OPIHI Field Trip Overview

Planning

In planning field trips:

- Consider both the scientific and educational objectives of the trip and the resources of the area, particularly sensitive, unique, or rare features (environmental and cultural).
- Prepare thoroughly to ensure the safety of all persons involved.
- Plan and conduct activities carefully to avoid long-term deterioration of the site.
- Avoid trampling, collecting, and general disturbance of organisms.
- Discuss the effect of your field trip on the environment with yours students.

Choosing an Intertidal Site

If possible, go to a previous OPIHI site. This contributes data to the long-term monitoring scientific goals of OPIHI and allows an examination of changes over time.

Some general criteria when choosing a new site:

- Is the site safe? Sites with steep drop-offs close to shore or big waves year round need to be avoided. However, a site that is inappropriate in the winter due to high waves may be calm and placid by spring.
- Is the site nearby? A site that is nearby may be more engaging to the students, since it is part of their local environment.
- Is the site accessible? There should not be a long, arduous, steep trek from the bus to the intertidal (and bathrooms nearby are always nice!). Remember that some of the most accessible sites may be very popular, and thus may be degraded.
- Is the site a rocky bench intertidal area? OPIHI intertidal areas are rocky. They can have some sand but should be dominated by a bench or boulders. Sandy beaches have less diversity in the intertidal because the shifting substrate does not allow organisms to adhere to the bottom.
- How big is the site? The site should be wide enough (along the coast) to accommodate at least five transect groups spaced approximately 2 m apart (10 m wide), larger is better. The site should also be at least 10 m long—distance between upper intertidal and still-shallow area (no deeper than knee-deep water at low tide). Of course, the shallow water can go on for much further than this.
- Is the site diverse? Are there different types of algae? Are there hiding places for organisms? A yes to these questions means the site will be interesting. While less diverse sites are important to survey as well, just checking off "rock, sand, rock, sand, etc." on data sheets can get boring.

It is *very* important to check out the site on a similar low tide level as your field trip(s). Some great locations will be covered by water and missed if you only see them at high tide. Take some pictures of the site to share with your students and look for organisms. Try to identify the most common species. Determine exactly where the transects will be laid and how long they should be, and anticipate any safety and logistical issues.

Number of Field Trips

If at all possible, take your students on two trips. More than one trip also allows students to ease their way into surveying. On the first trip students can become familiar with the environment, the sampling design and methodology, and be exposed to the species in the area. If the first trip can be more exploratory; on the second trip students will be in a position to take more accurate data. On the first trip, consider a species richness search (with organisms identification) or giving out

a list of common species at the site with space for student to write in their identifications, descriptions, and to draw pictures to create their own personalized identification sheets. If you are unable to go on multiple field trips, plan to spend more time in the classroom practicing sampling techniques.

Field Trip Date
Field trips need to be planned around low tides. Tidal level is determined mainly by the relative positions of the earth, sun, and moon, and is influenced by other factors like ocean floor topography. Tidal heights are written as negative and positive numbers indicating the magnitude of the tide. In Hawaii the difference between high and low tides is about 1 m (3 feet). We do not recommend scheduling field trip on low tides higher than 0.0. The more negative the tide, the better the field trip as more intertidal area will be exposed. However, large swells can make some sites inaccessible even at negative tidal heights. Most of the negative tidal heights during daylight hours occur in the spring and summer in Hawai‘i.

To determine the best time to go into the intertidal, consult a tide table. A good website is NOAA’s Tides and Currents, there are also many good apps. Most websites measure the tide in feet. Assume the tide height and time will be similar to the closest given location on the website, or average the values for two locations on either side of your site.

Length of Field trip
In general, the time required to conduct an OPIHI survey of the intertidal is about two hours. You will need to factor in time at the beginning and end of the trip to get situated, change shoes, and walk to the site. It is also helpful to debrief (with snacks!) at the site at the end of the trip. These tasks generally add approximately 15–30min to the field trips time, thus the total amount of time at the intertidal site should be at least two and a half to three hours. Time travel to and from a site should also be considered. If your school’s schedule limits the time you have for field trips, concentrate on surveying nearby sites.

Schedule your field trip to straddle the low tide. Within an hour after low tide, a site can be covered by water. For instance, if the low tide is at 10am, you would ideally have a field trip from approximately 9 to 11am (you would probably need to arrive a little earlier to get situated).

Determining the dates and time to go on a field trip is an important part of planning and one in which your students can take an active role. Use this opportunity to introduce or reinforce the concept of tides and chart reading skills.

