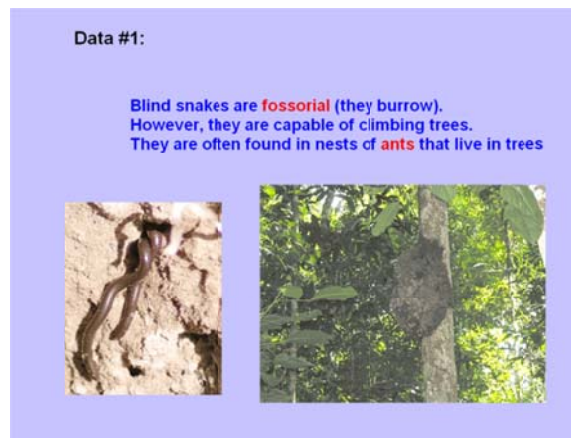


Chapter 5

The Owls and the Snakes (2) Transcript and Data¹

1. Izzy: Recording, I don't know who we're recording. Which means you want to be a star, right Josh? So you're gonna put your head up. Ok, there's your hypotheses. Yesterday you looked at some additional data, and I asked you to think about, does that help you answer the question what's going on between the snakes and the owls, or is it useless, but what we're trying to figure out is which one of our hypotheses is correct. So somebody got this piece of information; that blind snakes are normally fossorial. Don't you love that word?



2. Max: I have no idea what that means.
3. Josh: They burrow
4. Izzy: So, is there any way you could figure out what that means?
5. Max: Burrow, 'cause that's pretty much what it says right there.
6. Izzy: Yeah, so if you keep reading you can figure out what that means. Right, so they're burrowing. Well what's that mean? What's it mean to burrow?
7. Adrian: I think it means they're sleeping through the winter.
8. Izzy: That's hibernating. That's hibernating. That's close though.
9. Alex: They dig in the ground.

1. All quotes of scientists and data come from the original article (Gehlbach and Baldrige 1987).

10. Izzy: They can dig into the ground. Okay, they-they're a burrowing snake. I didn't even know snakes could do that. But blind snakes are burrowing, they're capable of climbing trees. So they can do all kinds of tricks. And they will climb a tree to reach the nest of ants. Interesting information, yes?
11. Josh: Isn't the place where, like, ants live called something else? Like, not a nest, but something else.
12. Izzy: Ummm, do ants live in something other than nests?
13. Josh: It might count as a nest but-what's the definition of a nest?
14. Izzy: Good question. What would you think of as a definition of a nest?
15. Josh: I just thought of it as a place where all the eggs are laid. I mean, ants live in a-more of a colony that needs a burrow.
16. Izzy: Ok, so uh, more like an apartment house, is that what you're thinking, than just a nest?
17. Josh: They have a nest area, but they've also got this chamber where the queen is and all that stuff.
18. Izzy: Ok. Okay, and maybe there's different kinds of nests. I know I have ants in my-in a tree at my house. I see 'em climbing out of the tree all the time and they go right out of the tree into my basement. So, y'know, I don't know if there are other words for where ants live. But, that would be an interesting, interesting thing to, to research. Does this information help us with any of these ideas about what's going on? Does that help us evaluate the relationship? We know that they can live underground. We know that they can climb trees and that they they like to get to ants' nests for some reason. Is that just interesting information or can we use it to evaluate one of our hypotheses? Adrian.
19. Adrian: Use it to evaluate.
20. Izzy: Ok, so what does it add that would help us answer the question, what's going on?
21. Adrian: Uh, it could enter the nest on it's own. The snakes are capable of climb climbing up trees and they can get to the nests on their own.
22. Izzy: Ok.
23. Adrian: And, if owls and snakes ever turn against each other, they could use that as an advantage for like, uh, battle and stuff.

24. Izzy: Ok. So, it would be possible for snakes-if we find a snake in a nest maybe it go there on its own. It wasn't brought there by an owl. Ok, so, maybe that's a whole new light on the relationship.
25. Josh: Don't snakes eat ants, and ants might like to, like when a baby gets born, when it hatches, ants will probably swarm around it and eat it so-same thing; eat ants and other pests would-the owl.
26. Izzy: Oh. Ok, so if ants are living in the owl's nest, maybe the snake is eating those ants and that helps the eggs. Interesting. So which of these ideas would that support Josh?
27. Josh: They're protecting the nest from ants.
28. Izzy: Ok, the snakes protect-protect the eggs from enemies, in this case which might be ants. Ok, so lets-lets put a check by that one. Lets see if any of this other data helps. Um, 89 percent of blind snakes found in owls' nests are still alive at the time the owls fly away. So once the eggs hatch the babies, which are called fledglings when they fly away, the owls are still alive. But 11 percent were found dead. But only one of those was found partially eaten. So 89 percent of all the snakes were still there and living after the eggs hatched, and the birds grew up till they were big enough to leave the nest. Max, does that give us any information that would help us support one of these ideas or get rid of one of those ideas?

