

Why do sharks sleep?



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Abstract

LOWER READING LEVEL

We all know how it feels when we have not had enough sleep. You might feel tired or have trouble concentrating. You might even be grumpy or irritable. Even though sleep is important to our daily lives, it is still a bit of a mystery. Why do we sleep and how did sleep evolve? Scientists have started researching sleep in other animals to find out.

Sharks are hundreds of millions of years old. They are the oldest living group of vertebrates with jaws! We think sharks

could help us figure out how sleep evolved. Only one study has looked at sleep in sharks. We wanted to change this!

We looked at the sleeping behaviors of draughtsboard sharks over 24 hours. We found out that when sharks sleep, they usually lie flat and have a lower metabolic rate. This means that sleep can be important to help conserve energy. It also helps us understand the evolution of sleep.

Introduction

We spend about a third of our day asleep. Have you ever wondered why? Scientists think that the main reason animals sleep is to save energy. The amount of energy we use is called our **metabolic rate**. Our breathing slows down and our body moves less when we sleep. Our temperature also drops. All these things decrease the amount of energy we use.

We study sleep by looking at sleeping behaviors. We look at how the body is positioned and at any changes in metabolic rate. We know that most animals sleep. We can see sleeping behavior in our pets at home. Sometimes we can even see them dreaming! But it is hard to measure what is happening inside the body while someone is sleeping. Researchers have studied sleep in lots of animals. They have found that sleep reduces the metabolic rate in humans, cats, rats, birds, and fruit flies.

Studies have shown that draughtsboard sharks are nocturnal. This means they look like they are sleeping during the day and are awake at night. We wanted to study draughtsboard sharks more. We recorded their sleeping behavior over 24

hours (Fig. 1). We wanted to know more about the purpose of sleep in sharks.

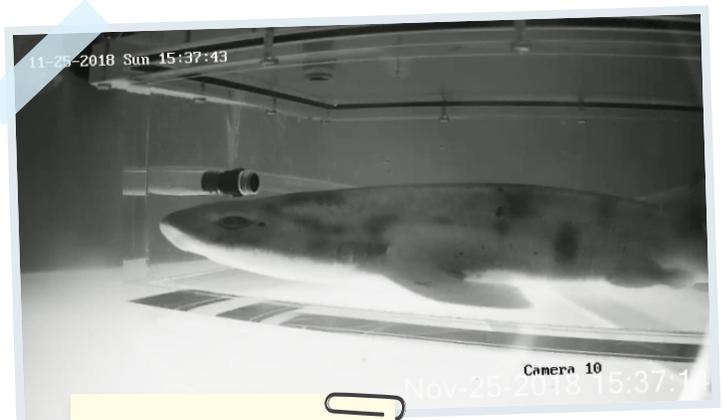


Figure 1: We put draughtsboard sharks inside special chambers to observe their breathing.

Methods

We collected seven draughtsboard sharks from the ocean and kept them in tanks. We moved each shark into a special chamber two days before the experiment. The special chamber allowed us to measure how much the shark was breathing. This gave them time to get used to their new environment.

The chamber was large enough for a shark to swim around in. We put a sensor in the water to measure the level of oxygen. When a shark is active, it will use up more oxygen from the water. We filled the chamber with fresh water when the oxygen levels got too low. Then we would start the measurement process again.

We video recorded the sharks for 24 hours while they were in the chamber. They were in daylight for 12 hours and in the dark for 12 hours. We looked at three different sleeping behaviors (Fig. 2).

1. Eyes – were they open or closed?
2. Body position – were they lying flat or were they raised up on their fins?
3. Level of activity – were they swimming, resting, or sleeping? Sharks were resting if they didn't move for up to 5 minutes. Sharks were sleeping if they didn't move for more than 5 minutes.

We used oxygen data from our special chamber to figure out the metabolic rate of the sharks. We used special computer software to help us. This allowed us to record the metabolic rate of the sharks and their behavior every second!

