

Fish's dish

— new fish feed ingredients for aquaculture —

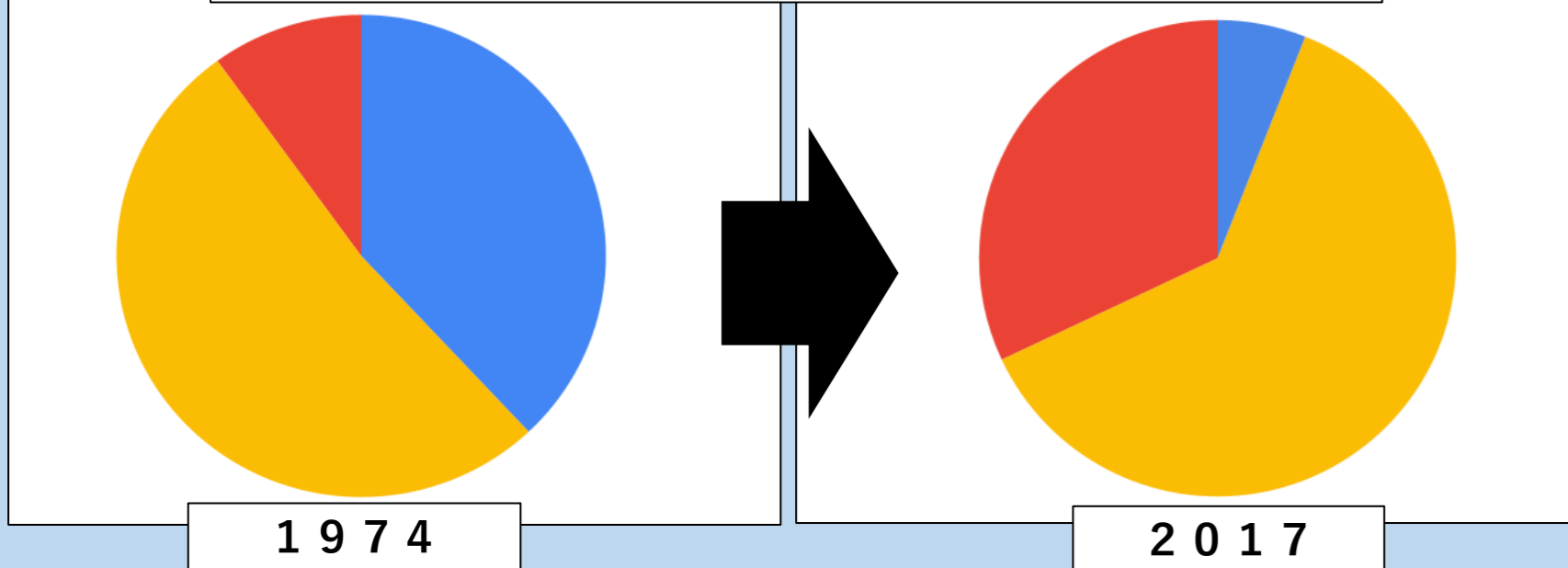
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Depletion of fishery resources is one issue in the current state of the world's fisheries. In response, aquaculture is expected to increase around the world and reduce the amount of fish caught. However, catching a lot of fish to use as feed is not sustainable. In order to solve this problem, this study conducted an experiment using feed which reduced the use of fishmeal and supplemented the missing protein and others, with insects such as cockroaches, crickets, and mealworms, making three kinds of feed containing insects and containing no insect for the control experiment, and feeding them to fish. The results showed that the growth rate of fish fed the feed created with crickets and mealworms is the highest. The study concluded that the fish feed created with crickets and mealworms was more effective in raising fish than regular fish feed.

