

CALIFORNIA



Marine Advisory Publication

Using Drift Bottles to Measure

OCEAN CURRENTS

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Ocean currents are important to us in many ways. Currents influence climate, marine shipping, and the distribution of fish and other marine life.

Figure 1 shows the usual patterns of ocean currents in the eastern Pacific Ocean. The California current, the major ocean circulation feature off the coast of California, flows southward along the Pacific Coast past Mexico. The warm Davidson current, shown flowing northward along the California coast, occurs only in late fall and winter when the wind frequently comes from a southerly direction.

The shaded area (figure 1) along the Pacific Coast shows a band of cold water, which has an important effect on the climate and marine life of the region. The cold water forms in the summertime when northwesterly winds push the surface water seaward away from the coast. This allows cold water from the ocean depths to upwell and take its place. Upwelling enriches our coastal waters by carrying up cold, nutrient-rich ocean water to the surface of the sea.

By using drift bottles to measure ocean currents, you can learn about the ocean currents off the coast of California. Scientists can also use the information you collect to add to their studies of California's currents.

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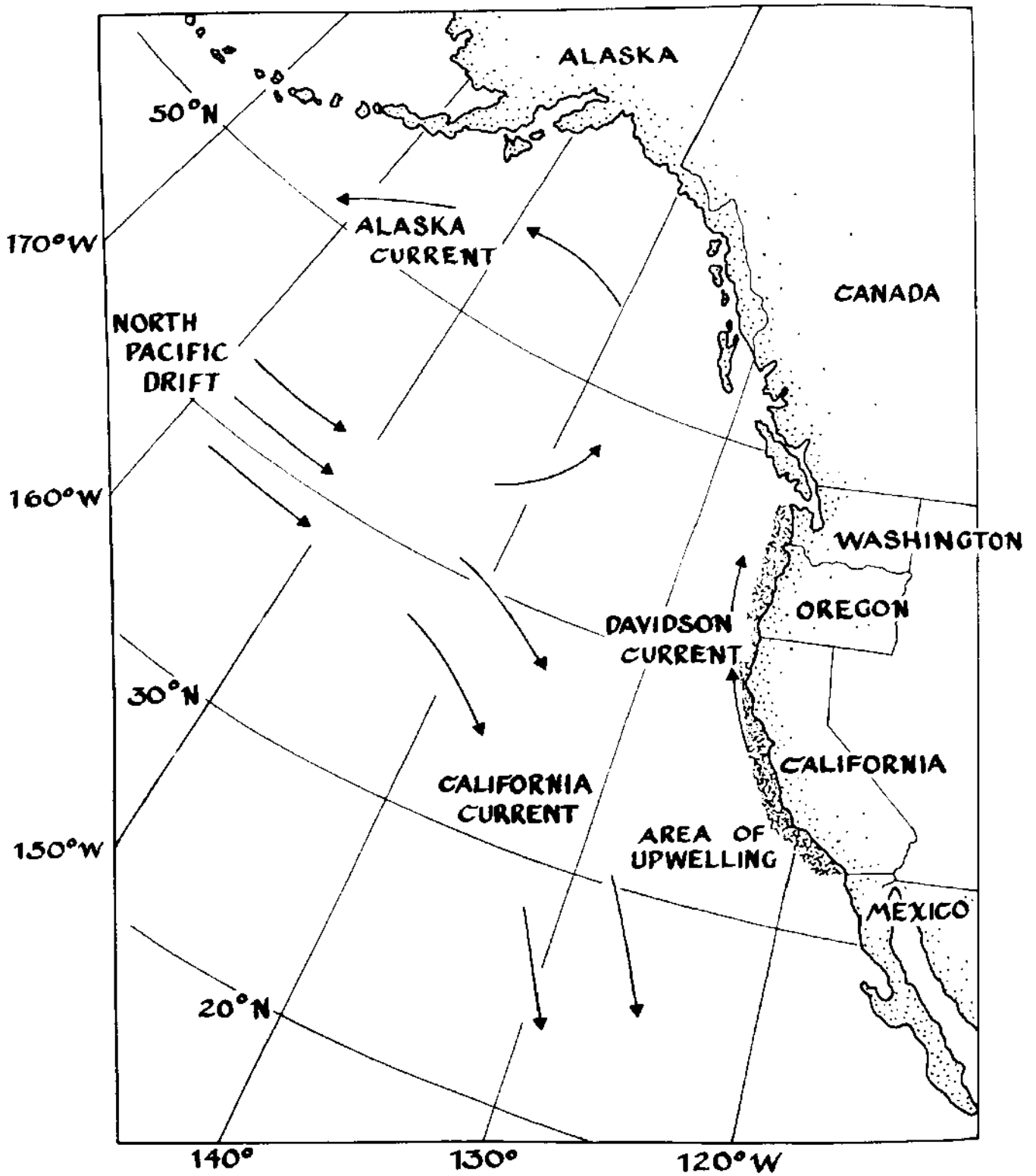