Data #2:

89% of the blindsnakes found in the nests of owls were still alive at the time the young owls flew away from the nest.

11% were found dead.

1 snake was found half eaten.



29. Max: We can get rid of the predator-prey relationship.
30. Izzy: Because?

31. Max: Because there's only 11% of them were found half eaten. But only one was eaten.
32. Izzy: Ok, and it-ok only one was eaten out of all the snakes that they found and most of them were alive.
33. Max: Uh huh.
34. Izzy: All right, so that certainly doesn't sound like they're being saved for food. Because, what would you expect if they were-how many (Max: None) would you expect to find alive after the owls left the nest?
35. Max: None.
36. Izzy: None. All right. Or very few, anyway. So we can-we can eliminate that one. Cool. So we're down to 3. Let's see what other evidence these scientists found. Young nesting owls will eat dead blind snakes as well as certain other dead snakes that are put into their nests-by the researchers-so some might-just hang on a second Cameron. I see your hand, I'm gonna call on you first. It sounds like the researchers did an experiment where they put snakes that were dead into the owls' nests to see what would happen. It says they will also eat live blind snakes, as well as other kinds of live snakes, put into their nest, if they can catch them. Live snakes that can quickly burrow into the debris or junk in the bottom of the nest are not eaten. Cameron, what did you want to say about that?

Data #3:

Young nestling owls will eat dead blind snakes as well as certain other dead snakes put into their nest.

They will also eat live blind snakes as well as other live snakes put into their nests if they can catch them.

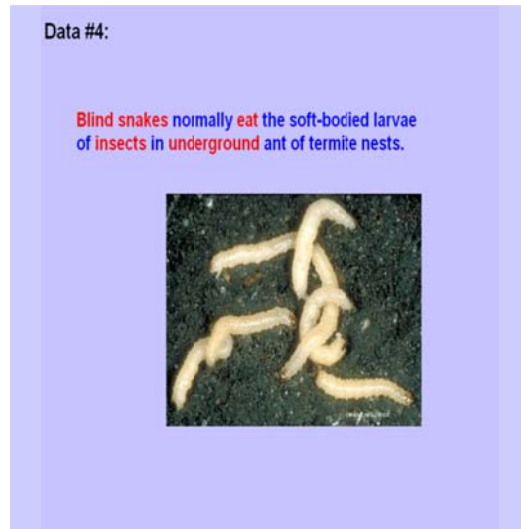
Live blind snakes that can burrow into the nest debris are not eaten.



37. Cameron: Well, I was gonna say the-because of the dead-uh the dead blind snakes-thinking if they were picky about their food-but it doesn't seem that way. Since they'll eat live ones.

38. Izzy: Alright, they'll eat them dead or alive. How do we know the blind snakes are coming to the nest? Are they dead or alive when they get to the nest?
39. Cameron: I know some are dead but-
40. Izzy: No, when they come to the nest what do we know for sure?
41. Cameron: They're alive.
42. Izzy: Ok, they're alive. So what information does this add?
43. Cameron: That the little owlettes like to eat the snakes and the—so my hypothesis was true.
44. Izzy: Which hypothesis?
45. Cameron: The snakes-the little owelettes hatch they eat the snakes.
46. Izzy: Ok, so that supports the predator-prey idea, but we have that other piece of evidence that they're still alive. So what must those snakes be doing? Those little-those live blind snakes that-that are put into the nest.
47. Alex: Practicing for hunting.
48. Izzy: Well, but, if they're-if they're practicing for hunting are they very successful?
49. Kevin: No, not really.
50. Izzy: Not really. So, what are those snakes doing to stay alive, according to this?
51. Josh: Burrowing.
52. Izzy: Burrowing. And are blind snakes capable of burrowing?
53. Max: Uh-huh.
54. Cameron: Yes.
55. Izzy: Yeah. Yeah, we found that out in the first piece of information so it turns out to be useful after all, so if the mother is bringing the snakes live to the nest, and they're not being eaten, they must be burrowing into the bottom of the nest. Otherwise, according to this, they'd be food. But that's not happening so we know that they're hiding in the nest ... Alright. Blind snakes,

in real life, normally eat soft-bodied larvae of insects that live in underground ant or termite nests. So what are larvae? Max?





