Instructor: Dr. Steven M. Aquilani (DCCC)
Email: saquilan@dccc.edu
Phone: (610) 359-5244
Office #: 3183
Web-site: http://learn.dccc.edu/~saquilan/

I. Required Materials (for Field Ecology in Belize):
   - Passport. You cannot exit or enter the country without a valid passport.
   - Snorkel Equipment (snorkel, mask, and fins). I recommend that you get fitted for your mask (preferably at a local dive shop) to insure your mask fits you properly.
   - See your physician and have your medical history form completed. Further information is available in the Immunization Information section of this syllabus.
   - There are no required books for this course. However, there are several books and field guides that students may want to purchase to improve their experience in the course (see the List of Recommended Field Guides section in this syllabus for a list and description of each). These books are helpful in identifying organisms we may encounter and/or reviewing concepts covered in the course, yet are optional. It is important to note that your instructors and our host, Programme for Belize, will have all of the aforementioned books available to you while we are in Belize. Please be sure to read the Things to Bring section of this syllabus for a list of all of the things that you will need (and more importantly, not need!) for our time in Belize.

II. Course Description: Field Ecology is designed primarily for majors in biology, natural science, and related fields, yet is open to students of all majors. This course introduces students to the general principles of field ecology pertaining to terrestrial, aquatic, and marine habitats. Emphasis will be placed upon regional conservation issues, biodiversity concepts, plant and animal interactions and adaptations, effects of human disturbance on native flora and fauna, and field research techniques. Students are expected to develop and apply skills in field research and in utilizing the scientific method.

III. Course Competencies:
   1. Apply the scientific method to test hypotheses
   2. Develop and apply skills used to identify, survey, and study plants and animals in a field setting
   3. Describe local, regional, and global trends in biodiversity
   4. Describe the processes and mechanisms that may affect biodiversity at local, regional, and global scales
   5. Develop an appreciation of the ecological and economic value of biologically diverse habitats
   6. Develop an appreciation of the value of diverse perspectives in a multicultural setting

IV. Suggested Audience: Science majors or individuals required to take a science course with laboratory.

V. Prerequisites:
   - Basic Mathematics (MAT 040) or satisfactory score on the math placement test.
   - Developmental Reading and Study Skills (REA 050) or satisfactory score on reading placement test.
VI. How to Succeed in This Course:
1) **Attendance is required at all lectures, class meetings, and activities.** Unexcused absences to any course activities will directly affect a student’s overall course grade.

2) **Be on time** for all lectures, hikes, and class activities.

3) **Be attentive and participate!** You will learn more by doing and actively participating in class activities than you will by passively observing. In this course, you have the unique opportunity to observe and study some of the world’s most diverse ecosystems. Make the most of this once-in-a-lifetime experience! Take time to look around, examine things closely, ask questions, apply what we discuss during our lectures to what we see in the field… this is what science and learning is all about!

4) **Show common courtesy and respect** to your fellow classmates, instructors, guides, and locals. This course is conducted in remote areas of a developing country. Many of the conveniences we have and take for granted in the U.S. (such as flushing toilets, long hot showers, and immediate medical care) are not available where we will be staying. Moreover, we will work closely with people from different cultures than ours. As a participant in this course you will observe people and things that are different than what you are regularly exposed to in the U.S. This should be part of the unique learning experience of the course. You will need to be respectful of the cultural differences you encounter among your hosts.

5) **Be flexible!** As occurs at sometime during all field courses, something will not go as originally planned. This will require flexibility and a positive attitude on your part. Similarly, we cannot control the weather and we will proceed with our activities even when it is raining. Again, a positive attitude will go along way to making the adventure enjoyable and memorable. **This course is not a vacation.** It will involve hiking, swimming, and attendance and participation in lectures

6) **Drug/alcohol abuse will not be tolerated.** Anyone who violates these rules will receive a failing grade (F) in the course and will be returned immediately at his/her own expense.

7) Should you encounter **any type of problem** during any part of the course **come to one of the instructors** for assistance.

VII. Student Code of Conduct:
Students and faculty of Delaware County Community College constitute a special community engaged in the process of education. The College assumes that its students and faculty will demonstrate a code of personal honor, which is based upon courtesy, integrity, common sense and respect for others both within and outside the classroom.

Your conduct at DCCC should reflect favorably on you and the college. Regulations have been developed to serve as guidelines for conduct within the college community and are designed to enhance the educational objectives of those associated with the college.