Figure 1. Major currents of the northeastern Pacific Ocean.

Materials Needed

Clear glass bottles that have screw-on caps
(soft drink, catsup, beer, and other bottles)

Dry sand

Rubber stoppers,* size #1 or #2 (2 centi-
meters) or

Corks and paraffin

Self-addressed postcards

Letters to persons returning bottles

Activity

Inform the Extension Marine Resources Specialist. If you begin a drift bottle project, let the Extension Marine Resources Specialist know about it by writing to Extension Wildlife and Sea Grant, 554 Hutchison Hall, University of California, Davis, California 95616. When you write, be sure to list the name and address of your 4-H club, the location from which you plan to release the drift bottles, and the number of bottles you intend to release. The Marine Resources Specialist will then send you some self-addressed postcards to put into your drift bottles.

Constructing drift bottles. Make sure that each bottle is water tight. Roll the postcards and place one in each bottle. Be sure to fill in the last two lines on the postcard before putting the card in the bottle. Use sand to ballast each bottle so that only the top 1½ inches of the bottle remain above the water. (See figure 2.) You can test the ballasting in a sink or tank of water. This ballast minimizes the effect of wind on the drift of the bottle. Seal each bottle with a rubber stopper and, if available, the screw-on cap. You can also use corks to seal bottles, but you must seal the corks with paraffin or roofing tar to protect the cork.

It is suggested that each person make ten or more drift bottles. You can expect to have about 10 percent (1 out of 10) of the postcards returned.