Number of Students and Chaperones
Avoid trampling the intertidal zone! We recommend groups of 30 or less. Check the DOE chaperone requirements for your grade level if required. Recruit as many science assistants as possible—ideally one for every 3–5 students. Science assistants can be scientists, graduate students, undergraduate students, and interested members of the public—it is most important that they are science-enthusiastic!

Sampling Protocol

Following a standardized protocol, like the OPIHI citizen science protocol, allows comparisons to other sites and over time.

Classroom Preparation
Spend the time to prepare your students for the field trip and make it meaningful. The trip should be part of your class objectives, building on prior activities and lead to future lessons. The OPIHI

pre-field trip activities introduce your student to the intertidal and allow them to practice the sampling methods that will be used in the field.

Species Identification
Spend time with your students learning and identifying the most common organisms at your site before you go into the field. If possible, bring organisms into the classroom from the site, and have students practice using the OPIHI ID cards and other identification guides. Students can also press algae or do a phylum research project to learn about the organisms they will encounter in the field.

Species can be identified with field guides, online resources, and identification (ID) cards. Some things to keep in mind:

- Focus on identifying things to genus if identifying to species is difficult.
- Keep in mind many of the species found at a site may not be on the ID cards or in books. Encourage students to explore additional resources rather than just using the OPIHI ID cards.
- The OPIHI ID cards and data sheets use scientific names. If you students are more familiar with Hawaiian or other names, you can add these or substitute them on the sheets (just make sure there is a 1-to-1 link with the scientific names).
- Species that cannot be identified in the field should be richly described and photographed for later identification.
- Encourage groups to ask each other if they are unsure about a species' identification, pooling knowledge leads to much more accurate identifications.

Metadata
The first thing students should do fill out the top of their data sheet(s). This metadata (e.g., names and other identifying information, like their transect number and the field site) is an important step and essential to comparing species abundances between sites, but is often overlooked in the excitement of setting up.

The transect line number refers to the group's transect placement in relation to all other groups. Transect line number information will become important when analyzing your data and looking at any zonation.

As a teacher, you need to fill out the class metadata sheet which includes information about:

> **Weather**. In dry and hot conditions, tidepools may become very salty and warm. In rainy conditions tidepools may become less salty. Thus, it is important to note recent rain events in addition to general weather conditions.
>
> **Tide and waves**. Waves have an effect on how much water moves in and out of the intertidal, which can impact temperature and nutrients. Waves can also have physical impacts on the movement of sand and organisms. Observing both tides and the waves can help to describe and characterize the general wave action at a beach as well as the particular wave action on the day of your survey.
>
> **Substrate**. Most intertidal areas are composed of basalt, limestone, and beach sand. Sand scour affects species compositions, as does temperature. Basalt is darker than limestone, and thus is hotter.

Human Impact. Humans collect organisms in the intertidal and can trample species in the intertidal. How urbanized the nearby area is will affect runoff and traffic to an area.

Reducing Student Errors—Mindful Data Collection
The most comment errors OPIHI students have made in the past center on missing data, sloppiness, methodical errors, and misidentification errors. Errors rates decrease with field trip experience (thus, multiple field trips will reduce error) and age. If you teach younger students prepare to spend a bit more time with them preparing for the field trip. To address these errors *prior* to data collection we recommend emphasizing neat data collection, talking about the importance of metadata, explicitly addressing and discussing the problems of falsifying data, emphasizing the important of using standard scientific vocabulary, and giving participants multiple opportunities to practice their data collection techniques and skills.

Transect Lines
The OPIHI protocol requires transect lines to be laid perpendicularly to the coastline. Groups of 3–5 students are assigned a line to survey. The students can lay out the transect lines themselves. Lay the lines as straight as possible and maintain equal spacing between groups (~2 m). The "0" mark should be in the water. Use the high tide mark as the transect end point. To determine the high tide level look for pools of water, the end of the organisms in the high intertidal (e.g., the end of the high intertidal snails), or a line of marine debris (e.g. drift algae, sticks, shells).

The total length of transect laid out will depend on the size of the intertidal site. The Hawaii state Department of Education does not allow public school students to get wet past their knees. Thus, your transects cannot extend into an area that is too deep. You are responsible for knowing how far the transect lines should extend into the water based on prior visits to the site. All the transect lines should extend approximately the same length (some variation is OK based on the contours of the intertidal site).