Background

Depletion of fishery resources

The situations of fish in the world



In 2017

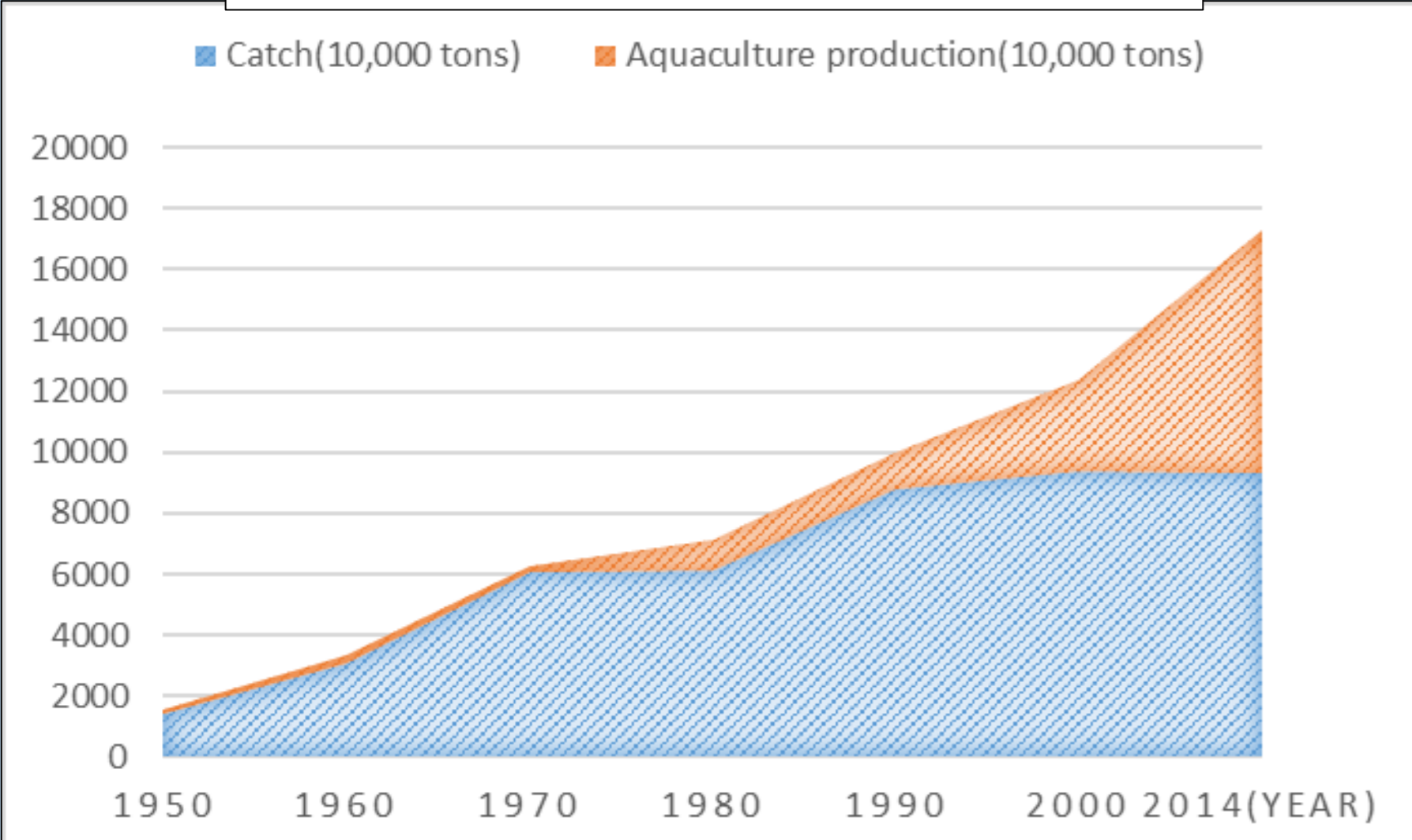
- The amount of fish which have the possibility to increase : 6%
- The amount of fish which are in danger of overfishing : 62%
- The amount of fish which are overfished now : 32%