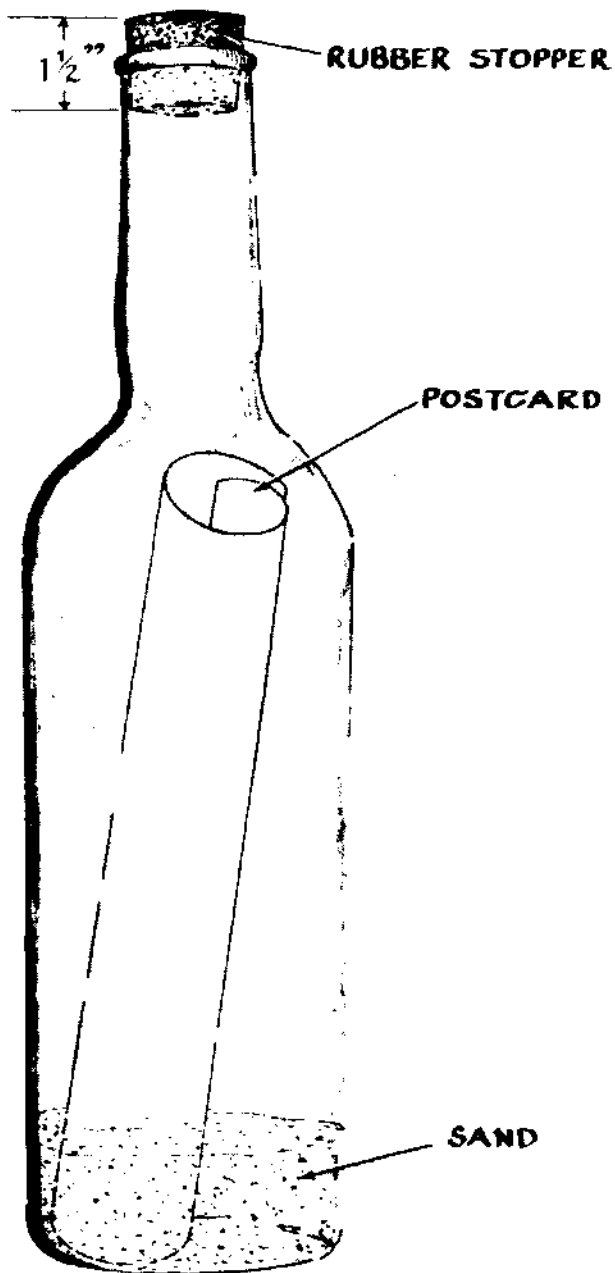


Figure 2. Completed drift bottle.

* Available from Peninsula Scientific Company, 2185 Park Boulevard, Palo Alto, California 94306, or other scientific supply companies.

Release the drift bottles. When the bottles are ready for release, arrange with local boaters, fishermen, or a marine advisor near you to have your bottles dropped at sea. Make sure that the person who drops the bottles for you records each location of release (latitude and longitude or LORAN[†] readings). You might want to have the bottles released at different distances from shore—for example: 3, 5, 10, and 15 nautical miles. **If you have bottles released from different points, indicate on each postcard the distance from shore that the bottle was dropped.**

Recovering drift bottles. Many people beach-comb along the California coast and are likely to find a drift bottle. To maintain public interest (and perform an educational service), send an explanatory letter to each person who returns a postcard from a drift bottle. A sample letter is included in this leaflet. Remember: the success of your drift bottle project depends on keeping the public informed of what you are trying to do.

[†] LORAN is the most common navigational system used on small ocean-going vessels sailing off the California coast.

Study your results. Any postcards returned will be received by the Extension Marine Resources Specialist in Davis. He will record the information from the cards and then return the cards to the 4-H club members who released the bottles. This is a statewide 4-H research effort; the findings will be summarized in a scientific publication and distributed to you.

Use your results to do the following activities.

On a nautical chart, plot the release point and time as well as the return point and time of each bottle. (Nautical charts are available from marine supply stores or libraries.) Figure out how fast each bottle traveled (miles per day). Study the diagram of major currents off the California coast and discuss why your bottles ended up where they did.

Does the distance from shore at which the bottles were released have any effect on where they were found? Why?

Inform interested citizens of the results of your project.

SELECTED REFERENCES

- Bascom, W. 1964. *Waves and Beaches*. Garden City, New York: Doubleday.
- Clemons, E. 1967. *Waves, Tides and Currents*. New York: Alfred A. Knopf.
- Gross, M. G. 1967. *Oceanography*. Columbus, Ohio: C. E. Merrill Books.
- Sverdrup, H. U.; Johnson, M. W.; and Fleming, R. H. 1942. *The Oceans*. New York: Prentice-Hall, Inc.
- Yasso, W. E. 1965. *Oceanography: A Study of Inner Space*. New York: Holt, Rinehart and World.

SAMPLE LETTER

Dear Drift Bottle Finder:

Thank you for returning the drift bottle made by 4-H member _____(name)_____. The bottle was released on _____(date)_____ at the following location: _____.

This is part of a statewide 4-H study of ocean currents being coordinated by the University of California Sea Grant Marine Advisory Program, a part of Cooperative Extension. The findings of this project will be used to trace currents along the California coast. All information contributed about the movement of drift bottles will be used in a scientific publication that explains the findings of all participating 4-H clubs in the state.

The attached map shows the usual patterns of ocean currents in the eastern Pacific Ocean. The California current, the major ocean circulation feature off the coast of California, flows southward along the Pacific Coast past Mexico to become the Northern Equatorial Current. The warm Davidson current, shown flowing northward along the coast, occurs only in late fall and winter when southerly winds are common.

The accompanying map also shows a band of cold water, illustrated by the dark area, along the Pacific Coast. This cold water forms in the summertime when northwesterly winds push the surface water seaward away from the coast. This allows the cold water from the ocean depths to upwell to take its place. Upwelling enriches our coastal waters and also causes fog.