Work your way into or out of the water depending on the tide (e.g. if the tide is coming in, your class should start at the deepest point on the transect). Remember to check a tide chart so you know if the tide is rising or falling when you arrive at the site and so you can direct the direction in which your students sample.

You should take transect point intercept data at least every meter. It is unlikely that your site matches the number of rows in the example data sheet. Modify the sheet to reflect your field transect length by adding or deleting rows to the data table.

In all OPIHI methods, record the organism on the surface. For example, if under one point a snail is on top of an urchin is on top of algae is on top of rock, record the species of the snail. Do not record transient objects (like trash or leaves) or "water". A skewer can help record what is under a single point.

Quadrats
Each OPIHI field trip should sample at least 25 quadrats in the intertidal. For example, if you have a class of 20 students, and you divide them into group of 4, you have 5 groups. If each group collects data from a transect, and each group completes at least 5 quadrats, you meet the goal of 25 quadrats. The more quadrat points, the larger an area of the intertidal will have been intensively monitored, and thus the more accurate the data.

In OPIHI, we will be using the point-intercept quadrat method. Optionally (and only if your

students are good at identifying things), you can have students collect data using the percent-cover quadrat method; students can then compare the information collected using both procedures. If you are collecting data using multiple quadrat methods, print separate sheets and clearly label which sheet is for point counts and which is for percent cover.

When using quadrats, it is important to spot-check student data sheets to ensure students are adding up their percent-cover or point-count numbers. This should be stressed and practiced in the classroom before the field trip. This is an important data verification step in the field that students should perform on their own ***before*** moving onto the next quadrat.

Students (and scientists!) prioritize the species on the ID cards and those written on their data sheets. As much as possible, data sheets should be tailored to the field site. Tailor the data sheets to your site based on the species you found on our scoping site visits. Additional species can be written in the blank spaces.

Indicate the designated transect points your class will place their quadrats in the top row of the columns. The transect points can be any standard distance (e.g. every 0.5 m, 1m, 2m, 5m, etc.) depending on the size of your study site.

Identifying Intertidal Organisms
To identify algae, it is often necessary to "pinch pick" it to allow for a close inspection of morphological characteristics. Only "pinch pick" algae and leave the holdfast to allow it to re-grow. Do not pick any algae that are prohibited from collection.

Safety
Having students come up with their own safety rules gets them thinking about potential safety issues, and should help with adherence. You can always bring up issues that students might not think of themselves. For example, many classes routinely forget to bring up raincoats for inclement weather. Discuss as a class what consequences there should be for breaking safety rules. Students, co-teachers, and chaperones should know what the rules are and what the consequences will be for violating them.

In process of discussing safety issues, students may conduct background research on the hazards of visiting the intertidal ecosystem (e.g. wet slippery environment, waves), and the specific hazards presented by different organisms. Students can then be responsible for identifying items that need to be in the first-aid kit brought on the trip. In addition to the standard first aid kit supplies, bring vinegar, which can neutralize many marine stings.

Again, with student involvement, discuss appropriate clothing, sun protection, and the need for water. You and your students should also discuss conservation techniques to use in the field, such as handling organisms gently and returning organisms to where they were found, and turning rocks back to their original positions. On site, point out potential hazards and remind students of safety rules.

Sample Safety Guidelines (written by students at the University Lab School):

1. Algae and seawater make the rocks slippery. Be careful walking around. No running.
2. Watch the waves; be aware of your surroundings. Never turn your back on the ocean.
3. Do not go into the water more than knee deep. (*This is a DOE regulation for HI public schools*)
4. Be aware of the dangers presented by marine organisms:
    - Sponges, fireworms, hydroids and some zoanthids can sting and irritate skin –

wear gloves or use nets when handling these animals.
- Oysters, crabs, mantis shrimp, octopi, sea urchins and moray eels can cause injuries – do not stick your hand into a hole if you don't know what is there, and handle all marine organisms with caution.

5. If you turn over a rock, make sure you put it back the way that you found it.
6. Do not leave any trash behind. If you see trash that someone else has left, pick it up.
7. Respect your colleagues, and the environment.
8. Be prepared for our trip. This is what you'll need:
    - clothes that can get wet and dirty
    - sturdy, close-toed shoes for walking around on rocks (reefwalkers, tabis, or old sneakers)
    - sunscreen and a hat
    - snacks and a drink
    - a good attitude!

