



BFE 2018

# **Arkansas School for Math, Science and the Arts**

## **TROPICAL MARINE BIOLOGY/BELIZE FIELD EXPERIENCE**

### **2024**

### **STUDENT HANDBOOK**

"Twenty years from now you will be more disappointed by the things you didn't do than by the ones you did do. So throw off the bowlines, sail away from the safe harbor. Catch the trade winds in your sails. Explore. Dream. Discover." – Mark Twain



## TENTATIVE COURSE ITINERARY

Days 1-6	Background material, lectures, etc. on the ASMSA campus
Day 7	Free for packing and goodbyes
Day 8	Fly to Belize City, then to San Pedro. Orientation & 1 <sup>st</sup> organism exam
Days 8-13	Marine conservation and ecology component, San Pedro
Days 14-16	Human island ecology component, Caye Caulker
Days 17-20	Mayan history and forest ecology component, inland near San Ignacio
Day 21	Return to US



Photo: J. Engman, BFE 2009

### Research Projects

You will take responsibility for being the class "expert" on two topics. One should be an organism (or group of organisms) that we are likely to encounter in the field. The other is some aspect of Belizean (or Mayan) history or culture. You are expected to research these topics before the course begins, and develop a fairly comprehensive command of each subject. You will write a paper on your topic. A portion of your course grade will be based on your papers, and on presentations to the class.

Your presentations will be made while we are in Belize. I will have a laptop computer and projector available, so you may plan on giving a PowerPoint presentation, if you like. A solid draft of your paper will be **due by the start of the field experience**, but you will not be required to turn in the completed paper until sometime after we return from Belize, so that you can incorporate your experiences and observations. Some projects may be designed to include data collection in the field, with subsequent data analysis.

There are many sources to help you select your topic. You might use "The List" to help you choose a marine organism. Our library also has a number of newly acquired books on Central America, both terrestrial and marine; you may get ideas from those. Feel free to talk to me, as I



have some suggestions. I encourage you to choose something exotic or exciting for your cultural/historic topic. Belize is a rich, diverse country, with a long and colorful history. Have fun with this. Topics will be reserved on a “first-come first-served” basis. Please check with me once you have an idea. We don’t want multiple people choosing the same or similar topics.

Your final papers, of course, will be word-processed. I will expect that you follow the CITATION format used in the journal *Coral Reefs*. I will expect a minimum of 10 relevant citations from peer-reviewed journals for your organismal paper. (In reaching your requirement of 10 citations, you may count internet sources only if they are on-line versions of peer-reviewed journals. See me if you have any questions on this.) You can also use additional sources that are not peer-reviewed. Plan on a minimum length of 10 double-spaced pages, not including your literature cited section.



J. Engman BFE 2014

## The List

The list of organisms that follows is one with which you will become very familiar. By the time the course is over, you will be expected to know all of the organisms on the list by sight, know something of their ecology, and know their basic taxonomic classification. For those that have them, you should learn common names, as well. For the start of the class, you should know the scientific and common names and be able to recognize them. Start learning one or two a day now, and it will be easy!

You will also be responsible for learning at least 30 of the more common fish species. We'll do that once class starts. You will find that they are very easy.

