



Conduct Your Own Scientific Investigation

It's time for you to become a scientific sleuth! Come up with some questions about things that interest you, and we'll show you how to find the answers using the scientific inquiry approach. You will deepen your knowledge of the leatherback, their habitats, and more. You may even learn some ways to help conserve them!

Scientific inquiry will help you to reveal truths and make discoveries. You don't have to follow a rigid procedure. Just observe, ask questions, do research, form conclusions, and report your results! Along the way, ask for advice from your teachers or scientific experts.

Follow these steps as you conduct your investigation:

- Make Observations
- Ask Questions Scientifically
- Do Background Research
- Hypothesize or Do Otherwise
- Choose a Research Procedure
- Gather & Analyse Data
- Form Conclusions
- Report Results
- Reflect on Your Experiences
- Start Again

Make Observations

Step One: be observant! Observations are data that you can perceive with your own senses of touch, taste, sight, smell, and hearing

Don't forget to distinguish between scientific observations (raw data) and other information, such as opinions, ideas, comparisons, calculations, and experiences. Try it with these examples:

1. On the first three days of the study, the peregrine falcon travelled 300 kilometres.
2. The king eiders probably delayed their departure from their staging grounds because the weather was sunny and warm.
3. When the polar bear came ashore at Nuvuk Point (65°N, 87°W) on May 20, 2001, the sky was cloudy, the temperature was -5 C, and it was snowing.

4. The leatherback sea turtle travelled 50 per cent faster while swimming in the Gulf Stream than it did in the Labrador Current.

Answer: Examples 1 and 3 are scientific observations, because they contain raw data. Example 2 is an opinion, based on vague information. Example 4 is a comparison, based on calculations.

As scientific sleuths, it is your responsibility to record your scientific observations for future use. If you don't record them conscientiously, you won't have the information you need to draw conclusions. Use either a notebook or the Investigator's Log (PDF – 62KB).

Write down 10 scientific observations about the leatherback turtle. This will help you zero in on a subject that interests you. [CLICK HERE](#) for background information about leatherback turtles that may help.

Ask Questions Scientifically

Now that you know the difference between scientific observations and other information, look at the 10 scientific observations you wrote down. These will help you decide what to investigate.

Come up with five questions based on your scientific observations. Start your questions with words like "Where," "What," "Why," "When," and "How." Write them down in your notebook or the Investigator's Log.

Next, single out the question that interests you most. It should be a question that you can answer using data from this website, or similar available sources. Have a clear idea of what you want to find out.

Can you answer your question using science? Ask yourself:

- Can an answer be found?
- Is data available to answer it?
- Can the method used to gather data be repeated by other researchers?
- Will your answers and conclusions be based on the data collected?

If you're still not sure, try to work out which of these sample questions can be answered using science:

1. Where do peregrine falcons that breed in Wood Buffalo National Park spend the winter?
2. How much time does an individual polar bear stay on land in one breeding season?
3. Is the migration behaviour of king eiders as interesting as that of harlequin ducks?
4. Do leatherback sea turtles enjoy swimming off Canada's coasts?

Answer: Numbers 1 and 2 can be answered scientifically because they are focused; raw data is available to answer them. Numbers 3 and 4 are value questions; their answers are based on opinions or judgements.

Finally, consult with other students, your teacher, or a scientific expert to see if you're on the right track. Verify that your question can be answered through scientific investigation – don't worry; you can change it later if things don't work out.

Do Background Research

Now that you've chosen a question, it's important to find out what other researchers have to say about your topic. Based on what you discover, you may think of new ways to approach your topic, or decide to change or narrow the focus of your question.

Here are some hints that will help:

- Use a wide range of resources, including reference books, magazines, CD-ROMS, interviews, and the Internet. COSEWIC and Hinterland Who's Who -- plus our backgrounders on the leatherback turtle — are great places to start.
- Take advantage of our Ask an Expert feature. Experts can help you focus your investigation. Prepare in advance so that you can clearly and concisely explain what you are planning to investigate.
- Be organized: keep a separate page in your notebook or Investigator's Log (pdf - 62KB) for each source of information you find. Include dates, titles, authors, publishers, and other reference data.
- Write a carefully thought out summary of your findings. Emphasize the question you plan to investigate.

As you do your background research, you may realize some things that weren't obvious before. Restate your question, if you need to. Make sure it is focused enough to allow you to conduct an investigation. Be flexible!

Again, review with other students, your teacher, or a scientific expert any changes you intend to make in your scientific investigation.

Hypothesize or Do Otherwise

A hypothesis is simply an educated guess — based on scientific observations — about what you think your investigation will uncover. The point is not to prove anything, but to learn if something is true.

As Turtle Trackers, you should be able to come up with a hypothesis about your turtle, but you don't need a hypothesis to conduct an investigation. In some cases, you may be better off without one, if little is known about your topic or if you lack information to predict what will happen or what you'll find out.

That said, a hypothesis can help you stay focused and organized during an investigation:

- Remember to base it on scientific observations.

- Consider phrasing your hypothesis as an "if-then" statement: "If leatherback turtles usually appear near upwellings, where warm and cold currents meet, then their prey is probably abundant there."
- Don't get emotionally involved in your hypothesis, trying to prove that it is true. It's simply an organizational tool to help you understand what you're investigating.

