BIOLOGY 13.01 and 13.02 – MARINE BIOLOGY – FALL 2014

4 hours lecture/3 hours lab (5 units)

- **Lecture in S34 Tues AND Thurs: 9:30 – 11:30 am**
- **Lab in S51 Tues OR Thurs: 11:30 – 2:20 pm**

Instructor: Jason Bram Office: Bldg. S5, Room S51a
Office Hours: Mon & Wed 10:30-11:30. Tues & Thurs 2:30-3:30 pm, and always by appointment
E-mail Address: bramjason@deanza.edu
Phone #: 408-864-8654
Instructor webpage: http://www.deanza.edu/faculty/bramjason **(not important!)**
Catalyst webpage: https://catalyst.deanza.edu/ **(very important!)**

You can use the instructor webpage to read a bit more about me! You can also find links to Catalyst, but the webpage is more for people outside the class to find out more.

We will be using the Catalyst webspace to:

1. keep up on course announcements and deadlines (as a student you are responsible for any info/announcements made in class and/or put on Catalyst)
2. track your grade in the course (take your points, divide by total possible to see your percentage and then refer to this greensheet!)
3. access course files like greensheets, lectures, labs, videos, and study guides.
4. Complete and turn in your homework assignments

Please let me know as soon as possible if you have any questions/problems with accessing Catalyst.

Textbook webpage (good resources for you, but not mandatory!):

http://highered.mcgraw-hill.com/sites/0073524204/student_view0/

INTRODUCTION: **Welcome to Biology 13 (Marine Biology) and the study of the wondrous array of life and adaptation in our oceans!** For most students this is an astounding, interesting, sometimes awe-inspiring and hopefully quite fun view of marine biology as we know it. This 5-unit course is an introduction to the wonderful diversity of marine life on earth. The course is intended for **non-biology majors**, and my goal as your instructor is to help you achieve a good understanding of the basic principles of marine life on earth! I also hope that you will develop a lifelong appreciation of marine biology – you will see for yourself that understanding marine biology makes the world a much more interesting place!

COURSE DESCRIPTION: An introduction to marine biology as a branch of the biological sciences and to its basic unifying principles, with selected application to the scientific method, physical and chemical oceanography, marine animals, marine plants, and marine ecology with major emphasis on the natural history of marine life. Additionally, various oceanic habitats, such as bays estuaries, and open oceans are described. This course satisfies the De Anza General Education Requirement in Natural Sciences and is transferable to both UC and CSU as a general education science course. This course does **NOT** apply towards a major in biology.

ADVISORY: English Writing 100B, and Reading 100 (or Language Arts 100) or English as a Second Language 24 and 72 (or ESL 4)

TEXT: A textbook is required, but you have some choices!!!

BEST CHOICE: Buy my customized version of Marine Biology by Peter Castro and Michael Huber 9th Edition 2013 McGraw Hill (ISBN 9781121977068). $96.40 at the bookstore

The best way to use the text is as a reference. My tests come from my lectures, AND MY LECTURES MAINLY COME FROM THIS BOOK, so if there's a concept that I go over in lecture that you need further information on, the textbook is a GREAT resource!

SECOND BEST CHOICE: Have an older edition of this book or get the current edition from some other source, but there are no guarantees that it will have the same material.

My suggestions are simply that: suggestions. You need to buy the book that's best for your particular situation.

For the lab, I am trying something new in order to keep costs as low as possible. Your lab manual will be available on Catalyst for no charge. You can print them out or view them electronically. It is your responsibility to have access to the lab manual.

I am well aware that finances may be very tough for some of you. This is why I do a custom version of the textbook, which is cheaper than the full textbook. This is also why I am providing the lab manual for you. All the field trips are no charge, and I actually use some of my own money as well as department money (hopefully!) to pay for the camping fees. If there are ever financial concerns, please do not hesitate to talk to me, as I was a "starving student" myself once! I will come up with alternatives for you!

For the lab, the **required** text is Marine Biology by Jason Bram. It will be posted on Catalyst. You MUST print out a hard copy and bring it with you, or be able to access it electronically during the lab via a laptop or tablet.

