Extension of "You Are What You Eat":

Lab Activity 8.2b: Plastic Investigations

"What plastic items are albatross likely to eat?"

Science skills
- Observing
- Classifying
- Predicting
- Communicating

Concepts
- Understand that seabirds that are surface feeders (albatross) are more likely to ingest plastic and feed it to their chicks
- Understand that birds with bigger beaks (albatrosses) eat larger prey and plastic (20-100mm)
- Scientists use Dichotomous keys as a tool for classifying things. Typically it is used to identify organisms.

California Science Content Standards
9. Investigation and Experimentation: Scientific progress is made by asking meaningful questions and conducting careful investigations.

Objectives
Students create and use a dichotomous key to determine if an albatross would ingest a particular piece of plastic. Students will measure objects and compare the characteristics of the assorted piles of plastic.

Time to complete
One class period

Mode of instruction
Teacher directed group lab activity and work with Dichotomous Key, followed by presentation of results and class discussion

Materials
1. Assorted plastic trash collected for Activity 8.2; assess the need to collect more; if necessary have students collect plastic trash from their neighborhoods, homes, and schools
2. Plastic Dichotomous Key Worksheet
3. Ruler to measure plastic
4. Plastic and Seabirds Power Point presentation

Preparation
Assemble all plastic that includes large/small, transparent/translucent, and assorted colors. Photocopy Plastic Dichotomous Worksheet. Read information about plastic and seabirds in the Plastic Power Point presentation. Optional: Select relevant (and appropriate to your particular class) information from the Power Point presentation to create a seabird and plastic information sheet to distribute to students.

Background
Marine plastic pollution is one of the major threats to seabirds (and marine mammals, fish, sea turtles, and marine life that feeds on plankton). The increase in plastic production and "single-use" plastic has resulted in a corresponding rise in the amount of plastic debris in the oceans that is being ingested by seabirds. Seabirds mistake plastic for prey and eat bottle caps, plastic fragments, cigarette lighters, lightsticks, and pieces of children's toys. Seabirds most susceptible to plastic ingestion are surface feeders and scavengers, such as Albatross. Birds' beaks determine the size of the food they eat. Albatross eat flying fish eggs along with pumice that is often used as a floating item to which eggs are attached. Plastic items that range in size from ~2 – 20 cm and even as large as a toothbrush(!) are ingested; albatrosses also eat plastic wrappers.

Outline
Before class
Assemble all plastic e.g. bottle caps, Styrofoam, children's plastic toy parts, plastic fishing floats, toothbrushes, light sticks, and divide into piles to be distributed to each group of 4-5 students.

During class
1. Review concept of density and properties of objects in salt water
2. Review "Plastics and Their Uses" and the types of plastic that floats or sinks
3. Sort and categorize plastic into specific groups: size, shape, transparent/translucent, light, medium, or dark colors, bright (yellow/red) or dull (blue/green); industrial plastic (pellets) or user plastic, plastic fragments
4. Group objects that have similar characteristics and create sub-groups; start with most general and progress to increasingly more specific characteristics
5. Use Plastic Dichotomous Key worksheet to create a Dichotomous Key, refer to example on worksheet.

Activity
1. Examine piles of plastic and plastic fragments; separate and group into categories based on similar characteristics; include size as a category and use ruler to measure
2. List characteristics; start with most general and progress to more specific
3. Create Plastic Dichotomous Key
4. Summarize results by using diagram/photo of actual size of albatross head and beak (see Plastics & Seabirds Power Point presentation slide # 8 & 9) and answering question "What items will an albatross most likely ingest and potentially cause harm? Assemble and label items likely to be ingested (several millimeters to ~20 cm) by an Laysan or Black-footed albatross

Results and reflection

1. Report findings and conclusions to the class
2. Create summary poster (use graphs/charts) of plastic items albatrosses are likely to ingest

Conclusions

Seabirds, specifically birds that feed on the surface of the ocean (dippers and scavengers), such as Black-footed Albatross and Laysan Albatross, often mistake plastic pieces as food and also feed plastics to their chicks. Types of plastic include single-use "user" plastic: e.g. bottle caps, plastic toys, cigarette lighters, light sticks, industrial pellets known as nurdles and fishing floats. Seabirds such as the albatrosses also eat fishing line. We can think of seabirds as ocean barometers that can indicate the amount and extent of plastic pollution in our oceans.

Extensions and applications

Research the "life –expectancy" of plastic; determine why there are so many bottle caps and identify their source; determine if large pieces of plastic break up into smaller pieces. Use poster "Marine Debris Biodegradation Time Line" that can be purchased from Mote Marine Laboratory Sarasota, Florida 34236; 941-388-4441 or 1-800-691-MOTE.

