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Darwin's Finches Skills Practice

Read, annotate, and complete each section.

All species of Darwin's finches are closely related, having derived recently (in geological terms) from a common ancestor. They live in the largely undisturbed environment in which they evolved, and none have become extinct as a result of human activity. One of the most conspicuous characteristics of the finches is their beak size and shape. Figure 1 illustrates the 14 finches observed by Darwin and other scientists studying the Galapagos Islands.

English name	Scientific name	Occurrence (islands) (breeding/extinct)	Body size (g)	Diet
Small ground finch	*Geospiza fuliginosa*	14/0	14	Mainly granivorous
Medium ground finch	*Geospiza fortis*	13/0	20	Mainly granivorous
Large ground finch	*Geospiza magnirostris*	12/2	35	Mainly granivorous
Cactus ground finch	*Geospiza scandens*	12/0	21	Mainly granivorous, flowers/nectar
Large cactus finch	*Geospiza conirostris*	2/0	28	Mainly granivorous
Sharp-beaked ground finch	*Geospiza difficilis*	6/4	20	Granivorous and insectivorous
Small tree finch	*Camarhynchus parvulus*	10/0	13	Mainly insectivorous
Medium tree finch	*Camarhynchus pauper*	1/0	16	Mainly insectivorous
Large tree finch	*Camarhynchus psittacula*	9/1	18	Mainly insectivorous
Vegetarian finch	*Platyspiza crassirostris*	8/2	34	Almost entirely herbivorous
Woodpecker finch	*Cactospiza pallida*	6/0	20	Mainly insectivorous
Mangrove finch	*Cactospiza heliobates*	2/0	18	Mainly insectivorous
Warbler finch	*Certhidea olivacea*	17/0	8	Insectivorous: small arthropods and nectar
Cocos finch	*Pinaroloxias inornata*	1/0	16	Omnivorous

Figure 1

Beaks of Darwin's finches are highly specialized according to dietary needs. A scientist was struck by the different utilities of the beaks and compared them to different kinds of pliers. He classified the feeding function of the different beak types into three main categories: (1) long and pointed beaks are best for probing, e.g. in flowers, foliage or wood; (2) convex curved beaks can apply force especially at the tip of the mandibles and are useful for tip-biting; (3) deep- based beaks are useful for cracking open hard food (seeds) at their base.

1. (IOD 302) As it is used in the passage, the term *conspicuous* means:
   a. ideal
   b. hidden
   c. noticeable
   d. common

2. (IOD 301) Of the insectivorous finches, which one has the largest body mass?
   a. Woodpecker finch
   b. Mangrove finch
   c. Small ground finch
   d. Large ground finch

3. (EMI 401) Based on Figure 1 and the reading, which of the following finches likely uses a long and pointed beak for probing food?
   a. Woodpecker finch
   b. Mangrove finch
   c. Sharp-beaked ground finch
   d. Cactus ground finch

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Figure 2 illustrates the average beak depth of finches when related to the maximum hardness of seeds they can crack.

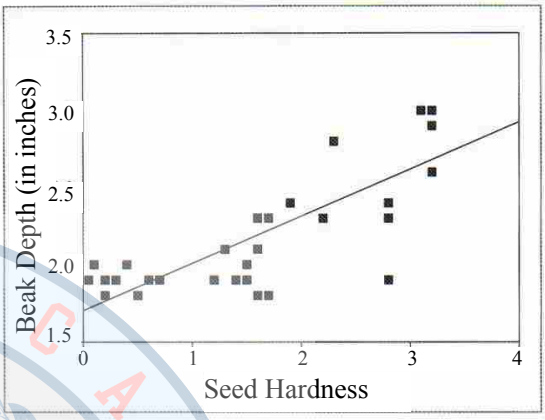

Figure 2

4. (IOD 301) When compared to a beak depth of 2.0, birds with a beak depth of 3.0 can-
   a. crack more seeds
   b. crack harder seeds
   c. crack less seeds
   d. crack softer seeds

5. (IOD 304) Which of the following best describes the relationship between beak depth and seed hardness?
   a. As the average beak depth increases, the hardness of the seeds they can crack decreases.
   b. As the average beak depth decreases, the hardness of the seeds they can crack increases.
   c. As the average beak depth increases, the hardness of the seeds they can crack increases.
   d. There is no relationship between beak depth and seed hardness.

Figure 3(a) illustrates the total number of medium ground finches with beaks in each size class, before a drought. Figure 3(b) shows the number of birds that survived the drought and subsequently reproduced. Figure 3(c) shows the number of birds on the island five years after the drought.