This is the (1st, 2nd, etc.) release of drift bottles by the _____(name)_____ 4-H club. Bottles from these releases have been returned from as far away as _____(location)_____. Bottles returned from this release are charted on the attached sheet.

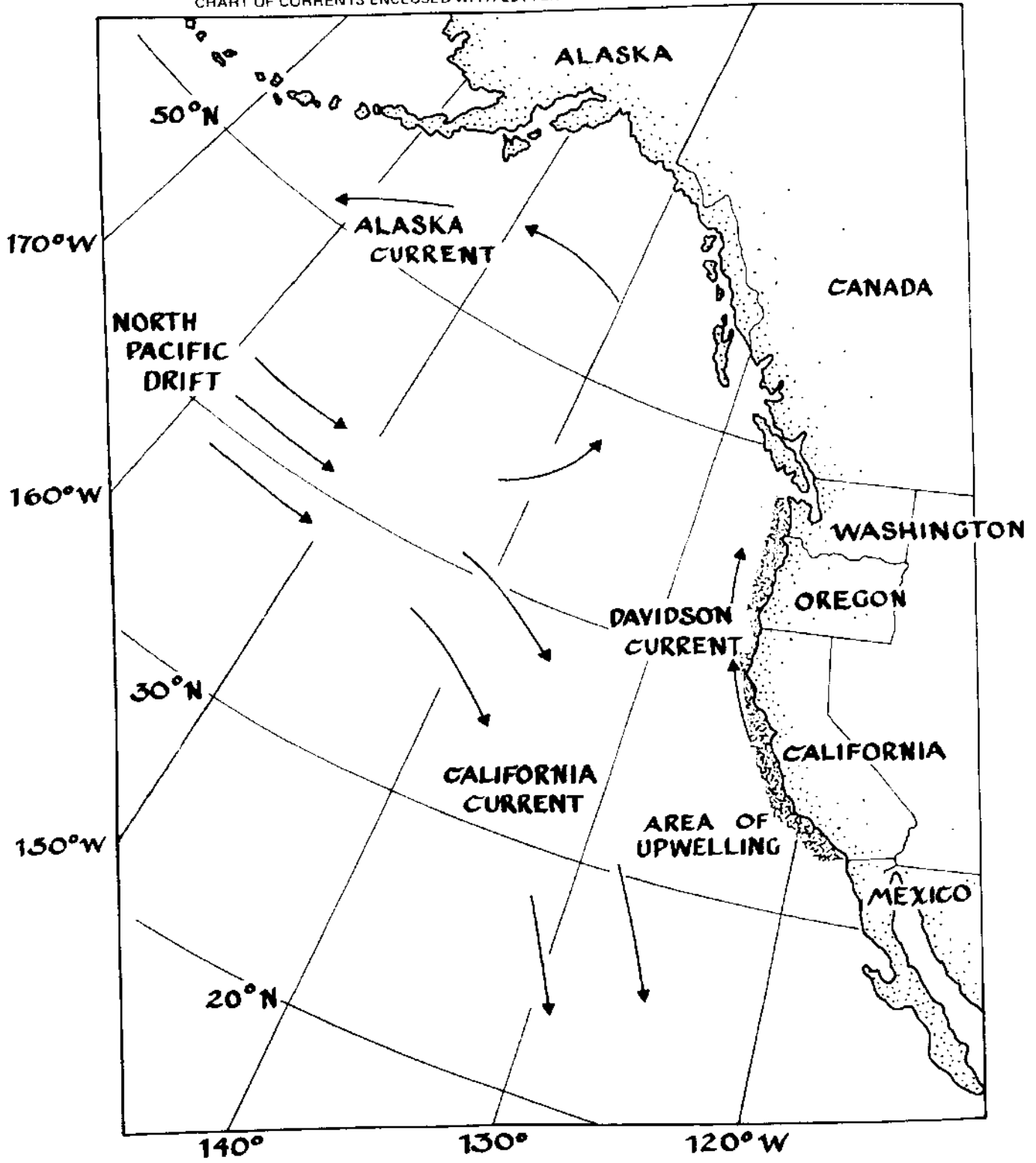
Thank you very much for your cooperation in this project.

