

Biodiversitas Kelautan Sebagai Sumber Bahan Alami



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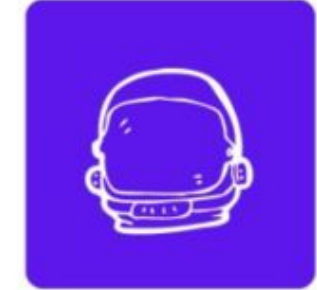
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MITRA PROYEK

Malaysia



Indonesia



Greece



Cyprus



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Pendahuluan



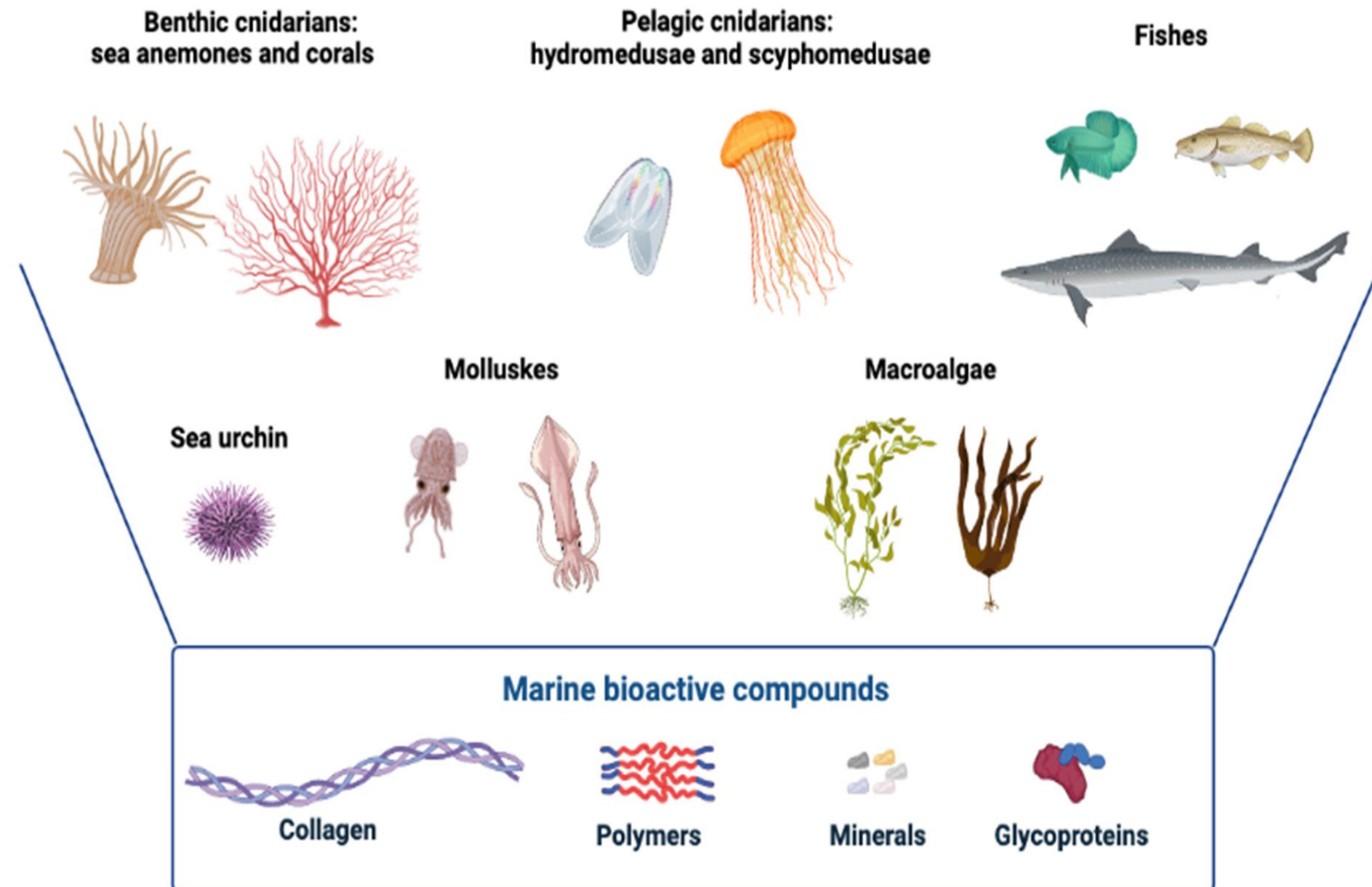
(Sumber: Biodiversity 8th Grade Quiz | Wayground (formerly Quizizz))

Biodiversitas kelautan mengacu pada keragaman organisme di ekosistem laut. Organisme tersebut kaya dengan bahan-bahan bioaktif alami yang dapat diaplikasikan di bidang farmasi, nutrasetikal, dan bioteknologi.