56. Max: The second stage of an insect growing-turning into a cocoon.
57. Izzy: Say that again.
58. Max: The second stage-the second stage of any insect.
59. Izzy: The second stage. So what would the first stage be?
60. Max: The egg.
61. Izzy: Oh, egg.
62. Max: It goes egg, then larva-
63. Izzy: And it might hatch into a larva. Might go into a cocoon.
64. Max: And they hatch.
65. Izzy: And then the co-um-well it hatched out of the egg, right?
66. Max: Yeah. And then it comes out of its cocoon.
67. Izzy: So they come out of the cocoon. Do you want to add something to that Josh?
68. Josh: Wait...does a caterpillar count as a larvae?
69. Izzy: Does a caterpillar count as a larva?

70. Max: It's a living thing actually
71. Josh: Well, larvae are living.
72. Izzy: So, well, it-according to Max's description would it be a larvae?
73. Josh: Yeah. Like, it's the first stage after the egg.
74. Izzy: So it goes egg, caterpillar, cocoon, and then it comes out of the cocoon in a different form.
75. Max: It's an adult, and that's-
76. Izzy: So if we use Max's definition it would be a larva.
77. Kevin: I think it's a little bit of both of commensalism and predator and prey.
78. Izzy: So you're jumping right-this-is this giving you information to make that decision?
79. Kevin: Yeah.
80. Izzy: Why do you say commensalism, predator and prey?
81. Kevin: Um, because well commensalism because, uh, the owl knows that the, um, that it would clean up the, the nest. Like from getting damaged or something, and like, and if it was to get damaged then the, uh, there won't be any eggs to like-to be, like, hatching from the nest.
82. Izzy: So what would be damaging the eggs?
83. Kevin: The insects.
84. Izzy: Ok, so if there are insects in the nest it would damage the eggs-
85. Kevin: Or-or at least do some, like, like termites they eat-they eat wood.
86. Izzy: Mmmhmmm.
87. Kevin: So-it's like
88. Izzy: That's a good point.
89. Kevin: They could break off the branch or whatever. And then-

90. Izzy: Oh! Think about that. The nest would fall to the ground.
91. Kevin: And then it's like yeah, because it's like if the blind snake wasn't able to somehow get through underneath the mess then they'll be eaten.
92. Izzy: So there's two purposes. One house cleaner, or if it's not a very good house cleaner we'll just eat it.
93. Kevin: Yeah.
94. Izzy: So commensalism and predator-prey. Hey, ok. Ok. So maybe we shouldn't eliminate this entirely because some of the snakes do appear to be eaten.
95. Cameron: If they're worthless.
96. Izzy: If they're worthless. Fire that maid, right? Fire that maid.
97. Cameron: It's either useful, or it's dead weight and we eat it.
98. Izzy: There we go. Alright.
99. Cameron: That's good use.
100. Izzy: Now, some of you had-I like that idea-had graphs and charts. Let's see; I think this was number 5. This was kind of a-a confusing one because of all those huge long names.
101. Alex: That I don't remember.
102. Izzy: Right. So, it's always useful to read the title of a table-it says arthropods. Arthropods in the debris of eastern screech owl nests. And then it tells you what stage they're in. If it has an "e" by it, it's an egg. If it has an "l" by it, it's a larvae. If it has an "n" it's a nymph, a "p" a pupa, which is like a cocoon. And "a" adult. So, if we're talking about arthropods, what do you think we're talking about? Any idea? Does that na-does that word mean anything to anybody? No? Then let's look at the list and see if there are any words on the list that stand out as something you might recognize.