The college reserves the right to deny admission of any applicant, to discontinue the enrollment of any student, or to withhold the degree of any student, if, in the opinion of the vice president for student development, a future association is not in the best interest of the student or the college.
VIII. Students with Disabilities:
Students needing accommodations due to a learning, physical, or psychological disability, please see Dr. Aquilani prior to departure. If you are a DCCC student and have not arranged specific accommodations, you must contact Ann Binder, Director of Special Needs Services, in the Career and Counseling Center (room 1320, (610) 325-2748).

IX. Things to Bring:
If we can give you one piece of advice for what to bring, it would be: BRING AS LITTLE AS POSSIBLE!

We will room in dormitory style housing. Everyone will be in a room with a roommate(s). Belize will be hot and humid, and there also will be plenty of mosquitoes (at times). You need to bring clothing that allows you to remain relatively cool but also protects you from the insects. While in the forest you will likely want to wear a long-sleeved shirt, long pants, a hat, and some decent shoes. Count on everything getting wet a few times. Remember if you bring it - you carry it.

Here is a checklist of things to bring:

- **YOU MUST HAVE A PASSPORT!**
- 1 (or 2) suitcase(s). One is optimal!
- One carry on bag (for personal items, toiletries, toothbrush, toothpaste, etc.)
- Hat and sunglasses
- Sunscreen (SPF 15+)
- One pair of comfortable walking shoes/hiking boots (sandals may be useful for showers and the beach).
- One daypack (for binoculars, camera, wallet, notebook, etc.) Your daypack can serve as your carry-on if you like.
- **Binoculars - YOU CAN'T WATCH WILDLIFE WITHOUT THESE!**
- Note pad and pencils. This is an academic course. You will be required to take detailed notes.
- 1-2 liter-sized plastic bottles for drinking water during vehicle travel and day hikes.
- One towel
- 1 flashlight (head lamps are great; bring spare batteries and bulbs)
- **Snorkel, mask, and swim fins - YOU CAN'T SNORKEL WITHOUT THESE!**
- 2 garbage bag liners to keep dirty clothes separate from clean, and to keep things dry when stored outside.
- Any medications you may need (if you take medication please inform an instructor prior to departure and bring enough for 2 weeks). There will be no place to purchase medications in Belize.
- Bug repellent (2-3 bottles) - Deet products tend to work best, but can be absorbed by the skin. However, it also works when applied to clothing.

- Clothing (we hope to have our cloths washed one time about a week after we have been in Belize):
  
  1-2 pairs of shorts
  
  1-2 pairs of long pants (lightweight cotton or mixed polyester-cotton hiking pants are recommended)
  
  1-2 pairs of long-sleeved shirts or t-shirts
  
  1-2 lightweight cotton shirts or t-shirts
  
  underwear and socks (a weeks worth is recommended)
  
  1 bathing suit (an extra swimsuit may be useful)
  
  lightweight raincoat or poncho (windbreaker might suffice)
  
  gloves (for handling bats if you desire)

OTHER ITEMS TO CONSIDER:

- Camera and film. There will be no place to buy film once we leave the U.S. If you do find it in Belize, it will be very expensive.

- Field guides (a list is provided below for those interested)

- $$$$$ for snacks, soft drinks, and souvenirs

- Personalized first-aid kit

- Leisure reading material

X. Immunization Information:
Make sure to see your family doctor at least one month before we leave for Belize for counseling regarding immunizations and any other medical precautions that you may personally need to take. You also should check out the Center for Disease Control (CDC) website for travel to Central America at www.cdc.gov/travel/camerica.htm

The CDC recommends the following vaccines for travel to Central America (copied from the CDC page listed above):

- Hepatitis A or immune globulin (IG).
- Hepatitis B, if you might be exposed to blood (for example, health-care workers), have sexual contact with the local population, stay longer than 6 months, or be exposed through medical treatment.
- Rabies, if you might be exposed to wild or domestic animals through your work or recreation.
- Typhoid, particularly if you are visiting developing countries in this region.
- As needed, booster doses for tetanus-diphtheria and measles.
- Malaria medicine
XI. List of Recommended Field Guides (remember, these are not required):

Below is a list of the names of some field guides and books that might be appropriate for our Belize travels. The list provided here is not an all-inclusive list of the best guides – there are many others that are probably just as good. **Keep in mind that the field guides below are not required for the course. We will have a couple of field guides that you can use as will our host - Programme for Belize.** All of the guides I list can be obtained within a couple of days from amazon.com, borders, or Barnes and Noble.