This situation is not sustainable

Aquaculture is one of the solutions

The situation of aquaculture

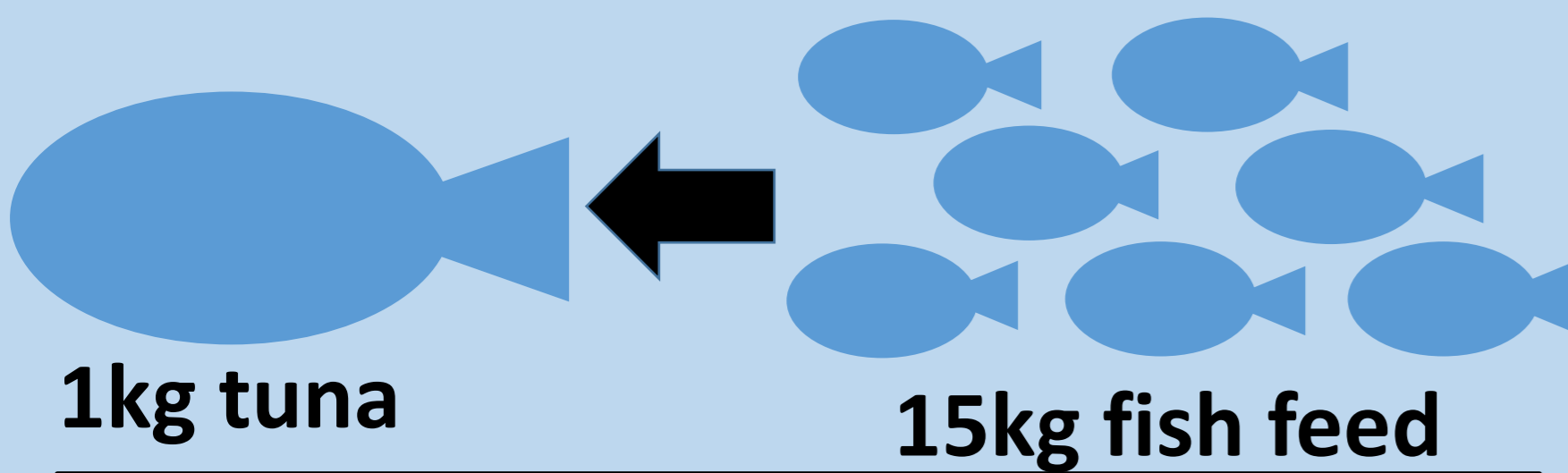
The amount of fish which are caught and aquaculture production



The percentage of aquaculture production is increasing

It will catch up with fishing

The problem of aquaculture



The increase of the amount of fish to be cultivated could lead to depletion of fish used as feed

The purpose of this study

To clarify

- which ingredients can be used as fish feed
- whether feed that uses other ingredients is available