Data #5:

Table 1. Arthropods in the debris of eastern screech owl nests, May-June.
(life stages: e = egg; l = larvae; n = nymph; p = pupa; a = adult)

Taxa and life stages	Percent of 49 nests
Arachnida	
Acarina, n, a	35 
Insecta	
Diptera	
Muscidae, l, p, a	78 
Stratiomyidae, l, p, a	71
Calliphoridae, l, p, a	69
Anthomyidae, l, p, a	37
Coleoptera	
Staphylinidae, l	41 
Histeridae, a	27

* *Leotyphlops dulcis* (blind snakes) have been observed eating these insects (in this study or reported by Punzo (1974))

103. Alex: Insecta.
104. Izzy: Insecta. Which would be a what?
105. Alex: Uh ... like an insect?
106. Izzy: Yeah, so we have names of insects here. And the reason it's so confusing is 'cause these are their Latin names. Their scientific names. And Diptera refers to flies. Ooh, Coleoptera, I think those are beetles, but I'm not sure. Hymenoptera.
107. Kevin: Isn't that the name of the bees in a movie?
108. Izzy: What-in a movie?
109. Kevin: Yeah.
110. Izzy: I don't know.
111. Josh: Can we turn the lights off?
112. Izzy: Uh-yeah, let me turn off half the lights. That's a good idea.
113. Josh: Like them? [referring to a bank of lights]
114. Izzy: I know, Lepidoptera I believe are butterflies. I think. Alright. So I don't know what all these words mean either but I know we're talking about insects. And there's that word, larvae. K, so-it's ringing some bells for me-is that ringing any bells for you? What do we know that the blind snake eats?

115. Alexis: Larvae.
116. Izzy: Alexis? What do blind snakes eat?
117. Alexis: Larvae
118. Izzy: Yeah, they eat soft-bodied larvae—of some insects. So when I keep reading this chart what do I see at the bottom? The asterisk here, every time I see an asterisk that means that that is—
119. Kevin: Eaten by the blind—.
120. Izzy: Something that a blind snake normally eats. So what does this, what does this tell me?
121. Kevin: How many different animals live in the nest. That those blind snakes eats.
122. Izzy: Ok, so this confirms your idea, right?
123. Kevin: Yup.
124. Izzy: There are things in the blind snakes' nest that that—excuse me, things in the owls' nest that the blind snake would like to eat. So it's possible for him to live in the nest, yes.
125. Josh: Yeah it says like 78 percent of one of those got eaten by snakes.
126. Izzy: Yeah. This one, right? Whatever that kind of fly is, is something that that—that the blind snake really likes to eat and it's in most owls' nests. So, so it tells us how many—even how—the percent of the nest it was found in. So, if the blind snake made its way into the nest, Rachel, would it find a meal?
127. Alex: Yup.
128. Rachel: No.
129. Izzy: No? Nothing in those owls' nests that they like to eat?
130. Kevin: Yes.
131. Rachel: Well, the owl egg but it's protected.
132. Izzy: Excuse me?
133. Rachel: The owls' egg.

134. Izzy: The owls eat the insects?
135. Rachel: No, I mean the snakes would eat the owls' ... eggs.
136. Izzy: Ok, now we gotta think back to the very first day. Were the snakes big enough to eat the eggs?
137. Rachel: Oh no, they're too small.
138. Izzy: They're too small. But will they find something else to eat? In the nest?
139. Rachel: Yeah, insects and stuff.
140. Izzy: Yeah, so there's insects there that they will eat. So which hypotheses does that support, Jake?
141. Jake: Both? Oh no, the second one does.
142. Izzy: The owls are providing the snakes a safe place to live. Is it a safe place? Or a place with food?
143. Jake: Place with food.
144. Izzy: I guess that makes it safe, right? So, are the snakes getting something out of this relationship too?
145. Ayrton: Their own food?
146. Izzy: Alright. So, the owls are giving something to the snakes. And you also told me that the snakes are protecting the eggs. Now do we have any evidence, yet, that the insects actually hurt the eggs?
147. Kevin: Nope.
148. Izzy: Do we need evidence that that's really happening?
149. Adrian: Yes.
150. Izzy: Ok, we have evidence that the snakes have something to eat. We know that the snakes are still alive. So they haven't starved to death by the time the owls leave, but-. Here's our last piece of evidence and let's see if that helps us answer the question. Are the eggs being protected? Alright, we got another table here. So it's important to read the title. What's the title there, Mike? Can you see it from there? Ok. Nestling. What would a nestling be?