Beletsky, Les. 1999. *Belize and Northern Guatemala: The Ecotravellers’ Wildlife Guide.* Academic Press ISBN 0-12-084811-2. For your money (~ $30) this might be your best buy as it is a nice guide for all of the vertebrates (and invertebrates) that you are most likely to see. The color plates are outstanding: birds, mammals, herps (reptiles and amphibians), reptiles, fish, coral, etc. This is not a comprehensive field guide aimed at a single taxon but a very broad field guide that provides information on those critters we will likely see. If you buy just one field guide this is probably the one to get.

Howell, S.N.G., and S.Webb. 1995. *A guide to the Birds of Mexico and Northern central America.* Oxford University Press, Oxford ISBN 0-19-854012 4 This field guide is the bible of birding in Central America. It is extensive (851 pp.) , so much so that it is a pain to lug around when your birding! If you are a die-hard birder this is the one you want.


Horwich, R.H., and J. Lyon. 1993. *A Belizean Rain Forest The Community Baboon Sanctuary.* Orangatan Press, Gay Mills, WI ISBN 0-9637982-0-0. This is a nice book that provides the natural history of the rain forest and some of its most common plants and animals. Not a true field guide, but it does provide very useful information on natural history of the type of forest we will visit.


Humann, P. 1994. *The Reef Set* (3 Volumes Boxed) (includes Reef Fish, Reef Creature and Reef Coral). Plastic Comb Spiral edition. New World Publications; ISBN: 878348086 ; Dimensions (in inches): 3.10 x 9.70 x 7.06. This is an outstanding 3 volume set. You can buy it in a package or individually. Plastic coated spiral edition is perfect for the island. However, there are plenty of copies of these on the island and no real need to
purchase them.

If you have a field guide of North American birds and don’t particularly want to invest in a new field guide bring it along. Many North American species occur down there.

XII. Method of Evaluation:
Your grade will be based on a composite of the following criteria:

1. **Independent Research Projects** and **Presentations** *(40% of course grade)*
2. **Class Participation and Exams** – class participation includes active participation in all course lectures and activities, as well as positive interaction with classmates, instructors, guides, and locals *(30% of course grade)*
3. **Proficiency in Identification** of common birds, fish, and invertebrates *(10% of course grade)*
4. **Field Journal** and **Class Notes** – handed in on last day of course *(10% of course grade)*
5. **Final Essay Exam** – taken on return plane ride back to the U.S. *(10% of course grade)*

XII. Departure/Travel Dates***:
Your instructors will provide a daily itinerary of all lectures and course activities during our 1st day in the rainforest (at La Milpa in the Rio Bravo Conservation and Management Area, Orange Walk District, Belize) and our 1st day on the reef (on South Water Caye, Belize).

*** STUDENTS ARE RESPONSIBLE FOR THEIR OWN TRAVEL TO AND FROM PHILADELPHIA INTERNATIONAL AIRPORT

### 2007 DCCC Student Travel Itinerary (From Philadelphia, PA):

<table>
<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Flight/Class</th>
<th>Depart</th>
<th>HK</th>
<th>Time</th>
<th>Arrive</th>
<th>Time</th>
<th>Equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sun</td>
<td>10JUN07</td>
<td>CO 1677</td>
<td>PHILADELPHIA,</td>
<td>9</td>
<td>5:38AM</td>
<td>HOUSTON, TEXAS</td>
<td>7:55AM</td>
<td>737-900</td>
</tr>
<tr>
<td>Sun</td>
<td>10JUN07</td>
<td>CO 1627 T</td>
<td>HOUSTON, TEXAS</td>
<td>9</td>
<td>9:00AM</td>
<td>BELIZE CITY, BELIZE</td>
<td>10:33AM</td>
<td>737-800</td>
</tr>
<tr>
<td>Fri</td>
<td>22JUN07</td>
<td>CO 1650 T</td>
<td>BELIZE CITY, BELIZE</td>
<td>9</td>
<td>11:23AM</td>
<td>HOUSTON, TEXAS</td>
<td>2:55PM</td>
<td>737-800</td>
</tr>
<tr>
<td>Fri</td>
<td>22JUN07</td>
<td>CO 1676 T</td>
<td>HOUSTON, TEXAS</td>
<td>9</td>
<td>5:55PM</td>
<td>PHILADELPHIA, PENNSYLVANIA</td>
<td>10:31PM</td>
<td>737-700</td>
</tr>
</tbody>
</table>

*** ALL TIMES LOCAL ***
COURSE COMPETENCIES AND LEARNING OBJECTIVES

A. Unit I – Tropical Forest Ecology (at La Milpa Field Station in the Rio Bravo Conservation and Management Area, Orange Walk District, Belize, C.A.)

