



## The Nike Shoe, Rubber Duck, & Hockey Glove Investigation

**What do 80,000 Nike sneakers, 29,000 rubber duckies, & 5 million hockey gloves have in common?**

Large ships loaded with containers are constantly traveling from the manufacturing centers in Asia to the markets of North America. On their way toward North America they travel what people in shipping call the great circle route: the vessels take a northern route to America and return to Asia using a more southern route. We can learn about currents from three unfortunate incidents involving containers which fell into the North Pacific Ocean.

**Nike Shoes: May 27, 1990.** The freighter Hansa Carrier, enroute from Korea to the U.S., encountered a severe North Pacific storm. During the storm, a large wave washed five containers overboard, containing approximately 80,000 Nike shoes ranging from children's shoes to large hiking boots. It has been estimated that four of the five containers opened into the stormy waters, releasing over 60,000 shoes into the North Pacific Ocean. The shoes washed ashore one at a time but were wearable after a scrub-down to remove barnacles, algae, and tar. Beachcombers held swap meets to find matched pairs.



**Rubber Ducks: January 10, 1992.** A ship from Hong Kong lost 12 containers. One included 7,220 Rubber Duckies along with equal numbers of beavers, frogs, and turtles for a total of 28,880 floating bath tub toys.

**Hockey Gloves: December 9, 1994.** The Hyundai Seattle had a major engine room fire, and was adrift for fifteen days near the international date line. It was traveling from Korea to Seattle, Washington with 726 containers. Forty nine of these were lost as the ship uncontrollably drifted before the fire was controlled and rescue tugs could arrive. Two of these containers contained hockey equipment which spilled into the ocean.



**Background:** Warm water moves along the equator from Panama to the Philippines (**North Equatorial Current**) and then going north past Japan (**Kuroshio Current**). North of Japan the water will be influenced by the westerly winds and curves to the east toward North America. As we travel toward America in the North Pacific on the **North Pacific Current** (south of the Bering Sea & Alaska), the water is cooling and contracting. The north Pacific current hits the coast of America and splits. A small part curves to the north, toward Alaska (**Alaska Current**). Most of the cold water, curves to the right and heads south toward California (**California Current**). Off the coast of Southern California the water curves again to the right, and continues just north of the equator on its trip back toward the Philippines to complete the circle.

**MATERIALS:** map of north Pacific, Coordinates, pencil/pen, map of surface currents

**PROCEDURE:** By plotting the locations of the container spills of the NIKE shoes, Rubber duckies, & Hockey Gloves, we will create a picture of currents (Ocean & Wind) in the North Pacific. Use a different color for each item shipped.

1. Plot & Connect the Nike Shoe coordinates with a **RED** line.

<b>Nike Shoes</b>			
<b>Date</b>	<b>Lat in °N</b>	<b>Long in °W</b>	<b>Comments</b>
5/27/90	48	161	Containers lost overboard
12/90	48	125	Cape Flattery, Wa (~200 shoes)
2/91	49	126	Vancouver Island, BC (~100 shoes)
3/91	53	132	Queen Charlotte Island, BC (~250 shoes)
3/91	47	124	Washington Coast (~200 shoes)
4/91	45	124	Columbia River (~350 shoes)
5/91	43	124	Oregon-California Coast (~200 shoes)
5/91	51	128	N. Vancouver Island (~200 shoes)
2/93	21	155	N. coast of Island of Hawaii (several)

2. Plot & Connect the Rubber Duckies coordinates with a **BLUE** line. \*Note the E & W long coordinates.

<b>Rubber Ducks</b>			
<b>Date</b>	<b>Lat in °N</b>	<b>Long in °E &amp; °W</b>	<b>Comments</b>
1/10/92	45	<i>178 E</i>	Containers lost overboard
11/92	57	136 W	Sitka, AK
2/93	58	137 W	Chickagof Island, AK
4/93	60	140 W	Yakutat, AK
5/93	62	145W	Cordova, AK
7/93	57	153W	Kodiak Island
5/95	59	164 W	Kipnuk, AK
7/95	57	170 W	Saint Paul Island

3. Plot & Connect the Hockey Glove Computer Predicated coordinates with a **GREEN** line. Then predict the dates & locations the hockey gloves will was up on the west coast of North America. All the data below is computer model generated (except the August 10<sup>th</sup> - fisherman). The fisherman removed 5 cm long barnacles that had grown on the floating gloves.

<b>Hockey Gloves</b>			
<b>Date</b>	<b>Lat in °N</b>	<b>Long in °W</b>	<b>Comments</b>
12/9/94	45	172	Ship Powerless & adrift
1/1/95	45	164	
2/1	44	161	
3/1	46	158	
4/1	44	157	
5/1	44	157	
6/1	43	156	
7/1	43	151	
8/1	44	145	
8/10	43	144	Seven gloves found by tuna fisherman.
9/1	42	140	
10/1	44	137	
11/1	44	132	
12/1	44	127	
1/1/96	46	126	

### **Analysis Questions- Nike Shoes**

1. Which current was the Hansa Carrier taking advantage of on its trip from Korea to Seattle, Washington?
2. What current caused some Nike Shoes to wash up along the coast of Washington, south to Oregon & California coastline?
3. What explanation can you give for the shoes traveling to these northern locations?
  - a. February 1991- middle of Vancouver Island
  - b. May 1991- north tip of Vancouver Island
  - c. March 1991- east side of Queen Charlotte Island (Canada)
4. In early 1993, NIKE shoes washed ashore at the northern end of the island of Hawaii. What currents were involved in the shoes trip from the point where they were lost in the ocean until they arrived in Hawaii?
5. Assume that Hawaii is located midway between the North American Continent & Japan. If the shoes continue to travel with the currents at the same rate, when are they expected to wash up on the beach of Japan? (Month & Year)

### **Analysis Questions- Rubber Duckies**

6. Explain why the rubber duckies travel about twice as fast as the shoes.
7. Explain why the rubber duckies showed up in the Gulf of Alaska instead of where the NIKE shoes were found.
8. It is expected that the rubber duckies will drift farther north during the spring, thaw, and become part of the arctic polar ice park.
  - a. In the year 2000, we can expect to see rubber duckies in the northern part of what ocean?
  - b. They will be traveling to the north of what country?

### **Analysis Questions- Hockey Gloves**

9. Are the hockey gloves following the path of the NIKE shoes or Rubber Duckies? Why?
10. Where and when could you predict when hockey gloves will wash ashore in North America?
11. Would the barnacles cause the gloves to be more current influenced or more wind influenced? Why?
12. The tugs sent to rescue the drifting ship came from Seattle, Washington. How far is it from Seattle to the spill site if 1 degree of Longitude equals 60 nautical miles? (Show math)