Data #6

Table 2. Nestling growth dynamics in eastern screech owls with one undisturbed, live blind snake at fledgling time versus same-season nests without blindsnakes but same size broods

	Snakes present	Snakes absent
Nestling growth rate	4.52 g/day	3.79 g/day
Fledgling growth rate	121.3 g	123.3 g

151. Mike: A new hatch. Like, just hatched.
152. Izzy: Yeah! Ok, that sounds reasonable. Something that's living in a nest. A nestling. Nestling growth dynamics in eastern screech owl nests with one live blind snake found in the nest when the birds leave. Ok, so we're looking at— and then they compare them to— what would this mean snake present snake absent. What do they compare these nests with snakes in them to? What kind of nests would these be? You gotta look at the chart, Alexis. What kind of a nest would this be? If it says snake absent. What would you expect to find in that nest?
153. Alexis: No snake.
154. Izzy: No snakes. Ok, so we got a comparison going on here. Nests with snakes present. Nests with snakes absent. And, what dependent variables are they measuring here? I know somebody can see this.
155. Kevin: The growth rate over a—.
156. Izzy: Look it, he can see it from the back of the room. Better check your eyes. Ok. The growth rate of the nestlings, or the baby birds. And fledgling weight. What would that mean?
157. Josh: The weight they are when they fly.
158. Izzy: The weight they are when they fly away. So what do you notice, Ayrton, what do you notice when you compare the growth rate of the nests with snakes to the growth rate of the owls without snakes. Who's growing faster?
159. Ayrton: Uh ... the snakes that are left.

160. Izzy: No— are we looking at the— at the way the snakes are growing or the way the little birds are growing?
161. Ayrton: The little birds.
162. Izzy: So the little birds in which nests are growing faster?
163. Ayrton: Um, the nests where the snakes are present.
164. Izzy: Yeah, alright. So they do grow faster when the snakes are present. Is that support for our idea—Josh?
165. Josh: It looks like the snakes do more helping. They're not as fat when they need to fly and then they grow—they grow really fast.
166. Izzy: They grow really fast and they can fly away at an earlier—at an earlier size. At a quick— so they're— they're leaving the nest more quickly. Good point. Not only are they growing faster but they're leaving the nest sooner. So they must— that's a good sign that they're healthy. So, Max, is that support for this?
167. Max: Yeah.
168. Izzy: That the snakes are protecting the eggs.
169. Max: Yeah, sort of.
170. Izzy: Yeah, sort of?
171. Max: As long as if they don't burrow fast than they're owl food.
172. Izzy: Excuse me?
173. Max: If they don't burrow—they don't burrow fast enough then they're hatchling food.
174. Izzy: One more time. Something about hatchling food. I didn't catch the first part. Slow down just a—
175. Max: If they don't burrow—they don't burrow into the ground and become hatchling food.
176. Izzy: Oh. That they don't burrow into the ground become hatchling food, they can protect the eggs. And we know that 89 percent of them, at least 89 percent of them can do that. Ok. And we know that they're living, so they must be getting food. And we think it's what? What's their food?

177. Max: Um.
178. Izzy: What are they eating in the nest?
179. Max: Ants. Bugs.
180. Izzy: Ants, yeah. Ants– I don't know if ants were on the list, but they're definitely eating insects. Ok, so what are we gonna call this? The owls give something to the snakes, and the snakes give something to the owls. What are we gonna call that relationship?
181. Mike: Mutualism.
182. Ayrton: Mutualism.
183. Izzy: Mutualism. Ok. Make sense? Anybody disagree?
184. Kevin: Yeah.
185. Izzy: What?
186. Kevin: I think that some of the– well, what I said before, predator-prey and commensalism. But it's supposed to be hard for them to like–
187. Izzy: Ok, so you don't think the snakes are really getting anything out of it?
188. Kevin: I mean yeah they are but, like, what– what do the owls get out of it?
189. Izzy: What do the owls get out of it?
190. Josh: They get to be more healthy.
191. Kevin: True.
192. Izzy: So– OK, they get– So the owls are getting healthier babies with a better growth rate. Ok, well I'm gonna give you– I'm gonna give you the whole research article. And it's– it's not an easy read by any means. It's not an easy read.
193. Kevin: Are we gonna have to do any writing on this?
194. Izzy: Oh my gosh, are we gonna have to do any writing, wouldn't that be awful?
195. Alex: Yes it definitely would.

