



National
Qualifications

X807/77/11

**Biology
Supplementary sheet**

Duration — 3 hours

Supplementary sheet for question 1

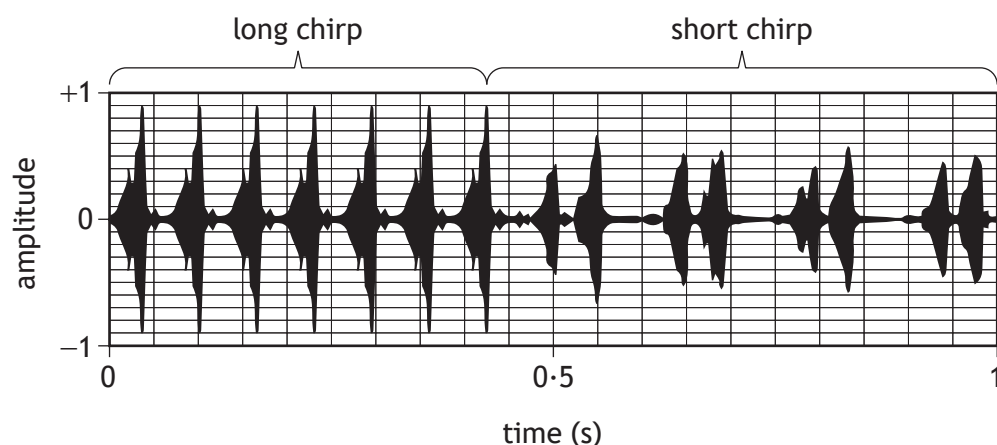


1. One disadvantage of sexual reproduction concerns the problems involved in locating and attracting a suitable mating partner. In many animal species, males use signals of some kind to attract mates. In the Pacific field cricket, *Teleogryllus oceanicus*, normal-wing males produce calling 'songs' to attract females by rubbing together specialised forewing structures.

Cricket calling songs can be recorded and presented visually as patterns of pulses in *sonograms*, where *amplitude* is a measure of the loudness of different parts of the song.

Figure 1 shows a sonogram of one male cricket's song consisting of a 'long chirp' section followed by a 'short chirp' section.

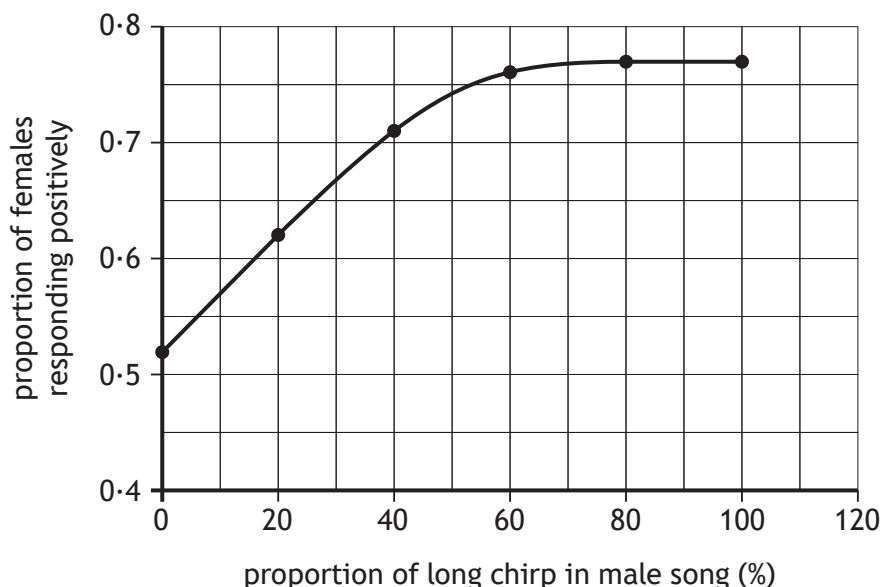
Figure 1



The proportion of song taken up by the long chirp section is important in female choice. Long chirps are more energetically demanding and may provide information to the female about the fitness of the singing male.

Figure 2 shows some results from an experiment investigating the positive responses of female crickets to songs with different proportions of the long chirp component.

Figure 2



1. (continued)

Apart from its energetic cost, sound signalling may make males more vulnerable to predators and parasites who can detect these signals. The female parasitoid fly, *Ormia ochracea*, can locate and parasitise singing male crickets using hearing apparatus that is evolutionarily convergent to that of *Teleogryllus oceanicus* females.

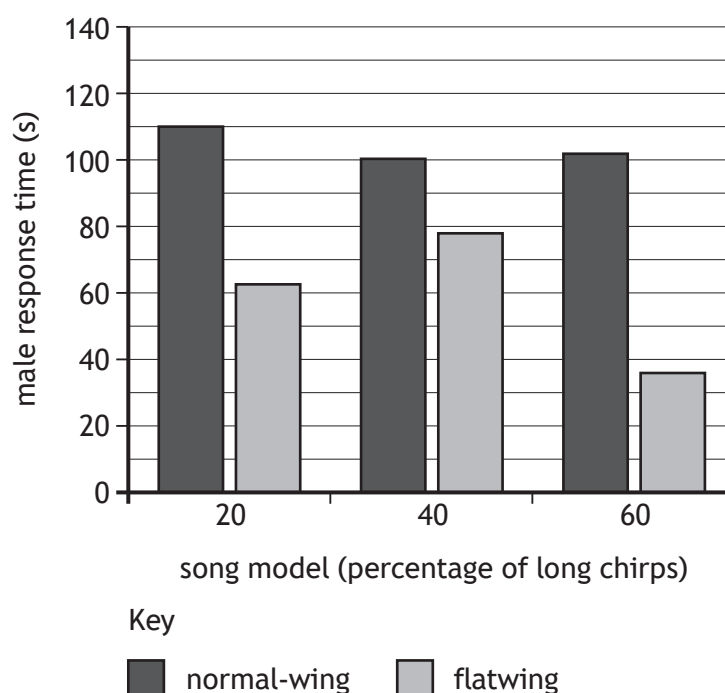
Some males, however, express a 'flatwing' mutation, which makes them unable to produce the song used by normal-wing males. This mutation makes such males silent. In fewer than 20 generations this flatwing trait has spread to more than 90% of males on the Hawaiian island of Kauai, which is also populated by the parasitoid fly.

Research was carried out to investigate the reproduction of flatwing males. It was discovered that these non-signalling males position themselves near signalling males and attempt to intercept and mate with approaching females.

The researchers hypothesised that such satellite flatwing males would be more likely to locate close to males with songs that were more attractive to females. To test this hypothesis they placed normal-wing and flatwing males in experimental chambers. Different song models were played through speakers and the response times of the males to settle near the speakers were measured.

Some of their results are shown in **Figure 3**.

Figure 3



[END OF SUPPLEMENTARY SHEET]