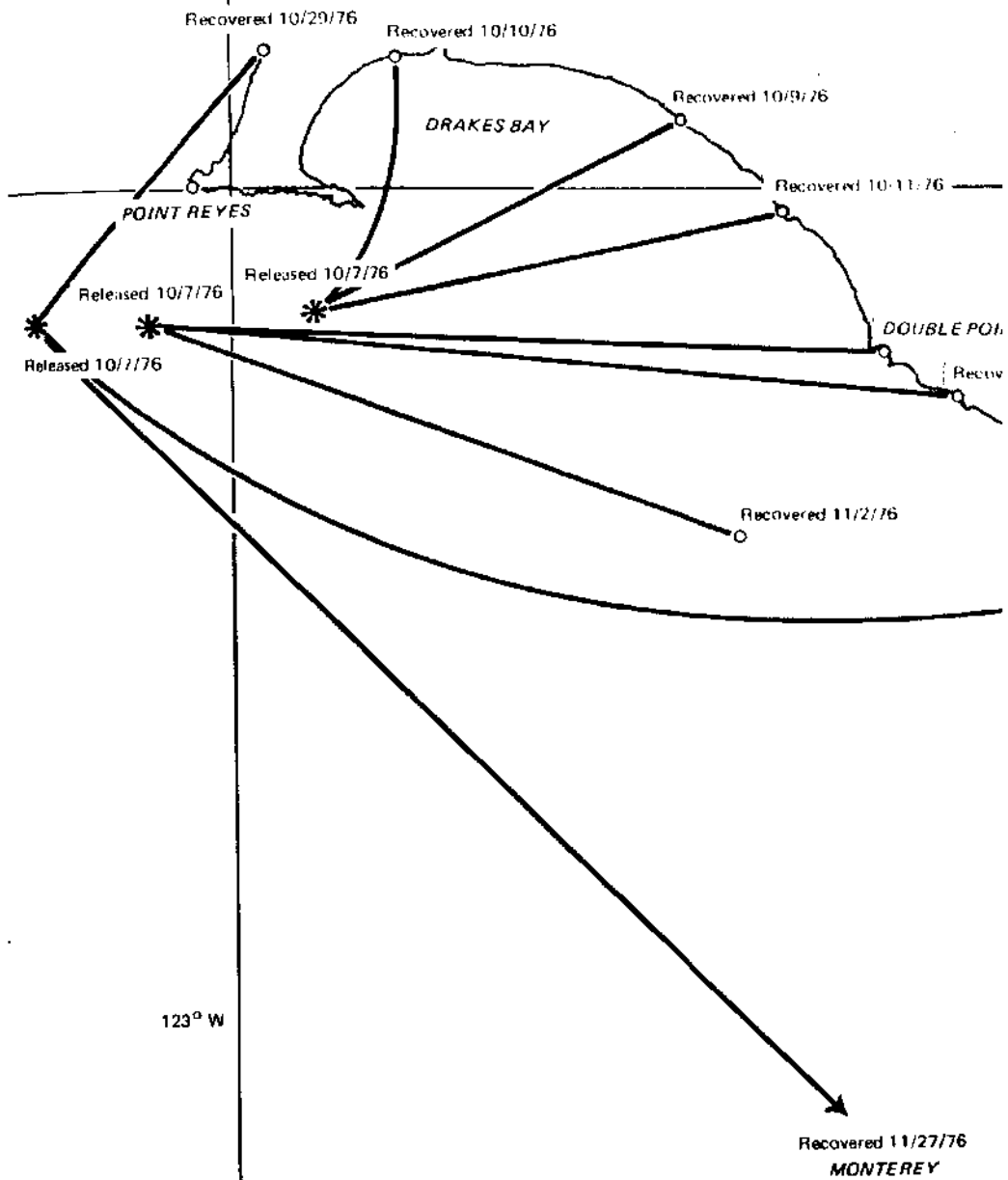
Sincerely,

4-H club _____

address _____

CHART OF CURRENTS ENCLOSED WITH LETTER TO PERSONS RETURNING DRIFT BOTTLES





SAMPLE CHART LISTING RECOVERIES
(to be sent to persons returning drift bottles)