

Experience the magic of Costa Rica's astonishing marine lights!

BIOLUMINESCENCE

Costa Rica offers a number of beaches where visitors can enjoy the phenomenon of bioluminescence, a fascinating sight in which the water is illuminated with bursts of light when it is moved.

During the night, some marine organisms – including bioluminescent plankton – create a magical spectacle in the water by emitting light due to a chemical reaction that occurs in their body without any external source of light.

¿What is bioluminescence?

Among marine organisms, it is a relatively common phenomenon, produced by microscopic organisms like bacteria and phytoplankton (dinoflagellates). Many other bioluminescent bacteria live as parasites or in symbiosis with other animals.



Cnidarians (jellyfish)



Crustaceans

Dinoflagellates

Cephalopods

Worms

Mollusks, echinoderms and fish, especially those that live in deep water like the anglerfish.

90%

of living beings that live in the bathypelagic and abyssopelagic zones – the deepest reaches of the sea – may be able to produce light in some manner.

On land

Bioluminescence is observed in fungi and invertebrates (fireflies and scarab beetles, for example).



Main observation areas

The Gulf of Nicoya (Guanacaste and Puntarenas) and the Gulf of Papagayo (Guanacaste) have the most reports of bioluminescence due to the amount of tourism and fishing in those regions.

Other areas where the phenomenon has been spotted include the Osa Peninsula in the southern region of Puntarenas – more specifically, the resplendent waters of Golfo Dulce – as well as Manzanillo on the Caribbean coast.



What is the best time to enjoy bioluminescence?

August, September, November and December, during the rainy season. In Guanacaste and in Paquera, year-round.

During the new moon.

- | | | |
|-----------------------|--------------------|-------------------|
| 1. Ostional | 7. Punta Cuchillos | 13. Playa Blanca |
| 2. Cocal | 8. Isla Gitana | 14. Caldera |
| 3. Montezuma | 9. Isla Cedros | 15. Isla del Coco |
| 4. Vivos-Bahía Tambor | 10. Isla Jesusita | 16. Manglares |
| 5. Quesera | 11. Paquera | Puerto Jiménez |
| 6. Paquera | 12. Isla San Lucas | 17. Playa Cativo |



TOURS

There are various ways to enjoy bioluminescence in Costa Rica. Some options are:



NIGHT TOURS IN KAYAK

to see how the water lights up as you move.



BOAT TOURS

for a unique experience.

It is important to remember that bioluminescence **is a natural event and cannot always be guaranteed.** It depends on the season and the water conditions. It is best to investigate prior to planning the trip in order to ensure that you have the opportunity to witness this marvelous spectacle.

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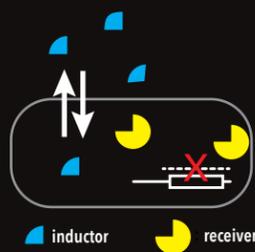
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There are various types of marine organisms that create bioluminescence, and each one's light has its own form and color, from warm green to phosphorescent blue.



In the particular case of marine bioluminescence near beaches, for example, it is observed when bioluminescent phytoplankton accumulates in large quantities near the coast and is agitated by the waves, producing a beautiful blue glow that extends along the beach.

Few bacteria



Many bacteria



Luciferase gen

Sampling of the sea water in the Gulf of Nicoya has shown that the bacteria and dinoflagellates that are most commonly seen on tours have been identified as belonging to two main genera: **Vibrio** and **Photobacterium**. Meanwhile, in Isla del Coco National Park, analyses have only found the genus **Vibrio**, as well as luminescent marine dinoflagellates belonging to the genera **Ornithocercus** and **Ceratocorys**.

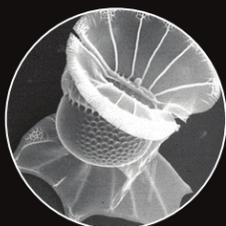
Bacteria belonging to the genera **Vibrio** and **Photobacterium** may be free-living or in symbiosis with animals like teleost fishes, squids and cuttlefish.