196. Izzy: Well I see a few blank lines here. Um, and– I'm not gonna– I'm giving it to you because I want you to see what a well designed investigation looks like when it's written up. All the pieces of the well-designed investigation are there. There's the testable questions, there's the background information, there's the experimental procedures with the independent and dependent variables and the controls. There's the data analysis. There's a conclusion. And this is what it looks like when it's all written up. Now, not that top page but what follows. So ignore the top page for right now and switch back to the article.
197. Kevin: Are we gonna have to write anything?
198. Izzy: Right now. Listen to him back there.
199. Kevin: I'm tired of writing in my classes today.
200. Izzy: Oh, tell me how much you've written today. Complain a little bit for me.
201. Kevin: I had three BCRs this morning.
202. Izzy: Oh did you?
203. Kevin: Yes.
204. Izzy: We love those BCRs.
205. Kevin: I hate those.
206. Izzy: I'm not gonna ask you to write any BCRs. OK.
207. Cameron: Do we have to answer all these questions?
208. Izzy: Hang on. Hang on. I told you to ignore the front page and turn to the second page. OK. The scientists here have given a name to the relationship. How many of you are voting for mutualism? Based on what we– the evidence we just went over, which is the evidence in this article. How many of would vote for mutualism as-as the kind of relationship that is occurring. Both sides being helped. One.
209. Kevin: Can we vote for two of them?
210. Izzy: Nope. I'm only gonna let you vote for one. 1, 2, get those hands up.
211. Mutualism. 1-2-3-4-5-is your hand up?
212. Max: No.

213. Izzy: Five.
214. Cameron: I think it's commensalism.
215. Izzy: Well hang on, I'm just doing mutualism. We've got five for mutualism. How many for commensalism? That the owls are benefiting but the snakes not getting a whole lot out of it.
216. Josh: I want to say mutualism.
217. Izzy: Oh, we got another mutualism. Six. Commensalism; One-
218. Kevin: Wait, both of those two hypotheses right there? Uh-
219. Izzy: Uh, this one right here-this was your idea, the owls- the snakes are protecting the eggs, but the owl- the snake's not getting much out of it. The owl is benefiting but not the snake. 1.
220. Adrian: Um, I want commensalism as well
221. Izzy: Two.
222. Max: I was commensalism.
223. Izzy: Three. So commensalism with the owl benefiting. Anybody think that only the snake is benefiting? Commensalism with only the snake benefiting.
224. Cameron: The owls are benefiting, not the snake.
225. Izzy: So, the snake benefits, the owl doesn't.
226. Cameron: The owl benefits, I was-
227. Izzy: Oh, so you want to go with this one. Anybody think it's predator prey? 1-2-3-4-5-6-7-8-9. Somebody didn't vote. Alexis, what did you vote for?
228. Alexis: Um ... mutualism.
229. Izzy: Alright, well I don't know who I missed but we'll call it six and four. Ok. So, what I want you to do; I have crossed out in the title and in the summary what the authors think the relationship is. I want you to scan through this article and tell me what the authors' conclusion is. Where would you look, where do you think you would-where do you think you would look in this article. Would it be in the questions that they asked, which are at the

beginning. Would it be in the description of the experiment? Would it be in the data they gathered? Or would it be in the conclusion?

230. Jake: Conclusion.
231. Izzy: Alright, so you might want to check there first. See who can find it first.
232. Max: I'm sticking to my answer.
233. Izzy: Well– we– we're just comparing– now that doesn't mean these guys are right. You looked at the same evidence they looked at.
234. Max: Well I–
235. Izzy: And you came to different conclusions. It doesn't mean that these guys are right. But let's see what-what conclusion they came to. So look back in that discussion ses–
236. Kevin: Are you going to tell us what they actually say?
237. Izzy: It's in here. I don't have to tell you, it's in here. What is their answer?
238. Rachel: Well, what–
239. Izzy: How about if I turn– well, where would be the most logical place to look for the–
240. Rachel: The tenth page.
241. Izzy: Yeah. And they call the conclusion the discussion.
242. Cameron: Do we just have to read this?
243. Izzy: Scan through it to see if you can find what the authors think is happening. Are they calling it mutualism, commensalism, predator-prey If they're calling it commensalism, who do they think is benefiting, the owl or the snake? ... OK and I see some people are starting right from the beginning, maybe they want to get the whole picture. Some people have jumped to the conclusion. To see if they can figure out what ... what the authors thought. Now I apologize, the printer wasn't– or the copier wasn't working rear well– real well. So, it's kinda-spots of it are hard to read. So–
244. Alex: I was right.
245. Izzy: Are you gonna find the answer– did you find it?

