

Teacher Guide

Stickleback Crosses

Abstract

Students analyze a scatterplot showing data from different stickleback crosses. The plot shows a positive correlation between lateral plate number in parents and offspring. Data cards help students understand how each data point was generated.

Learning Objectives

- Heritable traits pass by way of genes from parents to offspring.
- Heritability can be determined by comparing traits in parents and offspring. If a trait is heritable, offspring tend to resemble parents.

Estimated time

20 minutes

Materials

- Stickleback data cards: One card per student or pair of students
- Student worksheet: One copy per student
- Natural Selection Checklist: Each student should already have a copy. (Students will record information there at the end of this activity.)

Instructions

1. There are 16 different data cards. Print enough copies to distribute one card per student or pair of students.
2. Give each student a worksheet.
3. Instruct students to use their data cards to fill in the information on their worksheets and answer the questions. If your students have trouble answering questions 7 and 8, you may want to discuss these questions as a group.
4. The answers to questions 9 and 10 will help students fill in the Heritability section (item 2) on their Natural Selection Checklists.



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Data key

Answers on pages 1 and 2 of the student worksheets will vary depending on the data card the students have. The table below summarizes the correct answers for all of the data cards.

Cross #	Parents' number of plates		Mean number of plates	
	Father	Mother	Parents (x)	Offspring (y)
1	6	5	5.5	5.1
2	32	31	31.5	30.9
3	22	19	20.5	19.9
4	6	8	7.0	7.3
5	7	6	6.5	6.2
6	28	27	27.5	27.2
7	29	22	25.5	25.7
8	16	20	18.0	18.4
9	7	9	8.0	8.3
10	33	32	32.5	32.0
11	14	18	16.0	16.7
12	12	11	11.5	11.4
13	5	8	6.5	5.6
14	25	22	23.5	23.1
15	34	35	34.5	33.7
16	12	14	13.0	12.5

Data in this activity were inspired by Hagen, D. W. (1973). Inheritance of numbers of lateral plates and gill rakers in *Gasterosteus aculeatus*. *Heredity*, 30(3), 303-312. The data have been simplified so that the positive relationship is more apparent to students.

Because of the genetic mechanism of lateral plate inheritance, the data for crosses between fish with low and high numbers of plates are more complicated to explain. To keep the activity simpler, we decided to include data only for crosses involving parents with similar numbers of plates.

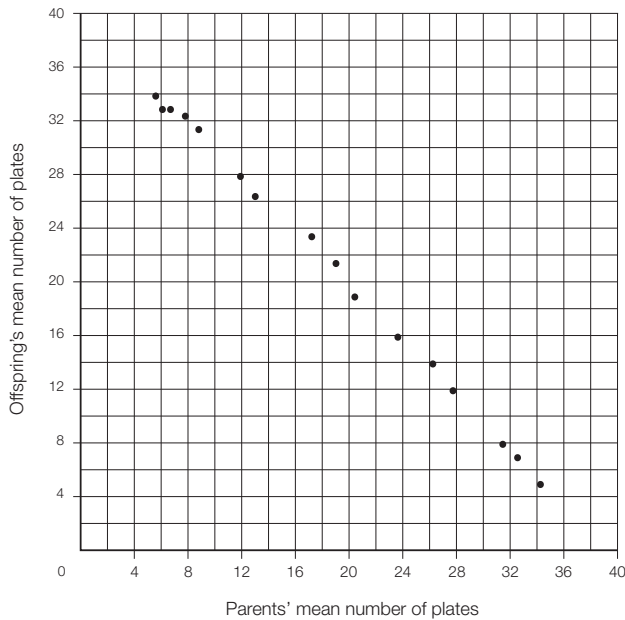
Answer key for student worksheet, page 3

7. Based on the graph, which claim do you agree with?

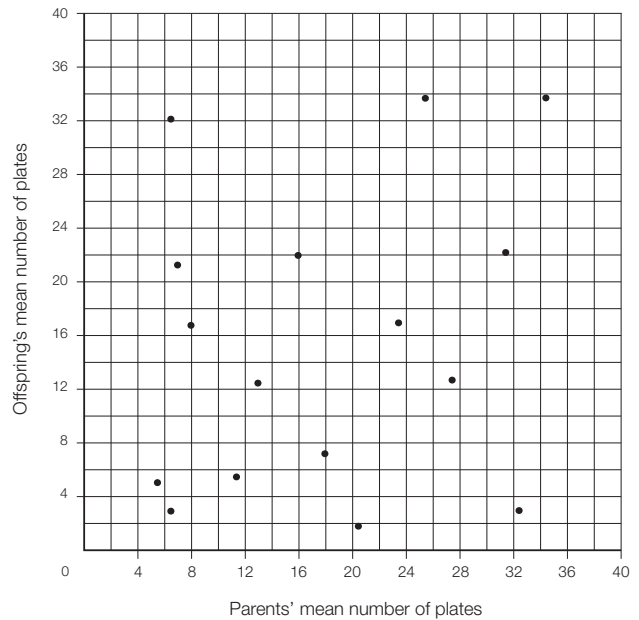
- a. There is a positive relationship in the number of lateral plates between parents and offspring: offspring tend to resemble their parents for this trait.
- b. There is a negative relationship in the number of lateral plates between parents and offspring: offspring do not resemble their parents for this trait.
- c. There is no relationship in the number of lateral plates between parents and offspring.

8. For the two options you did not choose (positive, negative, or no relationship), draw and label graphs that show what the data would look like:

Negative relationship



No relationship



9. If a trait is heritable, there will be a positive relationship between the phenotype in the parents and the offspring. Is lateral plate number heritable? **Yes**

10. What is your evidence?

There is a positive relationship between lateral plate number in parents and offspring: parents with more plates have offspring with more plates, and parents with fewer plates have offspring with fewer plates.