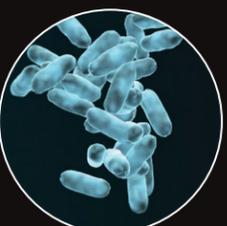
Ceratocorys



Vibrio



Ornithocercus



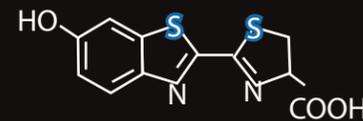
Photobacterium



BIOLUMINESCENCE IS PRODUCED BY A CHEMICAL REACTION

Luciferin

Organisms possess a protein known as luciferin



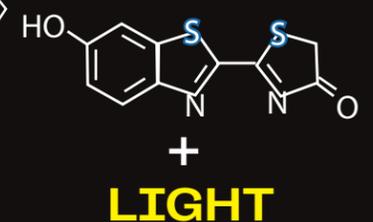
Luciferase

It is oxidized through the action of an enzyme called luciferase. Luciferase makes it possible for the protein luciferin to bond to oxygen



Oxyluciferin

The energy that results from this oxidation is emitted in the form of light (cells)



Carrying out this process has a cost for organisms, since it consumes ATP (an energy-containing molecule used in cellular function).



The light of these marine organisms has a wavelength of **550 nanometers (nm).**



The light emitted by fireflies has a wavelength of **510 nm - 660 nm**



WHAT IS THE PURPOSE OF BIOLUMINESCENCE?



Intraspecific communication.

Individuals of a single species use it to communicate with each other. For example, fireflies use bioluminescence for mating.



Attracting prey.

Some organisms have light-producing organs that attract their prey.



Defense. Some organisms produce light when disturbed in order to scare off predators.



Camouflage.

In some cases, for example in some species of fish, bioluminescence is used to camouflage an organism amidst the shadows of the ocean.



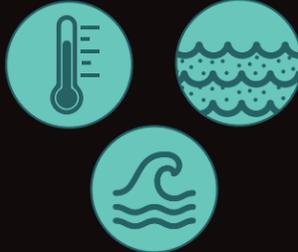
Research

Bioluminescence on the beaches of Costa Rica has been a subject of interest for scientists and experts in the field of marine biology. Studies have focused on understanding the organisms that are responsible for bioluminescence, the factors that affect their appearance, seasonal and geographic patterns, and their importance in marine ecosystems.

Some specific areas of research include:

Factors that cause bioluminescence:

These can include water temperature, salinity, the concentration of nutrients and the presence of predators and physical stimuli such as waves.



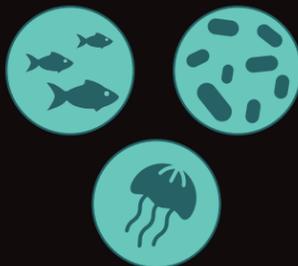
Seasonal and geographic variation:

Data collection over time and in different places in order to better understand the patterns and distribution of this natural phenomenon.



Ecological interactions:

This includes studies on how bioluminescence can affect the population dynamics of marine organisms such as predators and prey, and how it can affect the general functioning of coastal ecosystems.



This research is essential for understanding and appreciating the importance of bioluminescence in the beaches of Costa Rica. It also contributes to the conservation of these unique ecosystems and the promotion of sustainable tourism in the region.



The days of the new moon offer more darkness and less light reflecting off of the water than the full moon. However, tours can take place during any phase of the moon.



SEE LUNAR CALENDAR

vercalendario.info/es/luna/
tablasolunar.com/calendarios/calendario-lunar-de-costa-rica/

Bioluminescence sightings can be reported via this website:

biolumicostarica.weebly.com

This phenomenon is believed to exist in freshwater as well, as it is generally reported in coastal regions. Globally, only a few cases have been reported of bioluminescence in freshwater.

For more information about the project, or to report sightings of the phenomenon, you can contact the people in charge through social media:

 [Bioluminiscencia Costa Rica](#)

 [bioluminiscencia_costarica,](#)

www.ucr.ac.cr

biolumicostarica.weebly.com

CREDITS:

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