The ultimate goal

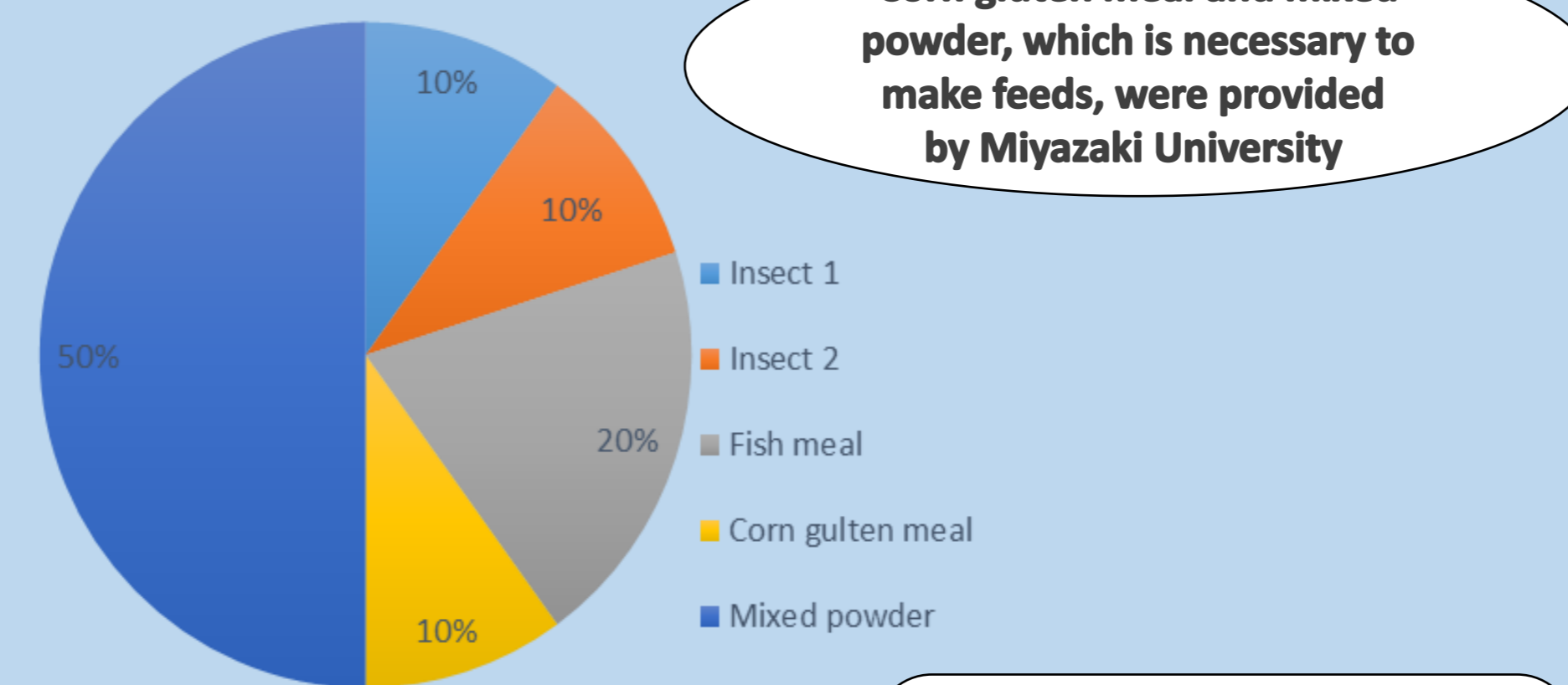
To find a way to move away from aquaculture in which fish are fed as fish feed

Step1 : Quantifying possible alternatives

As the alternative sources of protein, **cockroaches, crickets, and mealworms** were analyzed to reveal the amount of each content by professors at Miyazaki University.