COURSE REQUIREMENTS AND EXPECTATIONS: You are expected to attend every class meeting. If you miss a class, it is your responsibility to obtain information and materials dispensed in that class period. Attendance, as well as participation, will be the first criteria considered when determining "borderline" grades. In my experience, those students who do not attend class are the students who do not fulfill their potential regardless of their level of understanding. Medical, legal and other scheduled appointments should not be scheduled during normal class times and these will not be considered as excused absences. Medical or personal emergencies will require a written notice of the specific problem signed by an appropriately qualified individual.

Disruptive behavior will not be permitted in lecture. The lecturer will determine what constitutes disruptive behavior at his discretion, and disruptive students may be asked to leave. Here are some general rules:

- **Arrive to class on time, and do not leave early.**
- **No use of cell phones, MP3 players, text messaging, or pagers during lecture.**
- **Do not converse with your classmates (or yourself!) while the instructor or other presenter is addressing the class. If you have a question or discussion item, please raise your hand.**
- **Be respectful of your instructor, college staff, and your fellow students.**

I WELCOME AND ENCOURAGE YOU TO ASK ME QUESTIONS DURING LECTURE!!! IF I DON'T KNOW THE ANSWER, I WILL FIND YOU THE ANSWER!

ASSIGNMENTS	**DATE**	**POINTS**
Three Lecture Exams:	**Oct. 16, Nov. 13, Dec. 9**	100 pts. each
(non-cumulative, highest score is doubled)		
Two Lab Exams:	**Oct. 21/23, Dec. 2/4**	75 pts. each
Chapter Quizzes (on Catalyst)	**various dates**	up to 50 pts. (up to 5 pts. each quiz)
Lab Attendance/Participation:		30 pts. (5 pts. for each lab)
Three Mandatory Field Trips (4 are offered in the quarter)		30 pts. (10 pts. for each trip)
Project Presentations (group grade)	**November 18/20**	30 pts.

690 TOTAL POINTS POSSIBLE!!!

EXTRA CREDIT POINTS

Participation	**up to 20 pts.**
Paper (to be turned in as a Microsoft Word Attachment via e-mail)	**up to 20 pts.**

Note: Students who exceed 4 absences are not eligible for extra credit.

GRADING: Final letter grades shall be assigned in accordance with the following percentages:

A+	=	95% or higher	655 points or higher
A	=	91-94%	628-654
A-	=	88-90.9%	607-627
B+	=	85-87.9%	586-606
B	=	80-84.9%	552-585
B-	=	76-79.9%	524-551
C+	=	71-75.9%	490-523
C	=	63-70.9%	435-489
D	=	53-62.9%	366-434
F	=	52.9% and below	365 points or lower

Note: I do not curve the grades for the course. IT IS IN YOUR BEST INTEREST NOT TO SETTLE ON A GRADE!!! EACH OF YOU DESERVES THE BEST GRADE THAT YOU CAN ACHIEVE!!! DO NOT HESITATE TO TALK TO ME IF YOU ARE FINDING YOURSELF LOST, CONFUSED, OVERWHELMED, BORED OR SCARED ABOUT YOUR GRADE OR ANY OF THE INFORMATION PRESENTED AT THE EARLIEST POSSIBLE SIGN THAT YOU ARE HAVING DIFFICULTY.

EXAMS: Each of the exams will consist of a combination of multiple choice, short answer, matching, and fill-in-the-blank questions.

1. The lecture exams will only cover the material within that time period (i.e. the 2nd lecture exam will only cover the material presented AFTER the 1st exam).
2. I will be providing reviews for the lecture exams for you to study from, but in no way are they substitutes for coming to class!!!
3. You CANNOT make up an exam!!! This is not fair to the other students.
    a. It is my experience that certain students always seem to have emergencies come up on exam days. I have found that when I'm "nice" to students, they abuse the privilege. Please be a responsible individual!
    b. In saying all this, if an uncontrollable emergency or personal crisis arises, I occasionally will allow make-ups for **responsible** individuals, but they are few and far between. If something does happen, let me know the situation as soon as you can, and I will be more flexible. You will need to provide some sort of documentation (i.e. a doctor's note, etc.)
        i. IF THIS HAPPENS, IT CAN ONLY HAPPEN ONCE! IF IT HAPPENS MORE THAN ONCE, YOU HAVE MORE IMPORTANT THINGS TO WORRY ABOUT THAN THIS COURSE!!!
4. For the lab exams, seating will be assigned.