<i>Acanthopleura granulata</i>	<i>Dendrogyra cylindrus</i>	<i>Montastrea annularis</i>
<i>Acetabularia calyculus</i>	<i>Diadema antillarum</i>	<i>Nasua narica</i>
<i>Acropora cervicornis</i>	<i>Dichocoenia stokesi</i>	<i>Nemaster sp.</i>
<i>Acropora palmata</i>	<i>Dictyosphaeria cavernosa</i>	<i>Neomeris annulata</i>
<i>Acropora prolifera</i>	<i>Dictyota divaricata</i>	<i>Nerita peloronta</i>
<i>Actinopyga agassizii</i>	<i>Diodora listeri</i>	<i>Nerita tessellata</i>
<i>Agaricia agaricites</i>	<i>Diploria labyrinthiformis</i>	<i>Nerita versicolor</i>
<i>Alouatta pigra</i>	<i>Diploria clivosa</i>	<i>Octopus briareus</i>
<i>Alphaeus armatus</i>	<i>Diploria strigose</i>	<i>Ocypode quadrata</i>
<i>Anilocra sp.</i>	<i>Echinolitterata tuberculata</i>	<i>Ophiocoma echinata</i>
<i>Aplysia dactylomela</i>	<i>Echinometra lucunter</i>	<i>Orbicella cavernosa</i>
<i>Arca zebra</i>	<i>Elysia crispata</i>	<i>Orbicella faveolata</i>
<i>Atrina rigida</i>	<i>Euapta lappa</i>	<i>Oreaster reticulatus</i>
<i>Avicennia germinans</i>	<i>Eucidaris tribuloides</i>	<i>Padina sp.</i>
<i>Avrainvillea nigricans</i>	<i>Eusimilia fastigiata</i>	<i>Palythoa caribaeorum</i>
<i>Bartholomea annulata</i>	<i>Favia fragrum</i>	<i>Panulirus argus</i>
<i>Bunodosoma granuliferum</i>	<i>Fissurella barbadensis</i>	<i>Penicillus capitatus</i>
<i>Carpilius corallinus</i>	<i>Gorgonia flabellum</i>	<i>Penicillus dumnetosus</i>
<i>Cardisoma guanhumi</i>	<i>Gorgonia ventalina</i>	<i>Petrochirus diogenes</i>
<i>Caretta caretta</i>	<i>Grapsus grapsus</i>	<i>Physalia physalis</i>
<i>Carybdea alata</i>	<i>Halimeda goreauii</i>	<i>Plexaura sp.</i>
<i>Cassiopeia andromeda</i>	<i>Halimeda incrassata</i>	<i>Porites astreoides</i>
<i>Caulerpa sp.</i>	<i>Halimeda monile</i>	<i>Porites furcata</i>
<i>Chelonia mydas</i>	<i>Halimeda opuntia</i>	<i>Porites porites</i>
<i>Chiton marmoratus</i>	<i>Halimeda tuna</i>	<i>Rhipocephalus phoenix</i>
<i>Chiton tuberculatus</i>	<i>Hermodice carunculata</i>	<i>Rhizophora mangle</i>
<i>Cittarium pica</i>	<i>Holothuria mexicana</i>	<i>Sargassum sp.</i>
<i>Clibanarius tricolor</i>	<i>Hypanis americana</i>	<i>Scyllarides nodifer</i>
<i>Cliona sp.</i>	<i>Isophyllia rigida</i>	<i>Sepioteuthis sepiodea</i>
<i>Clypeaster rosaceus</i>	<i>Laguncularia racemosa</i>	<i>Siderastrea siderea</i>
<i>Coccoloba uvifera</i>	<i>Linckia guildingii</i>	<i>Stenopus hispidus</i>
<i>Codakia orbicularis</i>	<i>Lobatus gigas</i>	<i>Stenorhyncus seticornis</i>
<i>Coenobita clypeatus</i>	<i>Lytechinus variegatus</i>	<i>Stichodactyla helianthus</i>
<i>Colpophyllia natans</i>	<i>Manicina areolata</i>	<i>Thalassia testudinum</i>
<i>Condylactis gigantea</i>	<i>Meandrina meandrites</i>	<i>Trichechus manatus</i>
<i>Conocarpus erectus</i>	<i>Melampus coffeaeus</i>	<i>Tripneustes ventricosus</i>
<i>Cyphoma gibbosum</i>	<i>Meoma ventricosa</i>	<i>Turbanaria turbinata</i>
<i>Dardanus venosus</i>	<i>Millepora alcicornis</i>	<i>Udotea sp.</i>
<i>Dasycladus vermicularis</i>	<i>Millepora complanata</i>	<i>Valonia ventricosa</i>
<i>Dasyprocta punctata</i>	<i>Mithraculus sculptus</i>	<i>Zoanthus sociatus</i>

## What to take

Part of the fun in taking a trip like ours is in the planning. You should give very careful thought to what you are going to take with you. Most people tend to take far much more than they need, so *plan on packing light*.