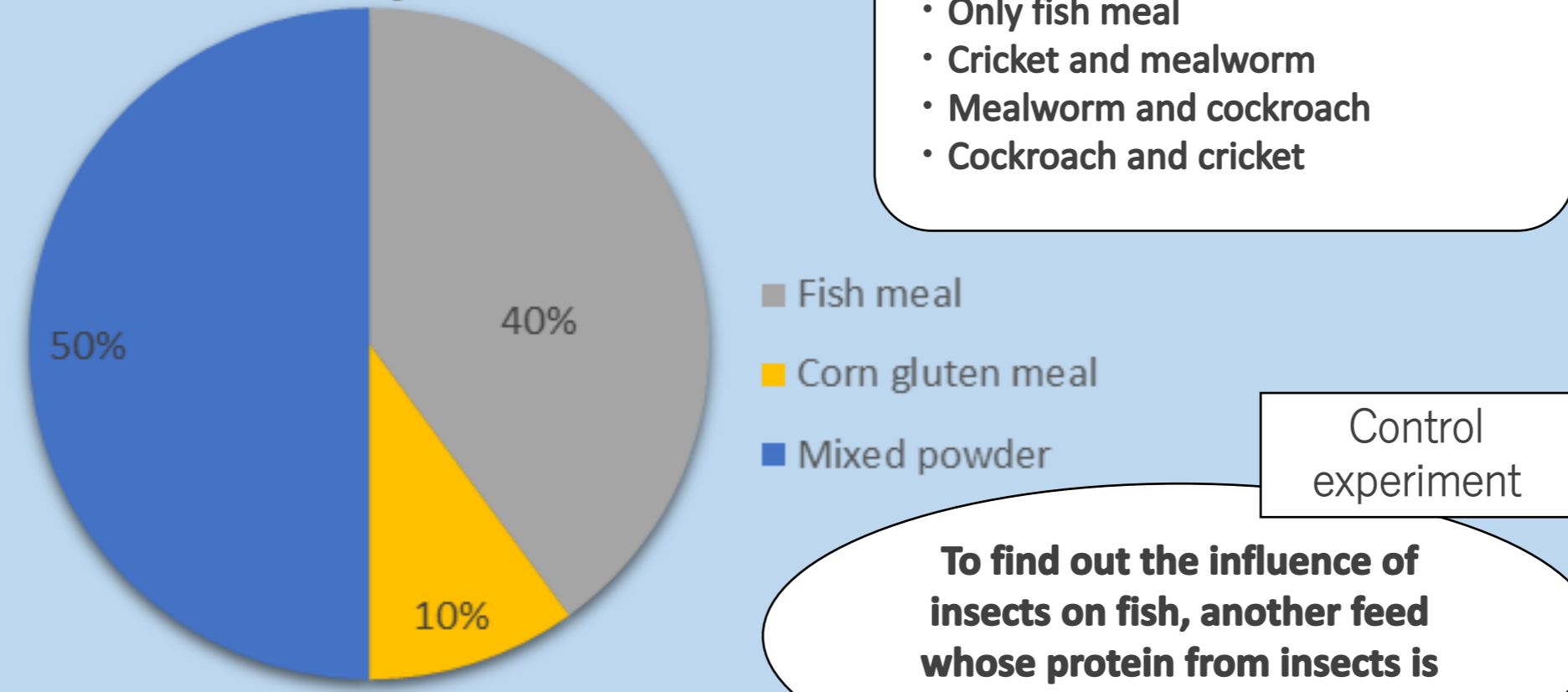
Result The amount of protein was not so much different in each insect, so each feed was determined to be made by mixing two insects out of the three.

Experiment



Corn gluten meal and mixed powder, which is necessary to make feeds, were provided by Miyazaki University

Control experiment



Four kinds of feeds

- Only fish meal
- Cricket and mealworm
- Mealworm and cockroach
- Cockroach and cricket

To find out the influence of insects on fish, another feed whose protein from insects is all substituted with fishmeal

Results

Control experiment using fish

2 g → 2.56 g (28% ↑)

Cockroaches and Crickets

2 g → 2.18 g (9% ↑)