IMPORTANT NOTES REGARDING THE PROJECT PRESENTATION: This will be a group project, and you will receive a group grade. You are required to orally present (as a group) a 4-6 minute seminar based on a topic in marine biology. A video/other creative activity may be done in lieu of the presentation. This project will be gone over in class around the middle of the quarter. As this is a group presentation, anyone who doesn't participate in their group will get a minimum of 5 points taken off of their grade. It is the group's responsibility to let me know if this occurs.

Project Presentation rubric

	Great	Okay	Doesn't do it
Does the group structure their presentation effectively?	6	4	1
Does the group seem to understand what they are presenting?	6	4	1
Does the group effectively use visual aids? (i.e. Powerpoint slides)	6	4	1
Does the group have good content?	6	4	1
Does the group provide three usable questions for the lab exam? (must be multiple choice with at least 3 choices)	6	4	1

IMPORTANT NOTES REGARDING THE FIELD TRIPS: We will be embarking on FOUR FIELD TRIPS IN THE QUARTER!!! YOU ARE REQUIRED TO ATTEND THREE OF THEM, and each one is worth 10 points for a total of 30 points!!! You can go on as many as you'd like, but you can only receive a maximum of 30 points. Here are the different ways you can get these points:
One field trip (sandy beach) is during lab time, and everyone is required to go. That's one!

1.Go on the weekend camping trip (2 field activities will occur over the weekend – dates will be posted to Catalyst).
2. If you can't go on the camping trip, I will be providing 3 day trip opportunities (dates will be posted to Catalyst), of which you need to attend 2 of them (Intertidal, Monterey Bay,Don Edwards).
3. If you can't make at least 3 of the field trips, I will give you a much less fun alternative assignment to make up those points. IT IS YOUR RESPONSIBILITY TO TALK TO ME TO GET THIS ALTERNATIVE ASSIGNMENT!!! For every field trip and/or alternative assignment you don't complete, you will be giving up 10 easy points!!!

Believe me, the trips will be a lot of darn fun, so I highly encourage you to attend!!!! Why would you be taking marine biology if you're not able to go into the marine environment anyway???

There is NO COST associated with ANY of the trips. Yes, I'm getting you all in the Monterey Bay Aquarium FOR FREE!!! However, YOU are responsible for your own transportation and any incidental costs (i.e. gas/food). MAKE FRIENDS/TRAVEL BUDDIES in this class. We're in this together. Splitting fuel costs is a great idea!!! Don't be shy!!!

IMPORTANT NOTES REGARDING THE LABORATORY ASSIGNMENTS AND THE LAB ITSELF:

1. **No eating, drinking, smoking, or sewing (especially no sewing!) allowed in the laboratory!**
2. **You are expected to attend all labs. If more than one lab is missed without a reasonable excuse, you may be dropped from the course! If three labs are missed, you will be dropped from the course!!!**
3. **If you miss a lab, you are responsible for finding out what you missed. If you don't, your lab test grade will most likely suffer tremendously! You MUST attend the lab that you are signed up for unless you clear it with me beforehand. If you miss the Monday lab for example, you cannot make up the lab by attending the Wednesday lab UNLESS you have cleared it with me in advance. If you do show up for the wrong lab, you WILL NOT get credit for attending UNLESS you have cleared it with me in advance. I've had too many Monday lab students "magically" start coming to the Wednesday lab on exam weeks.**
4. **Grading: You are responsible for attending lab and completing all the work required in lab. Your attendance in the lab won't be recorded until the end of class and you show me that you have completed your work.**
5. **The lab tests will be based solely on the labs/field trips that we do during class time, so it's definitely in your best interest to be there!!!**
6. **Like the lecture exams, the lab exams are non-cumulative.**

SCHEDULE: The following schedule may be modified during the course at my discretion. Check Catalyst for field trip date updates!!!