Pay particular attention to the size and weight limitations for international travel. Checked baggage cannot exceed 50 lbs, and a dimensional limit (L+W+H) of 62" applies. Carry-on baggage should not exceed 40 lbs, have a dimensional limit of 45", and should fit into an overhead bin or under your seat. (For reasons we will discuss later, I suggest a soft-sided backpack, not a rollerboard with wheels.) You should plan on checking only ONE bag. You won't need more than that, and I will need some of you to take an extra checked bag containing equipment and supplies for the course. Overweight baggage results in substantial additional fees, which you would be responsible to pay.

When you pack, assume that your luggage will be lost or delayed en route. Pack the most essential items, including medications, in your carry-on, but pay attention to airline regulations on liquids and prohibited items. Also be aware that the bag you treat as carry on for the international flight may end up being checked on the very small planes we use in Belize.

You will find that we will basically live in T-shirts and shorts, or T-shirts and bathing suits most of the time.

Belize is hot and humid. Think *light* for clothing: light colors and light materials are much better for the tropics.

Also:

1. Hat. Get one that actually gives you shade, not a baseball cap!
2. Sunglasses that effectively block UV.
3. At least one bathing suit. Most people like to have two, so one can dry.
4. Oxybenzone-free sunblock lotion (strong - I use SPF 45). Take much more than you expect to use. A severe sunburn could ruin your whole trip. Make sunblock a part of getting dressed in the morning. *Smear* it on. We will talk about this in class.
5. Lightweight hiking boots for hiking in the rainforest and for caving. I also like to have a pair of tiva-type sandals. Loose flip-flop style sandals tend to be unsafe and not very useful. An important note for all of your footwear: **break it in before you go!** Hiking through the forest is not the time to find out that your feet and your boots don't like one another. You will need at least one pair of socks that you can discard after using them; they will get ruined in a cave!
6. Diving mask, snorkel, swim fins. If you do not have them already, I suggest waiting and talking to me or a knowledgeable friend/salesperson before you make purchases. Fit is very important. I can make some suggestions to you on what to look for. You can get marginally acceptable equipment for as little as \$40, but you can also spend a lot more. Fins that have separate booties are not a requirement for this trip, but if you plan on continuing with snorkeling, they are much more versatile, and are less likely to chafe. Once again, make sure that you are comfortable with this equipment before we leave the country. You can buy replacements in Belize, but you will pay a premium.
7. Insect repellant. Don't bring aerosol versions; they may be confiscated at the

airport.

8. Current passport and a picture ID. Make 2 copies of these and keep one set with you, separate from the originals, and one set at home where they can be located by someone else in the event that you lose them in Belize. It's good to have copies of your credit cards with these. If you are going to be traveling using a non-US passport, please talk to me about this as soon as possible.

10. Plastic ziploc bags and garbage bags; good for protecting cameras, eyeglasses and towels, and luggage on boat trips and in torrential downpours. When it rains, it rains HARD.

11. If you are a prescription eyeglass or contact lens wearer, you should bring an extra pair.

12. Small backpack for day trips. This can be your carry-on backpack.

13. Water bottle – something that fits conveniently in your daypack.

14. Your journal packet and presentation materials, given to you in class.

15. Battery powered alarm clock, on a phone is fine. Not everyone will need one, but someone should have one.

16. "Personal items." Soap, shampoo, and other hygiene items will not be provided as they are in most US hotels.

17. Small LED flashlight. The kind you can strap to your head are particularly nice. Do not depend on the one on your phone.

### Optional Items

1. Camera(s). I put this under the "optional" category, because it is not a *requirement*. You will, however, want photos. Be aware that sudden and strong rainstorms are common in the tropics, so think about how you are going to keep an expensive camera dry. I am currently a big fan of gopro cameras. They take great video and photos, and are versatile. See me if you want to purchase your own and need suggestions. Those one-time-use underwater film cameras tend to be incredibly disappointing. Also, the allegedly water-proof cases available for snorkeling with phones are not dependably waterproof.