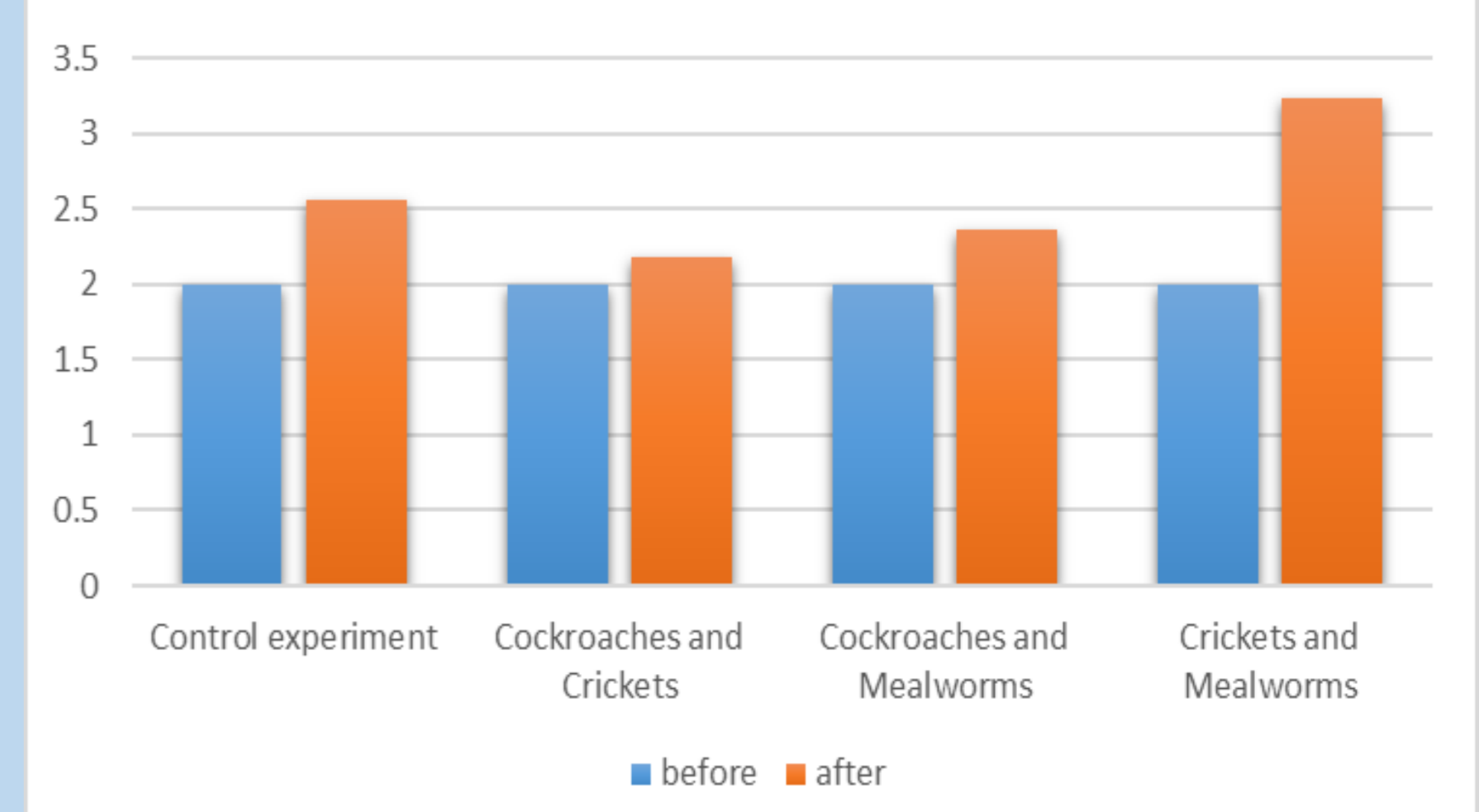
Cockroaches and Mealworms

2 g → 2.36 g (18% ↑)

Crickets and Mealworms

2 g → 3.24 g (62% ↑)

Body weight change



Discussion • Conclusion

The above results suggest

- Crickets and mealworms may contain some components that promote goldfish absorb protein such as vitaminB2, vitaminB6 and vitaminC.
- Cockroaches may have some components harmful for their growth.

Conclusion

Insects can be used as fish feed instead of fish meal

Future Outlook

To improve

- How long to conduct these experiments
- When to conduct these experiments

The ultimate goal

- To cultivate edible fish sustainably

In order to achieve

More aspects of fish cultivated with protein-supplemented fish feed need to be investigated; **meat quality, smell and color**