Unit I Course Competencies (with learning objectives specific to travel to Belize):

1. Apply the scientific method to test hypotheses
2. Develop and apply skills used to identify, survey, and study plants and animals in a field setting
   - Define and describe science as a unique academic discipline
   - Describe the scientific method
   - Define and interpret the following components of the scientific method: observations, hypothesis, prediction, methods, results, discussion, conclusions, dependent variable, independent variable, control, confounding factors
   - Develop a hypothesis on observations based in a tropical forest ecosystem
   - Make a prediction regarding your hypothesis
   - Develop a field research study or experiment to test your hypothesis
   - Identify and describe the dependent variable, independent variable, control, and any confounding factors of your study
   - Develop valid conclusions based on the results of your study
   - Orally present a summary of your research project
   - Describe the proper uses of mist netting to capture birds and bats
   - Assist in setting up and taking down mist nets under supervision
   - Assist in the removal of birds from mist nets under supervision
   - Demonstrate the proper procedure for handling bats and birds caught in a mist net
   - Describe the proper technique of mist netting to capture birds and bats
   - Assist in setting up and taking down of mist nets under supervision
   - Describe the data one could collect from a mist netted bird
   - Describe the data one could collect from a mist netted bat
   - List and describe the types of data that one can collect using mist nets to assess population changes and health
   - Describe the point count, line transect, and spot mapping techniques of surveying birds
   - Conduct point counts and a line transect survey of birds in the rainforest
   - Compare and contrast the usefulness of point counts and line transect surveys in assessing bird populations and communities
   - Develop methodology to determine tree diversity in a tropical rainforest
3. Describe local, regional, and global trends in biodiversity
4. Describe the processes and mechanisms that may affect biodiversity at local, regional, and global scales
5. Develop an appreciation of the ecological and economic value of biologically diverse habitats
6. Develop an appreciation of the value of diverse perspectives in a multicultural setting
   - define biodiversity
   - distinguish between species richness and species evenness
   - list, describe, and critique various species concepts
   - identify the approximate number of extant species that have been described by scientists
   - identify the estimated number(s) of extant species that are estimated to exist
   - distinguish between genetic, species, and ecosystem diversity
• describe latitudinal trends in biodiversity
• describe altitudinal trends in biodiversity
• list and describe global “biodiversity hotspots”
• relate environmental variability and habitat area to species diversity
• list and describe the major causes of decline in global biodiversity
• list and describe the value of protecting regional and global biodiversity
• develop and argument(s) for the value of protecting regional and global biodiversity
• define ecology
• define community ecology
• list and describe the types of studies community ecologists conduct
• distinguish between “equilibrium” and “nonequilibrium” hypotheses of community organization
• discuss the challenges of studying biological communities in nature
• define ecological niche
• distinguish between interspecific and intraspecific competition
• discuss the role of competitive interactions in affecting community structure and diversity
• list and describe types of biological disturbance
• discuss the role of disturbance in affecting community structure and diversity
• discuss the relationship between evolutionary time and species diversity (as described by the Evolutionary Time hypothesis)
• discuss the relationship between ecological time and species diversity (as described by the Ecological Time hypothesis)
• relate climatic stability to species diversity (as described by the Climatic Stability hypothesis)
• relate climatic predictability to species diversity as described by the (Climatic Predictability hypothesis)
• determine how habitat complexity affects species diversity as described by the (Spatial Heterogeneity Hypothesis)
• describe the link between resource abundance, dietary specialization, and species diversity (as described by the Productivity Hypothesis)
• relate how interspecific and intraspecific competition may affect species diversity (as described by the Competition Hypothesis)
• define rarefaction and describe its potential affect on species diversity
• discuss how predation can act as a rarefying agent and its potential affect on species diversity
• relate patterns of primary production to species diversity (as described by the Primary Production Hypothesis)
• describe the ecology and adaptations of epiphytes and epiphylls
• identify the patterns of epiphyte diversity as one moves between the vertical layers of a tropical rainforest
• describe the role of epiphytic loading in tropical rainforests
• describe the ecology and adaptations of lianas and stranglers (including Ficus spp)
• distinguish between parasitic and saprophytic heterotrophic plants
• relate form to function among the following plant adaptations common in tropical forests: buttressed roots, large leaves, drip tip leaves, smooth bark, spines and thorns, cauliflory, production of large fleshy fruits, thigmomany
• list and describe the characteristics of tropical soils
• describe the nature of the symbiotic relationship between ants and bull horn acacia
• describe the ecological role of termites in tropical forests
• describe the caste system of leaf cutter ants
• describe the ecological role of leaf cutter ants in tropical forests
describe the evolutionary significance of common characteristics of animals in rainforest ecosystems, such as adaptations of an arboreal life, bright coloration, loud vocalizations, frugivory