2. Small bills for spending money. Credit cards will work for purchases in San Pedro, but not in most other places that we go. ATM cards (cirrus system) generally work in Belize, but you may incur extra charges. Don't bring traveler's checks; they are virtually useless. Note that my approach to these trips is that you can arrive at the field station, and get on the plane without a penny in your pocket, and everything will be covered for you. If you want to make optional snack or drink purchases during your free time, or buy souvenirs, that will require you to bring your own cash.

3. Strongly recommended: something to cover you up when snorkeling. I always wear a thin diveskin. It helps prevent sunburn, can ward off stings, and helps to keep you warm in the water. You will not need a wetsuit of any kind.

4. Pleasure reading. Bring that book you have been dying to read, for those times when you are waiting for (a bus/a boat/the tropical storm to end/the plane to come/the flooding to go down so the road is passable, Dr. Engman to come back with the repaired tire(s), etc.).

5. Your important medications, if any. You should also discuss with your physician any other items that they recommend you take with you, or recommended vaccinations. All medications should be in their original bottles.

6. For most of the trip, we live in swimsuits, t-shirts, shorts and sandals. There are no laundry facilities, but if you bring some laundry soap and have clothes that dry quickly, you won't need to pack a lot of clothing.



Photo: Lindsay Bradshaw, BFE 2009

### **What NOT to Take**

Blue jeans. Once wet, these take forever to dry, and are hot and uncomfortable in the tropical climate.

Dressy clothes. We won't be going anywhere fancy.

Expensive jewelry. If it's irreplaceable, sentimental or valuable, consider leaving it at home.

Clothing or other things that look very military. Leave the camo at home. Leave anything with military insignias at home.

Cell phones and other electronic devices. I will strongly suggest that you do not bring them, or that you use them only for "emergency" needs. They can have a variety of unwanted effects on a field experience like this. Among other things, they tend to be very isolating. It's freeing to be cut off from social media, email, internet, etc. Really. I will always have a phone, will usually have email, and your families will know how to contact me, and therefore you, if needed. Be aware that there will be restrictions on the use of cell phones and other devices, and connectivity at times will be limited, expensive, or both.

### **I will bring for you:**

Basic first aid supplies

Binoculars to be shared

Student journals, article packet and field notebooks

A computer that can be used to make powerpoint presentations

### **Answers to Frequently-Asked Questions**

- The first part of the marine component of the course will take place at the TREC Tropical Research and Education Center in San Pedro. This is on an island adjacent to Belize's flagship marine protected area. That area is well-managed, and carefully patrolled. As a result, you will encounter many large fish and other organisms that we do not find in most of the Caribbean spots people visit. The lab is a secure, comfortable facility, but it is not fancy. Rooms have fans, but not air conditioning. The food served there is primarily American style, with a Belizean flavor. Students fall in love with the food. The lab provides us with a boat, crew, and a resident biologist/director, cooks, cleaning staff, and a registered nurse.
- The second part of the marine component will be on the small island of Caye Caulker. We will stay in a small, comfortable hotel. We will prepare some of our own meals, and will eat in local restaurants.
- The terrestrial component of the course will take place at a small facility located near Belmopan, the capitol city of Belize. It is also not fancy, but you will like it. It's surrounded by 8000 acres of tropical forest that has not been logged in over 1000 years.
- Rooming assignments will vary depending on location and group size. There may be one to three students to a room, each room with a private bath.
- This course involves some strenuous physical activity. You must be able to hike moderate distances in very hot weather. You should be comfortable crawling short distances through an undeveloped cave. You must be able to swim comfortably for long periods of time (although not necessarily at a rapid speed). You should be comfortable traveling through tight spaces, in water, and in the dark! You do not have to be SCUBA certified. All class activities in the water will involve only snorkeling. If you



have never snorkeled before, no problem... it is easier than swimming. Understand that we will be in the water most days, sometimes in deep water far from shore, but our boat will always be close, and there will be multiple experienced guides with you. You must know how to swim comfortably before the class starts. We will practice the basics of snorkeling before we leave the U.S. If you are a certified diver, you will have at least one chance to dive, at an additional cost.

