner, J. et al. Bright spots among the world's coral reefs. <i>Nature</i> 535 (7612). pp. 416-419.
Optional Reading	Hughes, T. et al. 2017. "Coral Reefs in the Anthropocene." <i>Nature</i> 546: 82-90.
Optional Reading	Hughes, T. et al. 2018. "Global Warming Transforms Coral Reef Assemblages." <i>Nature</i> 556: 492-496.
Optional Reading	Cinner, J. et al. 2016. "Bright Spots Among the World's Coral Reefs." <i>Nature</i> 535: 416-419.
Optional Reading	Cinner, J. et al. "Comangement of Coral Reef Social-Ecological Systems." <i>Proceedings of the National Academy of Sciences</i> 109(14): 5219-5222.

Required Reading	Balance, Lisa et al. 2021. "A History of the Tuna-Dolphin
Skim for general idea	Problem: Success, Failures, and Lessons Learned. Frontiers in
	Marine Science https://doi.org/10.3389/fmars.2021.754755
PowerPoint Lecture	10.Dolphin-Tunas (1 lecture)
	Could be alternative guest lecture on marine mammals
Optional: YouTube	Tuna Fishing, Parts I & II
Video for Lecture 10	http://www.youtube.com/watch?v=qEuioCqTjjo&feature=fvsr
PowerPoint Lecture	11.Ecological Trade-Offs in the ETP (1 lecture)
Required: YouTube	Ray Hilborn on sea- and land-based food
Video for Lecture 11	http://www.youtube.com/watch?v=hjiZA4pDiPg

# 10. Marine Mammals: Dolphins (Could be skipped if insufficient time)