DATE	LECTURE TOPIC	LAB
9/23	Intro/The Science of Marine Bio. (Chapt. 1)	Lab #1 –The Scientific Method/Metrics
9/25	The Science of Marine Bio. (Chapt. 1)	Lab #1 –The Scientific Method/Metrics
9/30	The Sea Floor (Chapt. 2)	Lab #2 – Microscopes/Plankton
10/2	Ocean Chemistry (Chapt. 3)	Lab #2 – Microscopes/Plankton
10/7	Ocean Chemistry (Chapt. 3)	**Sandy Beach Field Trip**
10/9	The Microbial World (Chapt. 5)	**Sandy Beach Field Trip**
10/14	Seaweeds (Chapt. 6)	Lab #3 – Seaweeds/Lab Exam Review
10/16	**LECTURE EXAM #1** (includes material covered 9/23 – 10/14)	Lab #3 – Seaweeds/Lab Exam Review
10/21	Marine Invertebrates (Chapt. 7)	**Lab Exam #1 (Labs 1-3, Field Trip)**/Lab #4-The Invertebrates
10/23	Marine Fishes (Chapt. 8)	**Lab Exam #1 (Labs 1-3, Field Trip)**/Lab #4-The Invertebrates
10/28	Reptiles, Birds, Mammals (Chapt. 9)	Lab #5 – The Vertebrates/Project Groups
10/30	Marine Ecology (Chapt. 10)	Lab #5 – The Vertebrates/Project Groups
Sunday November 2nd Don Edwards Wildlife Refuge Trip – Be at site by 10:00 am		
11/4	Marine Ecology (Chapt. 10)	Lab #6 – Vertebrate Dissections/Ecology
11/6	Between the Tides (Chapt. 11)	Lab #6 – Vertebrate Dissections/Ecology
Friday Nov. 7th– Sunday Nov. 9th Camping Trip (Intertidal, Elephant Seals) – Be at site by 3:00 pm		
11/9	**Monterey Bay Aquarium Be at Aquarium by 12:00 pm**	
11/11	Estuaries (Chapt. 12)	Lab #7 – Catch-up Lab/Presentation Time
11/13	**LECTURE EXAM #2** (includes material covered 10/21 – 11/11)	Lab #7 – Catch-up Lab/Presentation Time
11/18	The Shelf (Chapt. 13)	**Project Presentations/Lab Exam Review**
11/20	Coral Reefs (Chapt. 14)	**Project Presentations/Lab Exam Review**
Friday, November 21st Pigeon Point Intertidal Trip – Be at site by 3:30 pm!!!		
11/25	The Surface (Chapt. 15)	**NO LAB!**
11/27	**NO LECTURE OR LAB! THANKSGIVING!!!**	**EAT TURKEY!!!**
12/2	The Ocean Depths (Chapt. 16)	**Lab Exam #2 (Labs 4-7,Presentations)**
12/4	Make up Lecture	**Lab Exam #2 (Labs 4-7,Presentations)**

Tuesday December 9th FINAL EXAM (9:15 am – 11:15 am) IN THE CLASSROOM!!! (includes material covered 11/18 – 12/4)

ALL ASSIGNMENTS/EXTRA CREDIT/EVERYTHING MUST BE SUBMITTED VIA E-MAIL BY 11:59 PM ON 12/9!

EXTRA CREDIT: THIS IS NOT REQUIRED!!! However, I highly suggest doing all of the extra credit or you really only have yourself to blame for not receiving the grade that you want to get in this course!

You can earn up to 40 points by doing the following:

1. Participation (20 points maximum): These are my subjective points and are based on attitude, completed assignments, effort, and all around being a positive addition to the class. If you do this, you can safely assume that you will receive all of these points. These points are designed to bump deserving students up to the next highest grade as well as to eliminate "begging" at the end of the quarter. These points WILL NOT be posted to Catalyst, as many students will not need "bumping" up or that "bump" won't push the student

to the next highest grade. Please note that these points can be adversely affected by anything that doesn't show the utmost in responsibility as a student.

2. Scientific paper summary & opinion paper (20 points maximum):
    a. Write a 2-3 pg. double-spaced summary of a provided scientific paper (papers will be posted to Catalyst) (up to 10 points)
    b. Write a 1-2 pg. double-spaced opinion of the paper or the issue that the paper brings up. (up to 10 points).

IF YOU DO NOT FOLLOW THE INSTRUCTIONS ABOVE, POINTS WILL BE DEDUCTED FROM YOUR PAPER.

REMEMBER THAT I WON'T GIVE ANY PARTICIPATION EXTRA CREDIT FROM THOSE STUDENTS WHO HAVE MORE THAN 4 ABSENCES IN THE QUARTER (LABS & LECTURES).

