

Ship surfaces under water are quickly colonized by a slimy biofilm. This process, known as biofouling, poses **major challenges** to shipping because these coatings on the bow of ships increase friction and fuel consumption (Baum et al. 2004: 298; Matthiessen 2013: 487).

To **prevent fouling**, people used to coat the outer surfaces of ships with the chemical TBT. However, it was recognized in the mid-1980s that this substance was **toxic** to marine snails - it caused **masculinization** and **functional sterilization** of females even at low concentrations. Therefore, the substance was banned in 2008 (Fent 2013: 290f.).

For this reason, **alternative methods** had to be found to **prevent fouling**. People began to look for models in nature. In the [text](#), you will find information about the design of surfaces inspired by natural structures. Read the passages „**1. Introduction**“ and „**2.3 Progress in Biomimetic Sharkskin Surfaces**“

Tasks:

1. **Explain** the term "**biomimetics**" (it is also called "bionics"), in both German (or your first language) and English.
2. **Explain** the **importance of biological structures** for the development of artificial surfaces in English.
3. **Point out** the **use of shark skin** in the development of "biomimetic" surfaces. Here, you have free language choice.
4. The text states that the surface of the shark skin is structured differently in different species. It also points out that these skin structures have not yet been conclusively researched. **Assess** the **consequences** of this for the **protection of sharks**. Use another language than the one used in task 3.

If you don't know a word, you can use
the glossary.



Reference

Sullivan, T./O’Callaghan, I. (2020). Recent Developments in Biomimetic Antifouling Materials: A Review. In: *Biomimetics* 5 (58). <https://www.mdpi.com/2313-7673/5/4/58> (12.03.2022); abridgments are marked with brackets.

Glossary:

attributed to – zugeschrieben

sustainable – nachhaltig

self-assembly – Selbstmontage

macroscale – Makroskala

nanoscale – Nanoskala

accompanied – begleitet

succinctly – kurz und bündig

by most accounts – nach den meisten Rechnungen

Gyr. – Giga-Jahr (eine Milliarde Jahre)

refine – verfeinern

subsequently – anschließend

superimposed - überlagert

properties – Eigenschaften

superhydrophobicity – Superhydrophobie

biomineralisation – Biomineralisation:

Aufbau fester, kristalliner Strukturen durch Zellen (z.B. Aufbau von Knochen, Zähnen, Panzern etc.). Da diese Stoffsynthese mit großer Perfektion verläuft, versucht man, den Aufbau von Werkstoffen hieran zu orientieren (Spektrum Lexikon der Biologie: Biomineralisation).



drag-reduction – Verringerung des Widerstands

adhesion strengths – Adhäsionsstärke

reversible – umkehrbar/reversible

lift – Auftrieb

weight ratios – Gewichtsverhältnisse

vaunted - gepriesen

dermal denticles – Haut-Dentikel (des Hais)

protrude – vorstehen

intriguing – faszinierend

thrust – Schub

roughness – Rauheit

attachment – Besatz

placoid-scale – Dentikel (John/Ebling 2017)

pattern – Modell

micro-moulding - Mikrofilm

to deter – abhalten, hindern

durability – Haltbarkeit

integrity – Unversehrtheit

to compromise – schaden, beeinträchtigen

pristine – unverfälscht

wear – Abnutzung

apparent – ersichtlich

References (introduction and glossary)

Baum Dr., C. et al. (2004). Umweltneutrales Antifouling. Eine Delfinhaut für Schiffe. In: *Biol. Unserer Zeit* 34 (5), S. 298-305. <https://onlinelibrary-wiley-com.proxy.ub.uni-frankfurt.de/doi/abs/10.1002/biuz.200410261?sid=EBSCO%3Aedo> (zuletzt abgerufen am: 06.07.2021).

Fent, K. (2013). *Ökotoxikologie. Umweltchemie – Toxikologie – Ökologie*. 4. Aufl.. Thieme: Stuttgart/New York.

John, F./Ebling, G. (2017). Integument. In: *Encyclopedia Britannica*. <https://www.britannica.com/science/integument/Flukes-and-roundworms> (zuletzt abgerufen am: 05.07.2021).

Matthiessen, P. (2013). Detection, monitoring, and control of tributyltin – an almost complete success story. In: *Environmental Toxicology and Chemistry* 32 (3), S. 487-489. <https://setac.onlinelibrary.wiley.com/doi/epdf/10.1002/etc.2108> (zuletzt abgerufen am: 05.07.2021).

Spektrum Lexikon der Biologie (o.J.). *Biomineralisation*. Spektrum der Wissenschaft Verlagsgesellschaft mbH: Heidelberg. <https://www.spektrum.de/lexikon/biologie/biomineralisation/8734> (zuletzt abgerufen am: 05.07.2021).



Biodiversity is of great importance for the protection of human health. We must not exploit nature ruthlessly because we depend on intact ecosystems. The Covid-19 pandemic has made the biological vulnerability very clear. [Here](#), you can learn more about what biodiversity has to do with zoonoses like Covid-19.

Read the linked text and complete these tasks:

1. **Explain** the term "**zoonotic disease**" in both German (or your first language) as well as in English.
2. **Explain** the **relationship** between **human land use and the spread of infectious diseases** in English.
3. **Present** the **recommendations for action** that are formulated in the text. You can choose the language you want to use.
4. Summarize the **core idea** of the "**One-Health approach**" and discuss consequences for dealing with nature. Use another language than in task 3.

If you don't know a word, you can use the glossary.



Reference:

Wertz-Kanounnikoff, S. (2021). Preventing Future Pandemics Starts with Protecting Our Forests. In: *SDG Knowledge Hub. A Project by IISD*. <https://sdg.iisd.org/commentary/guest-articles/preventing-future-pandemics-starts-with-protecting-our-forests/> (10.07.2021).

Glossary:

unfathomable – unergründlich

crop – Frucht, Ernte

livestock – Nutztiere, Vieh

to encroach – eindringen

to spill over – sich ausdehnen

fruit bat – Fruchtfledermaus

toddler – Kleinkind

to roost – sich niederlassen, schlafen

turning the tide – das Blatt wenden

deforestation – Abholzung

contributor – Mitwirkender, Ursache

to halt – anhalten

mining – Bergbau

to repurpose – etw. umfunktionieren, einen Zweck ändern

subsidy – Subvention