6. (EMI 401) Which of the following conclusions about finches immediately following a drought is supported by the data in Figure 3?
   a. Finches with beak depths exceeding 10.3 were the most well adapted to drought conditions.
   b. Finches with beaks depth below 7.8 were the most well adapted to drought conditions.
   c. Finches with beak depths between 8.3 and 9.3 were the most well adapted to drought conditions.
   d. Finches had a equal chance of survival during drought conditions.

7. (IOD 501) When considering finches with a beak depth of 9.8, what happened to their population from the time of the drought until 5 years after the drought?
   a. increased
   b. increased, then decreased
   c. decreased, then increased
   d. decreased

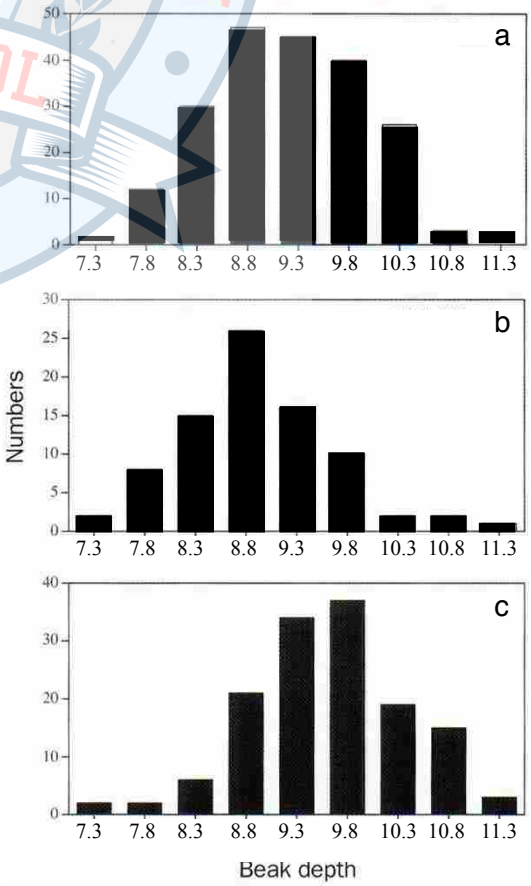

Figure 3

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Finch Data

Figure 1

Finch beak depth (see Figure 1) is an *inheritable* trait (it can be passed from parents to offspring). Researchers studied the beak depth of 2 species of finches, *Geospiza fortis* and *Geospiza fuliginosa*. Both species live on Island A. *G. fortis* alone lives on Island B, and *G. fuliginosa* alone lives on Island C. For both species, the primary food is seeds. Birds with shallower beaks can efficiently crush and eat only small seeds. Birds with deeper beaks can crush and eat both large and small seeds, but they prefer small seeds.

Study 1

Researchers captured 100 *G. fortis* finches and 100 *G. fuliginosa* finches on Island A. They tagged each bird, measured its beak depth, and released it. Then they calculated the percent of birds having each of the beak depths that had been measured. The researchers followed the same procedures with 100 *G. fortis* finches from Island B and 100 *G. fuliginosa* finches from Island C. The results from this study are shown in Figure 2.

Study 2

After completing Study 1, the researchers returned to Island B each of the next 10 years, from 1976 to 1985. During each visit, the researchers captured at least 50 *G. fortis* finches and measured their beak depths. Then they calculated the average *G. fortis* beak depth for each of the next 10 years. The researchers noted that, during the 10-year period, 3 years were exceptionally dry, and 1 year was very wet (see Figure 3). Small seeds are abundant during wet years. During dry years, all seeds are less abundant, and the average size of the available seeds is larger.