CHEATING: Absolutely no form of academic dishonesty or plagiarism will be tolerated. It is unethical, unfair, and a violation of your own intelligence as well as being lame, slimy, vile, and pathetic. **Anyone caught cheating will be subjected to the most severe academic penalties.**

ESSENTIAL STUDENT MATERIALS: Scantrons, #2 pencils, e-mail, textbook, and labs (either electronic or paper copies).

WITHDRAWAL AND YOUR CONCERNS ABOUT YOUR GRADE: Sunday, Oct. 5th is the last day to drop the course and receive a refund. The last day to withdraw from the course (without a "W") is **Sunday, October 5th**. The last day to withdraw from the course (with a "W") is **Friday, Nov. 14th**. IF YOU ARE CONCERNED ABOUT YOUR GRADE, PLEASE COME TALK TO ME AT THE EARLIEST POSSIBLE TIME SO THAT WE CAN DISCUSS YOUR OPTIONS. It is to your great advantage to discuss with me (I don't bite!) any problems you are having early in the quarter so that I can try and assist you as much as possible.
IT IS YOUR RESPONSIBILITY TO OFFICIALLY WITHDRAW SO THAT YOUR TRANSCRIPT RECORD WILL NOT BE ADVERSELY AFFECTED.

NOTE to students with disabilities: If you have a disability-related need for reasonable academic accommodations or services in this course, provide (name of Instructor) with a **Test Accommodation Verification Form (also known as a TAV form)** from Disability Support Services (DSS) or the Educational Diagnostic Center (EDC). Students are expected to give five days notice of the need for accommodations. Students with disabilities can obtain a TAV form from their DSS counselor (864-8753 DSS main number) or EDC advisor (864-8839 EDC main number).

PLEASE NOTE: I keep exams for 1 year and other work for 1 quarter.

SOME EXTRA NOTES AND HINTS TO BE A SUCCESSFUL COLLEGE STUDENT (from my own experience)!

1. **SHOW ME THAT YOU CARE ABOUT YOUR GRADE MORE THAN I CARE ABOUT YOUR GRADE!**
2. **ATTEND CLASS!!!**
3. **If you miss a class, get the notes from another student. If it's still unclear, then ask your professor!!!**

4. **Don't be afraid of a professor's office hours!**
5. **Don't be afraid of your professor! We are generally reasonable people! Talk to me! Ask me questions, no matter how stupid you may think they are!!!**
6. **Make your professor respect you! (see #1)**
7. **Don't procrastinate!**
8. **Remember that in the end, it is your responsibility to understand the assignment, not for your professor to explain it better!**
9. **Feel free to change your major!**
10. **Don't give your professor attitude. Remember that even if they're the biggest jerk ever, they have the power. Think of them as your boss. If you have a disagreement, bring it up after class/in office hours. (See #5)**
11. **Remember that there is some subjectivity in determining your grade.**
12. **Don't let up!**
13. **Being a student should be your #1 priority (if possible). BEING A STUDENT IS YOUR EMPLOYMENT. This of the college as the place that you work. Unfortunately, you don't get any wages except for the grades you receive, but in the end, those grades can lead to a much better future than a few bucks can!**
14. **Don't be in a hurry – what's another quarter/semester?**
15. **Study in a way that's best for you, whether that be in groups, at Starbucks, in a library, cramming, whatever!!!**
16. **Take advantage of extra credit!**
17. **Take advantage of opportunities presented (i.e. review sessions/study guides)!**
18. **A W is better than a D or F!!!**
19. **It's a competitive world. Be competitive in college! Don't settle!!!**

STUDENT LEARNING OBJECTIVES:

1. Examine marine biology as a branch of the biological sciences and its relation to the scientific field and how the scientific method is used.
2. Assess and apply biological concepts to modern life and a technologically based society.
3. Appraise the physical and chemical properties of the ocean.
4. Examine the structure of plant and animal cells, cellular processes and organic evolution.
5. Compare and contrast the anatomy, behavior, reproduction, and ecology of selected invertebrates, vertebrates, plants, and protista.
6. Assess ethical issues and environmental effects, from local to global that surround pollution and its effects on marine animal populations, phytoplankton production, oxygen production, global warming and ozone depletion.
7. Identify major marine environmental problems that have resulted from changes in ecological relationships.
8. Summarize major changes in natural gene pools as a result of direct and indirect selection by humans.