These safety guidelines can be incorporated into a student-generated field trip contract encompassing safety issues and safety rules to be signed by the student and a parent or guardian. When getting parent permission, make sure to collect student emergency contact numbers and medication information. Remember to research where the nearest medical facility is located.

Upon arrival at the site, survey the area quickly to determine if conditions are "normal". Should any unanticipated hazards be identified, an assessment must be made to determine if the activity should continue.

In the Field

Classroom Field Management

The best way to approach field classroom management is to prepare in your classroom.

- Share OPIHI goals with your students, make sure they are understood by everyone.
- Spend the class before the field trip reviewing details and logistics.
- Have you students be part of the planning process as much as possible—including prepping equipment as a class.
- Have students generate safety guidelines (see above).

Dividing students into teams of 3-5 before the trip and assign agreed-on roles to each team member. In the field, be clear that each group is assigned a transect and must stay along their transect. This ensures students say within safe, designated areas. Be prepared for student groups to end at different times and have expectations for groups that end early as well as slower groups. If you allow students to explore the intertidal after collecting OPIHI data, establish and indicate boundaries of the exploration area.

Conservation

It is important to make students aware of their impact on the intertidal. The goal is for your class to minimize their environmental footprint.

Intertidal Etiquette:

- Avoid stepping on invertebrates and algae whenever possible
- When holding organisms out of the water, keep them wet
- Replace rocks to *exactly* the same position as you found them
- Return animals to where you found them

- Limit the number of students you take on a field trip to approximately 30
- Do not leave any trash at the site

At the end of a field trip, it is important to have your students look back at the intertidal site and *see* their impact and the changes they have caused in the ecosystem. For instance, sand will now be compacted, rocks will have moved, and algae will have been compressed. Use this opportunity to tell your students to make this experience, and their inadvertent impacts to the intertidal, count.

Handling Intertidal Organisms—Invertebrates
Many intertidal invertebrates organisms are safe to handle. They can be held in your hand for a limited period of time (as intertidal organisms, they are used to being exposed to the air). It is important that the organisms stay wet and that you handle them gently. This entails holding organisms in the palm of your hand and not pinching, squeezing, or dangling them. Remind your students to treat the creatures with respect. Point out the hazardous ones students should not handle prior to the field trip (e.g., sponges, eels, cone snails, fireworms, crabs, urchins, mantis shrimp, hydroids).

If you have containers to temporarily place organisms in, keep the organisms from overheating and the water from becoming anoxic by periodically having your students exchange the warmer container water for fresh ocean water and keeping the buckets in the shade (or covering them so they are shaded). When placing organisms back in the water, try to return them to their original location. Have your students return organisms to the same distance from shore as where they were captured (for instance, a crab found in knee-deep water should be returned to the same depth). Other organisms depend on the shade and protection given by rocks and should be returned to them if removed, for example brittle stars will appreciate being put back near, or under, a rock.

What to Bring
For the Class

- First aid kit (with vinegar)
- ID books (invertebrate, algae, fish, etc.)
- Trash bags
- Sandwich and gallon-sized plastic bags
- Plastic bags to protect books
- Teacher metadata sheet
- Extra transect and quadrat data sheets
- Buckets or large containers to transport supplies (optional)
- Small containers for temporarily holding organisms (optional)
- Gloves to share (optional)
- Water quality monitoring equipment & data sheets
    - Turbidity: Tube, container to fill
    - Dissolved oxygen: Ampules, DO card, safety glasses, gloves, small cup, Tupperware for discarded vials
    - Thermometers
    - Hydrometer

For group of 3-5 students

- Transect
- Quadrat

- Camera (if possible)
- OPIHI ID card in plastic protectors (or laminated)
- Data sheets (transect & quadrat data sheets)
- Clipboard
- Pencils
- Rubber bands (to hold data sheets to clipboard)
- Plastic bags (for unknown algae)
- Permanent marker (to labels unknown algae bags with transect & quadrat information)
- Skewers (optional) to help collect point-count data
- Look boxes (optional)

Students

- Close-toed shoes
- Water bottle
- Sun protection: Sunglasses/sunscreen/hat
- Clothes that can get wet
- Rain jacket
- Snack (optional)

Post-field trip

Clean all field gear thoroughly—wash all equipment with fresh water.

Have student analyze, infer, represent, and communicate their findings so the data collected during the field trip does not just get handed off, but is authentically utilized in your classroom. After analyzing their data, students can present it in traditional ways, such as a lab or oral report, but can also make posters, teach the intertidal ecosystem to younger students, or invite parents to a symposium.