describe the climatic conditions found in tropical forest ecosystems
list and describe the vertical structural vegetation layers of a typical tropical forest
characterize the types of plants and animals found in each vertical vegetation layer of a typical tropical forest
relate forest age to forest structure
list and describe at least two common tree species associated with mature, undisturbed semi-deciduous tropical forest
list and describe at least two common tree species associated with recently disturbed semi-deciduous tropical forest
list and describe at least two common tree species associated with forest edges in semi-deciduous tropical forest
distinguish between the two orders of bats (Megachiroptera and Microchiroptera)
distinguish between monophyletic and diphyletic hypotheses of the evolutionary origin of bats
list and describe the defining physical characteristics of bats
list and describe the ecological roles of bats
discuss current conservation issues regarding bats
define Neotropical migrant
list and describe the three separate and distinct habitats that Neotropical migrants are dependant upon
describe the population status of Neotropical migrants dependent upon different breeding habitat
list and describe the potential causes of Neotropical migrant declines on their breeding grounds
list and describe the hazards of migration for birds
list and describe the potential causes of Neotropical migrant declines on their overwintering sites
list and describe adverse ecological and economic consequences associated Neotropical migrant declines
relate how locate rainforest dynamics affect global dynamics
compare the biodiversity of tropical rainforest habitats with temperate habitats
list and describe the use(s) of at least three commercially important tree species observed at La Milpa Field Station in the Rio Bravo Conservation and Management Area
evaluate the conflict between economic uses and conservation of tropical forest habitats
discuss the impacts of deforestation in tropical ecosystems
develop an argument(s) for protecting tropical forest habitats
identify common resident bird species found around our living quarters at La Milpa Field Station in the Rio Bravo Conservation and Management Area, including (but not limited to):
  - King Vulture (*Sarcoramphus papa*)
  - Black Vulture (*Coragyps atratus*)
  - Turkey Vulture (*Cathartes aura*)
  - Plain Chachalaca (*Ortalis vetula*)
  - Ocellated Turkey (*Meleagris ocellata*)
  - Ruddy Ground-Dove (*Columbina talpacoti*)
  - White-crowned Parrot (*Pionus senilis*)
  - White-fronted Parrot (*Amazona albifrons*)
  - Red-lored Parrot (*Amazona a. autumnalis*)
  - Vaux’s Swift (*Chaetura vauxi*)
  - Rufous-tailed Hummingbird (*Amazilia t. tzacatl*)
• Collared Aracari (*Pteroglossus torquatus*)
• Keel-billed Toucan (*Ramphastos sulfuratus*)
• Emerald Toucanet (*Aulacorhynchus prasinus*)
• Social Flycatcher (*Myiozetetes similis*)
• Brown Jay (*Cyanocorax morio*)
• Clay-colored Robin (*Turdus grayi*)
• White-collared Seedeater (*Sporophila torqueola*)
• Great-tailed Grackle (*Quiscalus mexicanus*)
• Montezuma Oropendola (*Psarocolius montezuma*)

*** realize that we are likely to encounter over 100 species of birds during our time in the jungles of Belize!

• distinguish between general bird “forms” in the field, such as: parrots, toucans, swallows/swifts, flycatchers
• demonstrate proficiency using binoculars/spotting scope and a field guide to observe and identify birds in the field
• develop an appreciation of the cultures and history of Belize
B. Unit II – Tropical Marine Ecology (on South Water Caye, Belize, C.A.)