EXPANDED DESCRIPTION: Content and Form

A. Examine marine biology as a branch of the biological sciences and its relation to the scientific field and how the scientific method is used.
    1. Analyze the characteristics of science.

2. Formulate and solve problems utilizing the scientific method, including experimentation.
3. Examine biological fields, including sub-disciplines with emphasis on marine biology, including career opportunities.
4. Examine the role of science in a changing society such as significance in health fields, food industry, biotechnology and transportation.
5. Assess the contributions to scientific studies by cultural, ethnic and gender groups.

B. Assess and apply biological concepts to modern life and a technologically based society.
1. Examine characteristics of life.
2. Examine the processes that sustain life, including photosynthesis, cellular respiration, and energy flow.
3. Compare and contrast the diversity of life on earth, including the five kingdoms of life.
4. Integrate the diversity of life with current theories of organic evolution.
5. Assess the impacts of our industrial society on life sustaining marine life.

C. Appraise the physical and chemical properties of the ocean.
1. Examination of bottom topography, including shelf, slope, trenches, and submarine volcanic islands.
2. Compare chemical characteristics of open oceans from the surface to the bottom.
3. Appraise chemical characteristics of estuaries, mudflats, rocky outcrops, and reefs.
4. Assess geological settings as a home for marine life, including rocks, minerals, mud, vulcanism, sedimentation and erosion.
5. Examine unique traits of water and its relationships to life.
6. Compare different salts and their osmotic effects on life.
7. Compare different ocean currents and their effects on the distribution of sediments, plants, animals, and larval forms.
8. Examine variations in creation of waves, their movement, and their effects on plant, animal and human populations.

D. Examine the structure of plant and animal cells, cellular processes and organic evolution.
1. Examine cell structure and function of plants and animals.
2. Examine cellular processes including, but not limited to: osmosis, diffusion, mitosis, meiosis, photosynthesis, respiration, and digestion.
3. Examine organic evolution: historical background and foundations of the theory, how the theory works.
4. Assess sexual and asexual strategies of reproduction in plants and animals.

E. Compare and contrast the anatomy, behavior, reproduction, and ecology of selected invertebrates, vertebrates, plants, and protista.
1. Examine plant diversity and adaptations including diatoms, red algae, green algae, blue-green algae, mangroves, cordgrass, pickleweed, and coconut trees.
2. Examine the process of photosynthesis and efficiencies of different marine plants.
3. Assess geographic and vertical distribution in the sea of marine plants.
4. Assess anatomical adaptations of marine plants related to drying, radiation, reproduction and flotation.
5. Examine uses of marine plants by different human cultures.
6. Compare similarities and differences within the invertebrates.
7. Compare similarities and differences within the vertebrates.
8. Assess the development of vertebrates based on:

a. Importance of behavior and feeding strategies.
b. Variations in locomotion, social organization, and reproductive strategies.
c. Variations in anatomy and locomotor adaptations of vertebrates including amphibians, reptiles, birds, fish and mammals.
d. Geographic distribution and ecology of vertebrate animals.

F. Assess ethical issues and environmental effects, from local to global that surround pollution and its effects on marine animal populations, phytoplankton production, oxygen production, global warming and ozone depletion.
   1. Assess effects of oil spills on the environment.
   2. Examine effects of chloroflorocarbons on the ozone layer and global warming.
   3. Assess effects of nuclear power wastes dumping, thermal pollution in rivers, bays, and ocean.

G. Identify major marine environmental problems that have resulted from changes in ecological relationships.
   1. Examine the sea as an important source of minerals, including table salt, sulfides of metals, and manganese.
   2. Assess production methods of producing freshwater for drinking and irrigation.
   3. Examine the sea as a source of fossil fuels.
   4. Examine the methods of aquaculture, mariculture, and sea ranching for the production of fish and shellfish.
   5. Examine the causes of depletion of commercial fishes and shrimp and the brink of population collapse.
   6. Assess the disruption of marine ecosystems as a result of the loss of non-commercial animals from mechanized fishing technique.

H. Summarize major changes in natural gene pools as a result of direct and indirect selection by humans.
   1. Assess over-fishing of major pelagic fisheries such as tuna.
   2. Examine collection of inshore bivalves as a non-sustainable resource.
   3. Examine loss of marine bird populations due to oil spills.
   4. Assess loss of marine mammals due to tuna nets and oil spills.