References • Acknowledgements

—Acknowledgements—

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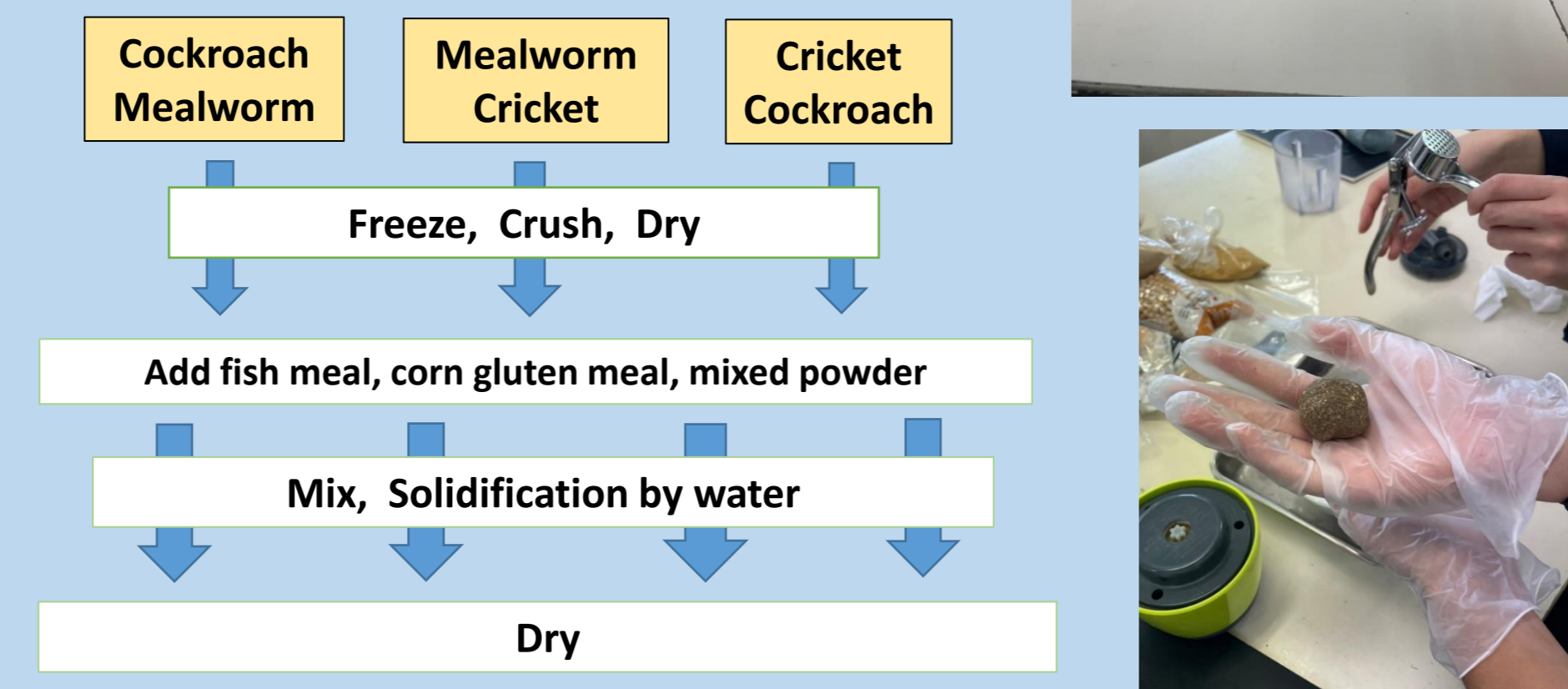
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Step2 : Creating feed

Preparations Fish meal(20g), crickets(15g), mealworms(15g), cockroaches(15g), corn gluten meal(5g), mixed powder(30g), mixer, scale, mortar, water, pipette, drying oven, deep freezer, a garlic squeezer, medicine spoon.

Objective Making three fish feed using three kinds of insects



Step3 : Feeding fish

Preparations Goldfish, aquarium, food, scales, beakers, tap water, and water purification equipment

Objective Considering the difficulty of getting and keeping fish

- Process
- 20 goldfish were divided into 4 feeding areas for each feed.
 - Feeding them once a day for a month
 - Measuring their body weight change