246. Kevin: Yup. I'm right.
247. Izzy: Now, are you right or do– or do these guys back up your opinion? Or your– your conclusion.
248. Students: Right ... yeah man
249. Kevin: I'm always right.
250. Izzy: Uh-uh-uh-uh-uh. You're looking for the answer, right?
251. Rachel: I already found it.
252. Izzy: Alright, well leave it open. K, put your hand up when you found their conclusion, their description of what's going on. So 3-4. Did you find it? I see you got something underlined. Alright, underlining's a good thing. Ok, I'm noticing that the people who went to the conclusion have found it the fastest.
253. Cameron: Um, but what about?
254. Izzy: Alright. So what was it Rachel?
255. Rachel: Commensalism.
256. Izzy: Ok, they're calling it commensalism. Why are they calling it commensalism Adrian.
257. Adrian: Uh, because they're not protecting each other because some of them have been found dead, but they don't want to, like, rule out that it's predator-prey because they went, like, y'know, let them live for a while. So, um, basically, um, that– and sometimes– yeah I guess it is.
258. Izzy: Ok, that sounds like it's your interpreta– they're calling it commensalism and that's your interpretation of why they're calling it commensalism. What reason do they give? That's certainly evidence that they used. But what reason in their conclusion do they give, Jake? Why they're calling it commensalism.
259. Jake: Um ... seems like– snakes and owls don't have a connection. That's all it says.
260. Izzy: Ok, the sn– the– alright, that's what commensalism means, is that the snake wouldn't be getting anything out of it. But you told me that the snake's getting a meal, right? Isn't that getting something out of it?
261. Jake: Yeah.

262. Izzy: So how are they arguing that the snake's not getting anything out of it? They don't mention anything about some of the snakes are found dead.
263. Adrian: Well, yeah, actually they do.
264. Izzy: In the conclusion?
265. Adrian: Well, yeah, I mean like not all of them—
266. Izzy: Ok, can you read that part to me?
267. Adrian: [*Reading*] “The frequency of the-of live snakes was: 9 nests, (1snake each.” Uh, other numbers of them. “In the later [*sic-paper says 'latter'*] example no snakes were found during the first 3 nest checks, but 12 (one dead) were removed 5 days later, 2 more the next time, and single specimens were”—
268. Izzy: Okay.
269. Adrian: “Taken on the last two visits.”
270. Izzy: OK. You're reading the data analysis, right?
271. Adrian: Yeah.
272. Izzy: That's all the information they looked at, and they included that in their analysis but in their conclusion—alright, where would you look for the conclusion?
273. Adrian: It's just that's the section, so I assume there's a page from what they did.
274. Izzy: OK, look in the conclusion and tell me if you can find why they're saying it's commensalism.
275. Max: Because—
276. Alexis: Because only live blind snakes are commensalism and dead ones could be replaced by other snakes. Like, these [*reading*] “like *V. stri-a-tula*,” these “we envision selection for the live capture and transport of all wildlife by the owls.”
277. Izzy: So, that's telling us that the snakes aren't benefiting? Or is that telling us how the owls are benefiting?

278. Kevin: It says the owls are benefiting also, but no matter what the owls still ha-like they still, they still hatch. So it's not mutualism. Like, it kinda throws you off that the owls are getting something out of it which they? kinda do. But, um, like all the snakes like basically they don't get all the insects feeding off of the owls-
279. Izzy: And they grow faster.
280. Kevin: And they grow faster by six days.
281. Izzy: MmmHmm. MmmHmm ... so that's still a benefit. Ok, but why don't we- why don't we consider- you guys are calling it mutualism, I heard you say they're-the snakes are getting something, right? They're getting food. They're getting a meal provided to them. Why are these guys not counting that as a benefit?
282. Rachel: Because it's 50-50.
283. Izzy: What's 50-50?
284. Rachel: Some snakes do get insects and some don't they said.
285. Kevin: So they didn't feed
286. Rachel: It depends what owl you get or what nest you get.
287. Izzy: Uh, sounds like 89 percent of the snakes are getting food. It goes, 89 percent of the snakes are still alive. Can I borrow this (*the article*) for a minute? Um, this is hard without my glasses. What's it saying here about the snakes being able to find food on their own? They don't need to be brought to the nest to find food. Think about it. I could put all of you guys in jail, right? And feed you. Is that a good deal for you?
288. Adrian: No.
289. Max: Yeah.
290. Izzy: Is it?
291. Max: Well, we're getting something to eat so eventually we don't starve to death.
292. Adrian: If you get to just eat and not feed you'll fight. There's nothing fun to do in jail.
293. Izzy: Yeah, are you- are you starving at home?

