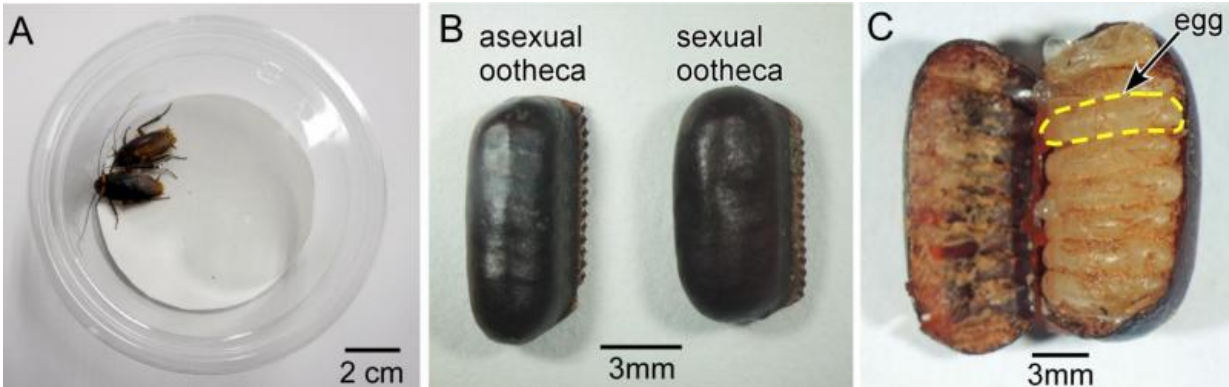


Clues as to why cockroaches are so prolific

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(A) Female cockroaches kept in a container. (B) The egg case on the left is an asexual egg case, while the right one was produced by sexual reproduction. (C) A dissected egg case stuffed with 16 eggs. Credit: Hokkaido University

Parthenogenesis is a strategy employed by females to reproduce asexually when they find no mating partners available, and is seen in a wide variety of animals, including arthropods, fish, amphibians and reptiles. As opposed to sexual mating which enhances genetic diversity, the asexual strategy is aimed at rapidly generating large numbers of female progeny to expand their habitat.

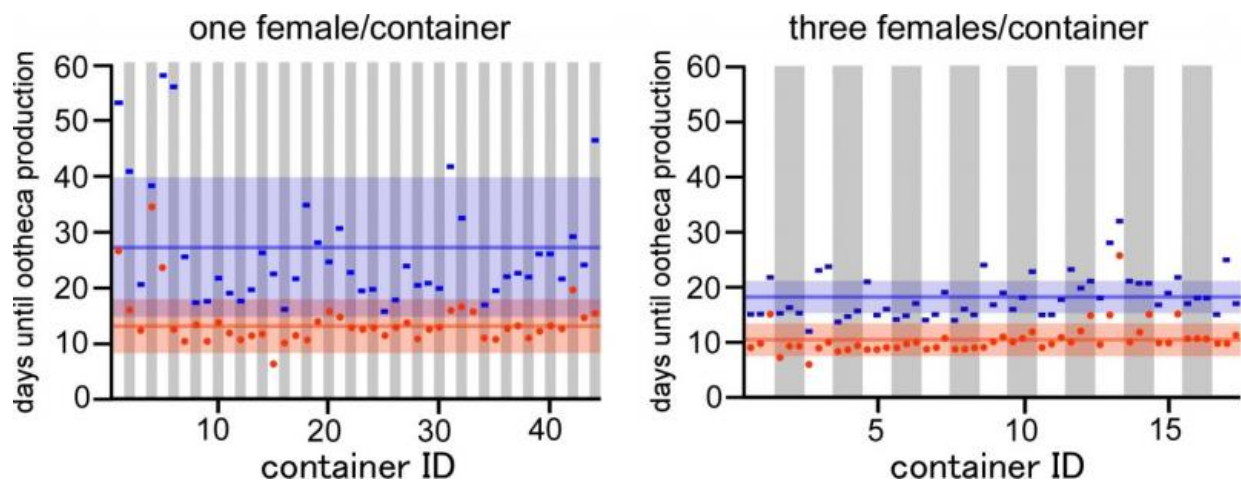
Cockroaches belonging to the *Periplaneta* genus are indoor pests that are ubiquitously found across temperate and tropical regions.

Parthenogenesis of this genus was reported in literature a long time ago, but little has been known about the factors that cause them to switch

from a sexual mode of reproduction to an asexual one.

In a study conducted by Hokkaido University researchers, one or more female American cockroaches (*Periplaneta americana*) were placed in individual plastic containers immediately after becoming adults. They then measured the exact timing of the delivery of asexually produced egg cases (i.e. oothecae, each containing about sixteen [eggs](#)) for more than two-months.

When only one female was kept in a [container](#), it took more time to produce an egg case than group-housed females. When three or five females were kept in a container together, they produced egg cases faster than any of the other groups. While the timing of egg case production of isolated females varied from individual to individual, the group-housed females produced egg cases in a synchronized manner. This apparent synchronization was observed even across different containers, suggesting that the egg case production rate had reached its maximum through some kind of interaction between individuals within the container.



Timing of the first and second egg case productions. When three females were

placed in the same container (right panel), the intervals between production of the first egg case (red dots) and the second egg case (blue dots) were shortened and the timing of egg case production was synchronized, compared with isolated females (left panel). Credit: Kato K. et al

The researchers also found that housing females with genitalia-ablated males or removing the antennae of group-housed females did not significantly promote egg case production. The daily addition of female [sex pheromones](#) to the containers did not raise egg case production either. The results imply that group-housed females promote asexual egg production by perceiving female-specific chemosensory signals - other than sex pheromones - that they detect via their antennae.

"Our study shows that female cockroaches promote asexual egg production when they are together, not alone. This is consistent with the fact that progenies produced by fifteen females in a larger container have maintained a colony for more than three years, whereas those produced by one female die out fairly quickly. In addition to the increased fecundity of group-housed [females](#), the synchronized egg production could also assure higher survival rates via the aggregation of similar-aged larvae," says the corresponding author, Hiroshi Nishino, at Hokkaido University. "The traps utilizing sex pheromones to attract only male cockroaches are not sufficient. Understanding the physiological mechanism behind the reproductive strategies should help us find more effective ways to exterminate pest cockroaches in the future."

More information: Ko Kato et al. Group-housed females promote production of asexual ootheca in American cockroaches, *Zoological Letters* (2017). [DOI: 10.1186/s40851-017-0063-x](https://doi.org/10.1186/s40851-017-0063-x)

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