Write your Turtle Trackers hypothesis in your notebook or Investigator's Log. Remember to consult with your teacher or a scientific expert before going further.

Choose a Research Procedure

There's one more decision to make before you can launch your investigation — how will you gather your data? Choosing a reliable way of collecting, classifying, and analysing scientific information is highly important.

Consider using our leatherback sea turtle tracking journal; you can use it to plot the daily and weekly movements of the turtles. You can also make migration maps, record weather data, gather information on habitat conditions along the migratory route, and keep field notes.

Of course, you're free to devise alternative research procedures. If you do, remember:

- Know what kinds of data you want to record, how regularly, and for how long. We recommend that you do this weekly, but you can collect tracking, weather, and habitat information less regularly. You'll eventually need to interpret how various factors, alone or in combination, influence migratory species, so you'll need to gather the right kinds of data. This will include numerical measurements (latitude, longitude, and weather data) but also information on habitat, including ecozones.
- Develop procedures to record information. How you collect and organize data will make all the difference in how you analyse and interpret them, the conclusions you come to, and the results you report. With numerical data, a simple table could allow you to explore relationships between rainfall, temperatures, ocean currents, and other factors affecting wild travellers.
- Write down the procedures you plan to follow in your notebook or Investigator's Log (PDF - 62KB). Thinking this through — before you begin collecting data — will make for a better investigation. Make sure your procedures take into account how you will record any information you need to answer the question you've chosen, and to support or oppose a hypothesis, if you use one.

If you choose to devise your own research procedures, ask other students, your teacher, or a scientific expert for feedback before you start gathering data.

Gather & Analyse Data

At last, it's time to start collecting and analysing data on the leatherback; their movements, habitats, and how they're influenced by weather. While doing your research, remember:

- Record your data in accordance with the model in our sample page of the tracking journal. If you've devised your own research procedures, follow them just as planned, unless changes are needed.
- Gather day-to-day data at least twice a month or, better yet, on a weekly basis. Otherwise, you may find that you can't keep up with the amount of information supplied.
- If possible, record this information for one or two migration seasons (fall and spring) throughout the school year.
- Collect data not only numerically but also descriptively and visually. For example, depict habitats in words and illustrations. Use graphs to correlate weather patterns with animal movements.
- Analyse your data regularly. Illustrations, graphs, maps, and other creative ways of "playing with your data" will help you find patterns and connections among them.
- Be honest with your data. Don't try to prove anything, twist the truth to make it look a certain way, or find meaning that isn't there.
- If you use a hypothesis, remember it's only a tool to get focused and organized. Being a scientific sleuth is about discovering things that are true.
- Write a weekly or biweekly brief in your notebook or the "My Field Notes" section of the tracking journal, summarizing data you've recorded and analysed. Doing this will help you to think logically and keep a sense of flow in your investigation.
- If you need advice while doing your research, consult with your teacher or a scientific expert.

Form Conclusions

Congratulations, Turtle Trackers! Did your turtle finish the journey? You have a little further to go. Interpreting your data and writing your conclusions is the most important part of your investigation!

“Interpreting your data” is the same as finding out what they mean. It's about reviewing your numerical data, drawings, maps, field notes, and other information — including patterns and connections among them — and asking yourself if they signify something.

Have you found an answer to the question you posed at the beginning your investigation? If you used a hypothesis, have you found enough data to support or oppose it? If you're not sure, say so. Be true to your data. Don't let your assumptions confuse your perception of what things mean. Don't pretend to find meaning if it's not really there. Remember, scientific investigation is about discovering things that are true.

Your conclusions are a written interpretation of what your data mean. If more data are needed to answer your question or to support or oppose your hypothesis, suggest what kind of research ought to be carried out.

With the help of feedback from your teacher or a scientific expert, rewrite your conclusions as clearly and accurately as you can.

Report Results

So, you're eager to tell the world what you've learned! Don't just hand out your written conclusions. Think about what helped you understand the significance of your data. Was it a map, chart, or illustration? Whatever it was, include it when reporting your results. Graphs, tables, photos, a website, display board, or scrap book are just a few options. Get creative, and share your results with CWF!

You may also want to report how your findings can contribute to species-at-risk recovery. Then, take the next step and check out our guide to creating a recovery plan – we'd love to help you with that, too!

Reflect on Your Experiences

Reflect on how you've grown as a scientific sleuth. Complete your investigation by writing a final entry in your notebook or Investigator's Log. Ask yourself:

- What new skills and ideas you've learned — not just scientific inquiry but also geography, map-making, math, species-tracking, wildlife recovery, drawing, writing, space technology, and more.
- How you'd change your investigation if you could do it again.
- What you most liked about conducting your own investigation.
- If you think you could get more out of this experience by doing another investigation.
- How else this experience has enriched your life.

Finally, remember to share your project with us! We'll showcase your work along with others from learners across the country!

Start Again

Ready for another round? If you think you can deepen your knowledge by gathering data through another season, doing more research to test your hypothesis or to answer your question, or conducting a whole new investigation, go for it!