1. Apply the scientific method to test hypotheses
2. Develop and apply skills used to identify, survey, and study plants and animals in a field setting
   - Define and interpret the following components of the scientific method: observations, hypothesis, prediction, methods, results, discussion, conclusions, dependent variable, independent variable, control, confounding factors
   - Develop a hypothesis on observations based in a tropical marine ecosystem
   - Make a prediction regarding your hypothesis
   - Develop a field research study or experiment to test your hypothesis
   - Identify and describe the dependent variable, independent variable, control, and any confounding factors of your study
   - Develop valid conclusions based on the results of your study
   - Orally present a summary of your research project

3. Describe the processes and mechanisms that may affect biodiversity at local, regional, and global scales
4. Describe the processes and mechanisms that may affect biodiversity at local, regional, and global scales
5. Develop an appreciation of the ecological and economic value of biologically diverse habitats
6. Develop an appreciation of the value of diverse perspectives in a multicultural setting
   - demonstrate proper reef diving/snorkeling etiquette and safety
   - describe the polyp structure and colonial lifestyle of corals
   - define symbiosis, commensalism, mutualism, and parasitism
   - relate the importance of symbiotic algae to coral reef health
   - identify and describe the nature of at least three symbiotic relationships that you observed along Belize’s barrier reef
   - distinguish between the following reef types: fringing reefs, barrier reefs, atolls, and patch reefs
   - distinguish between the following reef zones: back reef, fore reef, reef flat, palmate zone
   - describe the geographic distribution of the world’s coral reef ecosystems
   - list and describe the environmental conditions (physical and chemical) necessary for coral growth
   - identify common corals found along Belize’s barrier reef, including:
     - fire corals (*Millepora* spp.)
     - staghorn and elkhorn corals (*Acropora* spp.)
     - finger corals (*Porites* spp.)
     - brain corals (*Diploria* spp.)
     - rose coral (*Manicina* spp.)
     - star corals (*Montastraea* and *Siderastrea* spp.)
     - sea fans (*Gorgonia* spp.)
   - distinguish between the major groups of marine invertebrates found along Belize’s barrier reef, including: finger and vase sponges, jellyfish, feather stars, sea stars, sea urchins, sea cucumbers, tunicates, featherduster worms, anemones, snails, conch, bivalves, shrimp, lobster, true crabs, hermit crabs
   - describe trophic community structure among biota in reef habitat
   - define coral reef bleaching
   - describe the ecological and commercial implications of coral reef bleaching
   - evaluate the status of the coral reefs of Belize
   - relate the importance of stable and healthy seagrass beds to healthy coral reef habitats
   - identify turtle grass (*Thalassia testudinum*), shoal grass (*Halodule wrightii*), and Manatee grass (*Syringodium filliforme*) using blade size and shape
• list and describe the ecological functions of sea grasses
• compare and contrast floral and faunal biodiversity in sea grass beds and coral reef habitats
• identify “halo zones” between reef patches and sea grass beds and offer a hypothesis to explain their existence
• distinguish between marine algae and marine plants found within sea grass beds
• describe the geographic distribution of the world’s mangrove ecosystems
• describe how mangrove communities function as facultative halophytes in coastal ecosystems
• identify red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*), and white mangrove (*Laguncularia racemosa*) using leaf and stem appearance
• compare and contrast the biology and geographic distribution of red, black, and white mangroves
• distinguish between prop root and pneumatophore structure and function
• describe the ecological importance of mangrove forests
• trace the flow of nutrients from terrestrial to mangrove to seagrass to coral reef habitats
• list and describe the major human-induced threats to mangroves
• evaluate the potential effects of mangrove destruction on the environment
• describe the feeding and breeding ecology of the Brown Booby (*Sula leucogaster*) and the Magnificent Frigatebird (*Fregata magnificens*
• distinguish between the major “types” of fish found along Belize’s barrier reef, including: needlefish, trumpetfish, sea horses and pipefish, toadfish, jacks, sharks, butterfly fish, angel fish, stingrays, wrasse, parrotfish, grouper, barracuda, and puffers
• use field guides/dive cards to identify common fish species found along Belize’s barrier reef
• develop an appreciation of the cultures and history of Belize