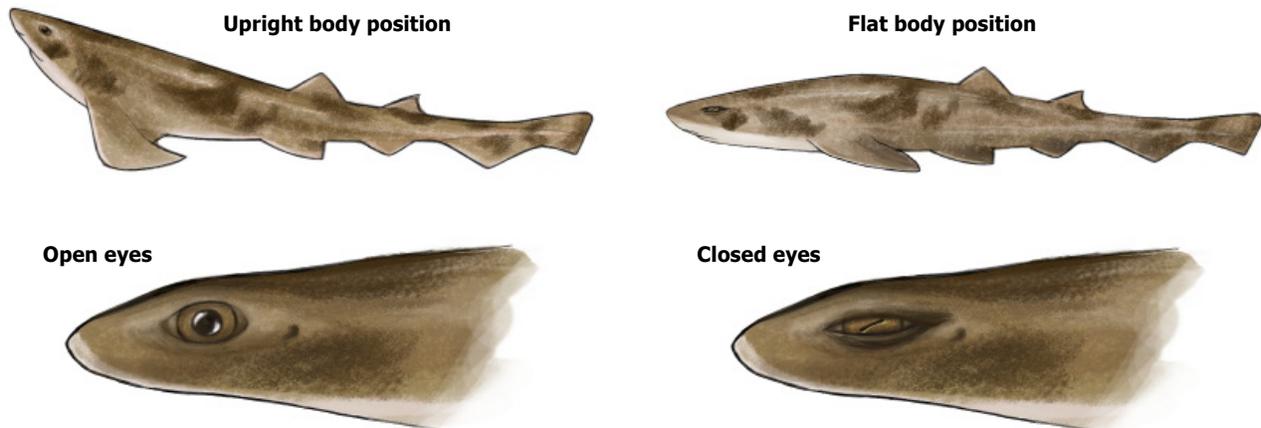


Figure 2: The sharks showed different kinds of behavior.

Results

We confirmed that sharks were more active at night. Metabolic rate was highest when they were swimming. It was lowest when they were asleep. Sharks had the same metabolic rate during the day while they were resting or sleeping. But at night, their resting metabolic rate was more like when they were swimming. (Fig. 3) This means sharks might be more "awake" than we thought.

We found that body position was the best way to see if a shark was asleep. Sharks that were asleep often had their eyes closed during the day. At night their eyes were open 38% of the time while sleeping. Sharks might close their eyes because it is bright outside, not because they are asleep.

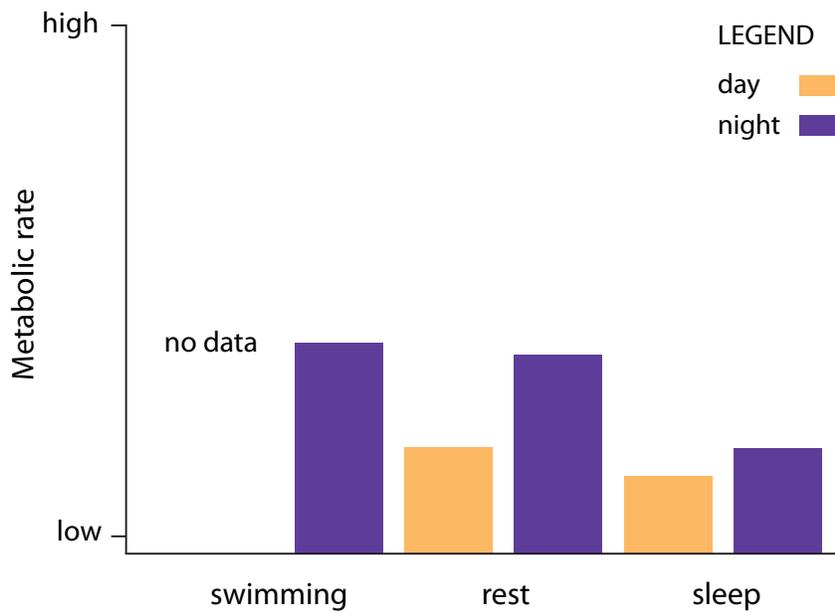


Figure 3: Metabolic rate for each activity during the day and at night.

When did the sharks have the highest metabolic rate?

Discussion

We found the first metabolic evidence of sleep in sharks. Sharks have a lower metabolic rate when they are asleep. This supports the idea that sleep is important to help save energy.

Sharks have lived for millions of years. They could help us learn more about how sleep evolved. In the future, we should look at other things like how the brain acts during sleep. This could help us learn more about how sharks and humans sleep.

Conclusion

Sleep is important to our lives. While we are sleeping, our body resets and checks in on all its vital systems. These include our circulation, growth, and our immune system. Sleep is also important for our brain function. It helps to improve memory and can even improve your creative ability!

Here are some top tips to help improve your sleep routine:

- Put away electronic devices an hour before bedtime.
- Go to bed and wake up around the same time each day.

- Avoid foods or drinks that have caffeine in the late afternoon or evening.
- Keep your bedroom quiet, cool, and dark.
- Exercise for at least 30 minutes a day.

Check your understanding



- 1 Why do you think there were no data for sharks swimming during the daytime?
- 2 We recorded metabolic rate at the same time we looked at activity. What other factors might impact how much energy you/an animal uses in an hour?
- 3 Apart from whether the eyes are open or closed, and body position, what other behaviors might mean an animal is asleep?
- 4 What benefits do you think you get from sleep besides conserving energy? List at least three. Then find a partner and discuss.

Glossary of Key Terms

Metabolic rate – the amount of energy used by an organism in a given period of time.

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