294. Max: No.
295. Izzy: No. Alright, you're not-so why should I put you in jail to feed you? Is that a benefit to you to be taken out of your home and be put-be put in a jail?
296. Max: No, 'cause I get food while I'm not in jail.
297. Josh: They have a lot of food.
298. Izzy: Excuse me?
299. Josh: It's safe and the jail has a lot of very good food, I'd probably go.
300. Izzy: You'd rather go to the jail? OK.
301. Josh: Not me, but someone who isn't addicted to computer and TV.
302. Izzy: So some— some people might prefer to be in jail to get the free meal, than to be sitting in the termites' nest in the ground to get their free meal. That's what these guys are arguing. That, y'know, the snake could live just fine on his own, he doesn't need to be put in the nest. He's being put in the nest to serve the owl. Does anybody— so they're calling it commensalism. Based on that. Do you mutualistic people buy that? Are we gonna just say these guys are right? They're scientists, that's the conclusion they came up with. So they're right and we're wrong.
303. Josh: Can they prove they're really not helping the snake?
304. Izzy: Can they prove— well what-how would they have to prove that it's not helping the snake? How would you— how would you go about proving that the snake is— is not being helped?
305. Josh: Well those snakes are blind. I don't think they can find anything. And if they're in those nests they're safe and get free meals?
306. Izzy: OK, so, how would you prove that the snakes in the nest— how would you prove that? That's your hypothesis. That's your idea. How would you prove that those snakes in the nest are better off than those snakes down on the ground. What could you do?
307. Josh: Well, there's trees, there are predators that would hurt a snake. The owl would probably attack it because—
308. Izzy: Well hang on now—now you're giving me a lot of probablys. We want to know how—and think, help him out. Don't— I don't want— nope, sit down.

Be quiet. How could he prove, how could you mutualistic people prove, what would you expect to see if you compare the owls in the nest to the owls on the ground. If you're right, what could you see about those owls in the nest?

309. Adrian: One would— some more snakes would be found alive in the nests than on the ground.
310. Izzy: Now, is that practical? Do you think they're are more owls on the ground or in the nest?
311. Adrian: Not the owls.
312. Izzy: Or snakes. Or do you think there are more snakes living on the ground? 'Cause not all owls pick up snakes.
313. Adrian: Well—if we're talking about just blind snakes.
314. Izzy: Right, but—
315. Adrian: But I'm talking about all snakes here—they're mostly on the ground.
316. Izzy: Well just blind snakes, do you think that overall that you're gonna find more up in nests if this is the only owl that does it, and only 20 percent of the owls do it?
317. Adrian: No.
318. Izzy: There's probably gonna be more on the ground but what could you compare about, other than number of owls.
319. Adrian: Number of snakes. Or owls?
320. Izzy: Sorry, I keep saying owls. What could you compare instead of numbers of snakes?
321. Adrian: Number of eggs the owl lays.
322. Izzy: Now we want to see though, if the snake is benefiting, not the owl here. If, if the snake in the nest has a benefit, what would— how could you prove that he's better off than the snakes on the ground. What could you how could I compare to see if Max is better off in his home than Rachel is in her home? That's your homework. I want you to come back with at least two ways I could compare snakes in nests to snakes on the ground. Alright. That's your homework.

Numbers 1 and 2.

Aphids are insects that feed on fluids from the stems of plants. After the aphids ingest the plant fluids, they excrete a liquid called honeydew.



1. Ladybugs eat aphids, which are a source of protein for the ladybugs. Which of these terms best describes the relationship between the ladybugs and the aphids?

A mutualism
 B parasite-host
 C predator-prey
 D commensalism



2. Some species of ants protect aphids from predators. The ants benefit by feeding on the honeydew produced by the aphids. Which of these terms best describes the relationship between the aphids and the ants?

F mutualism
 G parasite-host
 H predator-prey
 J commensalism



Homework:
 Answer to prepare
 for tomorrow's
 quiz on
 relationships

3. Which of these describes a parasite-host relationship?

F Birds catch gypsy moths and eat them for food.
 G A gypsy moth caterpillar eats the leaves of a plant.
 H Bacteria feed on a dead gypsy moth.
 J A fungus lives in the body of a live gypsy moth caterpillar.