Use activities and discussion questions for all grades in Activity CA3 Clean shorelines, Clean Oceans: Shoreline Cleanup p. 131 and Activity CA4 Preventing Pollution at the Source

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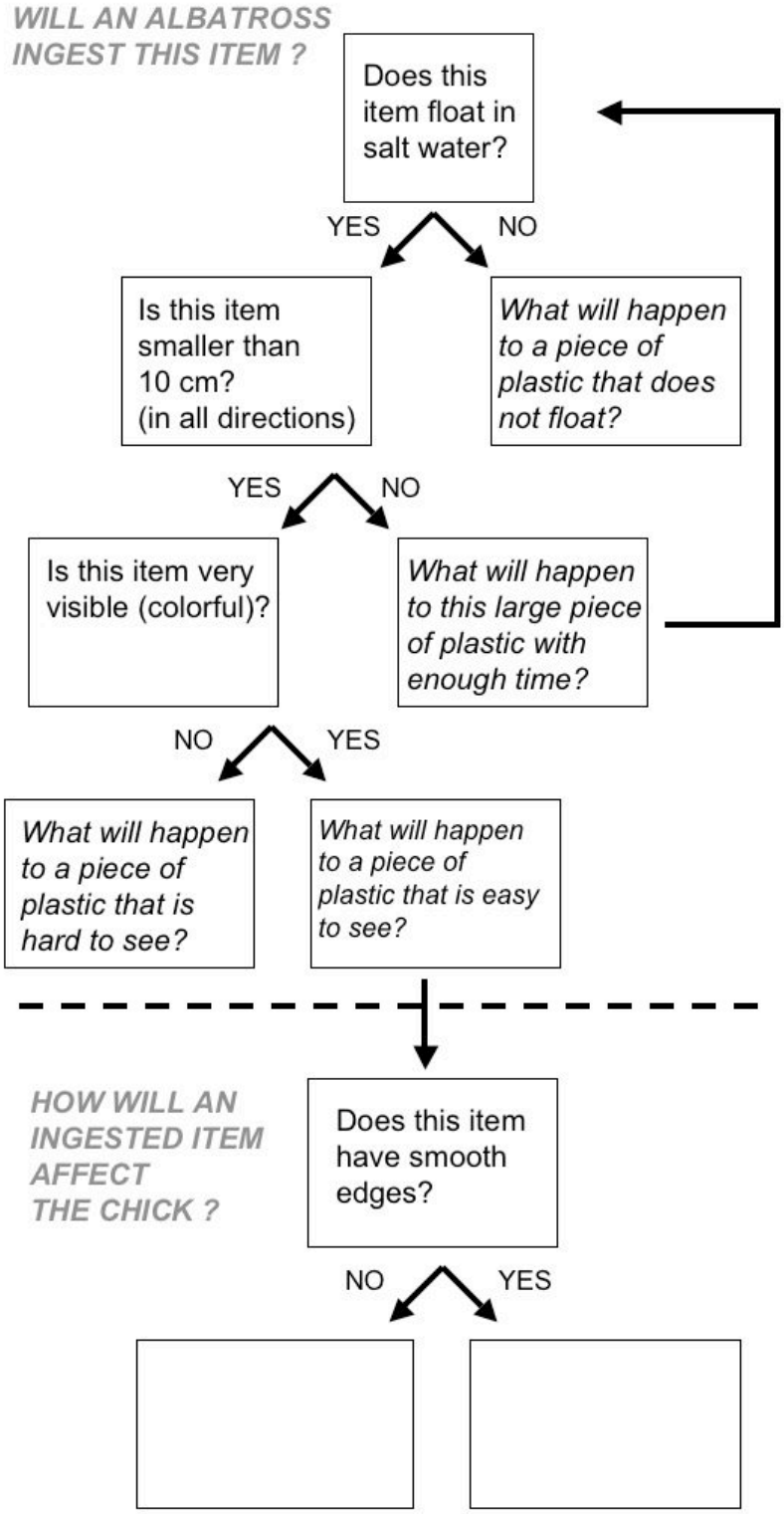
PLASTIC DICHOTOMOUS KEY WORKSHEET

(Use the space below to create a plastic dichotomous key)

Suggested Categories: size, weight (buoyancy in salt water), visibility (transparent/translucent) and color (attractive/not attractive to birds)

Example of a dichotomous key



ALBATROSS BOLUS WORKSHEET

Sorting Worksheet for Plastic by **COLOR** (courtesy C.Moore, Algalita Marine Research Foundation & W.Henry, UCSC)

Sample Number: _____ Sample Location: _____ Lab Technician: _____

Sample Station: _____

Sample Date: _____ Analysis Start Date: _____

PLASTICS											
COLOR → **SIZE ↓**	Black/Gray	Blue	Brown/Tan	Green	Orange	Pink/Red	Transparent/ Translucent	White	Yellow	Unidentified/ Misc.	**TOTAL** for each size class
Measured											
> 4.75 mm											
4.75 - 2.80 mm											
2.79 - 1.00 mm											
< 1.00 mm											
Tyler-sieved											
> 4.75 mm											
4.75 - 2.80 mm											
2.79 - 1.00 mm											
< 1.00 mm											
TOTALS											