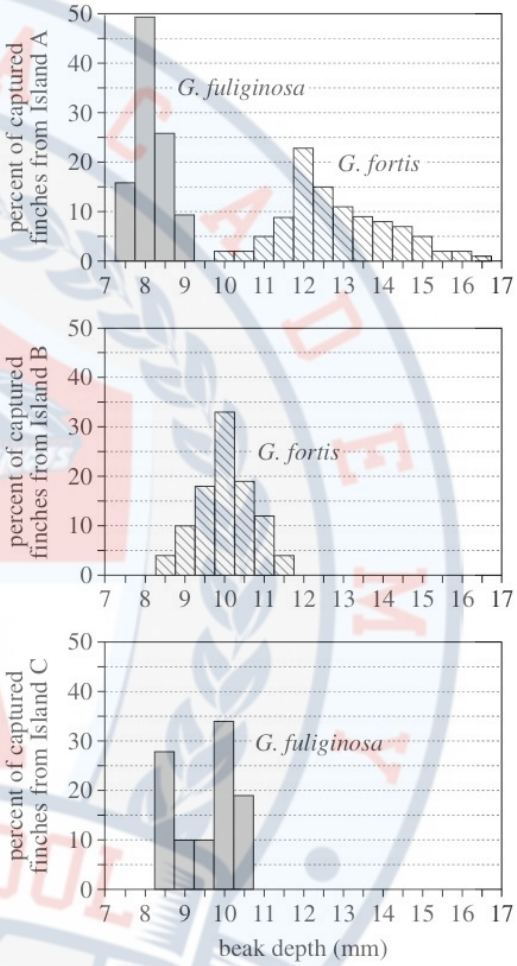

Figure 2

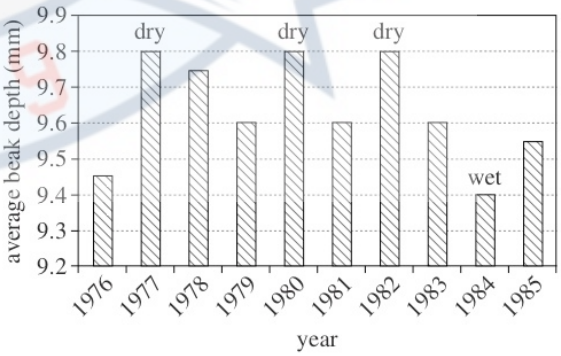

Figure 3

1. (IOD 301) Based on the results of Study 1, the highest percent of finches on Island B and Island C had a beak depth of:

	Island B	Island C
a.	8 mm	8 mm
b.	9 mm	12 mm
c.	10 mm	8 mm
d.	10 mm	10 mm

2. (IOD 303) How many finches were captured and measured from Island A in Study 1?
   a. 50 c. 150
   b. 100 d. 200

3. (IOD 303) What years would you expect to find fewer but larger seeds?
   a. 1976 and 1977 c. 1980 and 1982
   b. 1977 and 1979 d. 1983 and 1984

4. (IOD 304) According to Figure 2, as the beak depth of *G. fortis* on Island B increases, the proportion of finches:
   a. increases only c. increases then decreases
   b. decreases only d. decreases then increases

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5. (IOD 402) Which of the following is the order of beak depths of *G. fuliginosa* finches on Island A, from greatest to least percent?
   a. 9 mm, 7.5 mm, 8.5 mm, 8 mm
   b. 8.5 mm, 8 mm, 9 mm, 7.5 mm
   c. 8 mm, 8.5 mm, 9 mm, 7.5 mm
   d. 8 mm, 8.5 mm, 7.5 mm, 9 mm

6. (SIN 404) Study 1 differed from Study 2 in which of the following ways?
   a. *G. fortis* finches were captured during Study 1 but not during Study 2.
   b. *G. fuliginosa* finches were captured during Study 1 but not during Study 2.
   c. The beak depth of captured birds was measured during Study 1 but not during Study 2.
   d. The beak depth of captured birds was measured during Study 2 but not during Study 1.

7. (SIN 401) It is most likely that the researchers tagged the birds that they captured during Study 1 to:
   a. determine how beak depth was affected by rainfall on Island A.
   b. determine the average age of each finch population.
   c. ensure that the beak depth of each finch was measured multiple times during Study 1.
   d. ensure that the beak depth of each finch was measured only once during Study 1.

8. (EMI 401) Which of the following conclusions is best supported by the data shown in Figure 3?
   a. Finches with deeper beaks had a higher fitness because they could eat the larger seeds during dry years.
   b. Finches with thinner beaks had a higher fitness because they could eat the larger seeds during dry years.
   c. Finches with deeper beaks had a higher fitness because they could eat the smaller seeds during dry years.
   d. Finches with thinner beaks had a higher fitness because they could eat the smaller seeds during dry years.

9. (IOD 402) Based on Figure 2, which of the following is true?
   a. *G. fuliginosa* finches had greater beak depths on Island A compared to *G. fuliginosa* finches on Island C.
   b. *G. fuliginosa* finches had greater beak depths on Island C compared to *G. fuliginosa* finches on Island A.
   c. *G. fortis* finches had greater beak depths on Island B compared to *G. fortis* finches on Island A.
   d. *G. fortis* finches had greater beak depths on Island B compared to *G. fortis* finches on Island C.

10. (EMI 502) A researcher hypothesized that there would be more variation in the beak depths measured for the *G. fortis* finches when they were forced to compete with another finch species for seeds. Do the results of Study 1 support this hypothesis?
    a. Yes; the range of beak depths measured for *G. fortis* finches was greater on Island A than on Island B.
    b. Yes; the range of beak depths measured for *G. fortis* finches was greater on Island B than on Island A.
    c. No; the range of beak depths measured for *G. fortis* finches was greater on Island A than on Island B.
    d. No; the range of beak depths measured for *G. fortis* finches was greater on Island B than on Island A.