- **Health Insurance.** You must have individual health insurance that will cover you while you are out of the country. Details will be available later.
- You will always have access to safe, bottled water. Do not drink the tapwater or brush your teeth with it. Bottled water will always be provided.
- I have never had a single person get seasick on this trip. Our main boat, the 48' Goliath, is large and very stable. Since we are always INSIDE of the reef (separated from ocean swells by the reef itself), the water is always calm, or at most a little choppy. Still, if you have motion sickness issues, you may want to bring some medication; some of the driving around can induce motion sickness in particularly sensitive people.
- If informed in advance, we can accommodate vegetarian diets throughout the trip. Vegan is more challenging, but feel free to discuss options with me.
- The weather will be more pleasant than summer in Arkansas. We will be there during the rainy season, although that rarely affects what we do.
- You can buy just about anything you need in San Pedro, although our tight schedule and distance from town generally makes it difficult to do much shopping. Extra batteries, typical OTC medications and inexpensive clothing are available close to our lab. Once we go inland, shopping will be much more difficult.
- **BRING SUNBLOCK LOTION WITH YOU!** I cannot stress this enough. You'll be spending a lot of time in the tropical sun and it is wicked. Waterproof cream sunblocks are the only way to go. Spray-on sunblock often results in bad burns.
- Money for souvenirs? You will probably want some. You may also want some for snacks and sodas in the evenings in San Pedro. In general, however, souvenirs and handicrafts available in Belize are pretty run-of-the-mill. T-shirts, hats, etc. are everywhere, but local handicrafts are not very evident. When we go inland, you may find some carvings or textiles that interest you. See me if you have questions. Do not plan on bringing home wildlife products, fruits, vegetables, meat, Cuban cigars, biological specimens, sand or soil, shells or living things.
- **Passports.** You must have a valid passport to travel to Belize. The State Department has a very helpful site that can answer all questions related to obtaining a passport. [http://travel.state.gov/passport\\_services.html](http://travel.state.gov/passport_services.html) Please

begin this process soon, if you do not have a valid passport; processing has traditionally required at least 6 weeks. Lately, however, because of the pandemic, it has been taking up to 11 weeks, and sometimes longer. My suggestion is to apply for one as soon as you commit to the course.

- **Health Issues.** Please visit the CDC web pages on Belize. Although there are no *required* immunizations for travel to Belize, the Center for Disease Control has recommendations. I will leave the decisions up to you, and any medical professionals you care to consult with. You should discuss travel-related health issues with your physician. Whatever vaccinations or other treatments you may choose, do not wait until just before the trip to receive them, as some people may have short-term reactions that can prevent travel.
- **SCUBA Diving.** SCUBA diving, probably one dive, is an optional activity. The cost will be approximately \$100. No one may dive without a certification card. Talk to me early if you plan on this activity. Diving in the tropics can be fun and exciting, especially if the only other diving you have done is in freshwater lakes. In my opinion, however, the snorkeling that we do is of such high quality, and we see so many amazing things, that I don't strongly suggest to anyone that they get certified just for the chance at one dive in Belize.
- **Field guides.** The most dependable and comprehensive resource for learning "the list" is a pair of required books by Eugene Kaplan. They are the *Peterson's Field Guide to Southern and Caribbean Seashores*, and *Peterson's Field Guide to Coral Reefs*. They are available at many locations, but I have found used copies on amazon.com very inexpensively. You should be wary of googling organisms on the list and depending on the images you find; they are frequently incorrect. Kaplan seldom is. The list does include some terrestrial organisms that you will not find in Kaplan's books. I can help you with those.

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