(Duarte, 2006)



Kenapa Organisme Laut?



- ❑ Struktur kimiawi unik yang disebabkan oleh lingkungan ekstrem
- ❑ Mengandung senyawa antimikroba, antikanker, dan anti-inflamasi
- ❑ Potensi yang belum terjamah: hanya <1% spesies laut yang dipelajari secara kimiawi

Kekayaan Biodiversitas Kelautan

Statistik Kunci:

- ~240.000 spesies laut yang diketahui (jutaan belum teridentifikasi).
- Keragaman yang tinggi dari terumbu karang, kawah bawah laut, dan tanaman bakau.

Kenapa organisme laut?

- Sistem pertahanan kimiawi (toksin anti-predator, antimikroba).
- Adaptasi terhadap salinitas, tekanan, dan suhu ekstrem.

(Duarte, 2006)

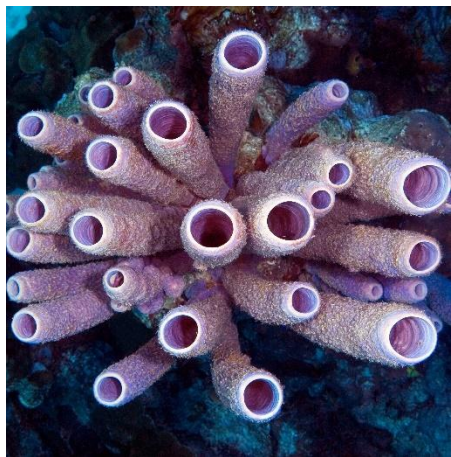


(Sumber: <https://www.asiaone.com/world/map-worlds-uncharted-ocean-beds-take-s-shape-despite-crisis>)



Organisme Laut Terkait

❑ Spons Laut



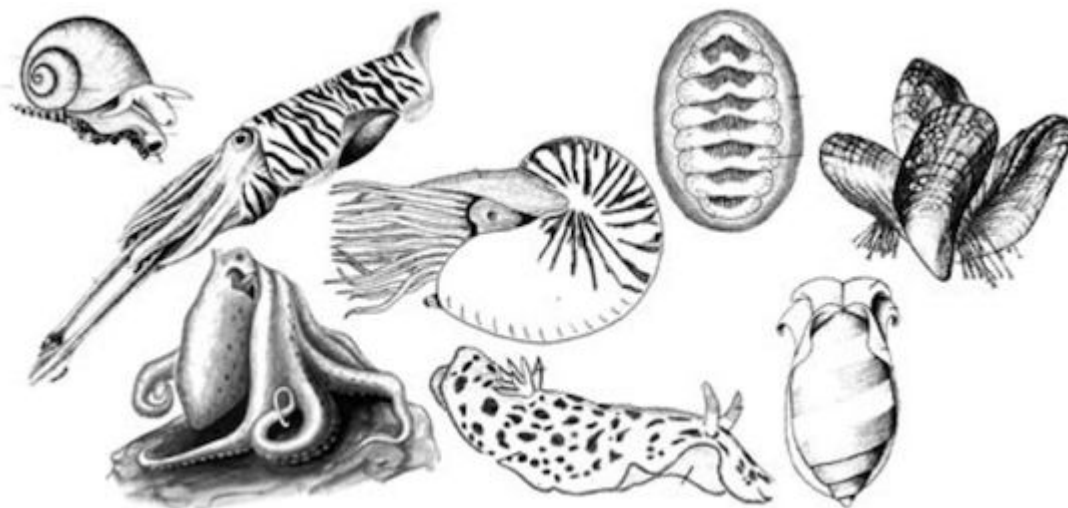
❑ *Cyanobacteria*



❑ Alga



❑ Tunikata, Moluska



❑ Fungi laut & Actinomycetes



Aplikasi Bahan Alami dari Ekosistem Laut

❑ **Farmasi:**

Obat kanker (cth, Cytarabine, Trabectedin)



❑ **Nutrasetikal:**

Lemak Omega-3, Antioksidan



❑ **Kosmetik:**

Senyawa anti-penuaan dan tabir surya



❑ **Industri:**

Enzim untuk biokatalisis



(Martins *et al.*, 2014; Suleria *et al.*, 2015)

Tantangan dan Peluang

- ☐ Sistem panen berkelanjutan dan konservasi biodiversitas
- ☐ Kebutuhan teknologi mutakhir (metagenomik, biologi sintetik)
- ☐ Permasalahan legalitas dan kode etik (bioprospeksi, pembagian keuntungan/manfaat)

(Source: Ethical Bioprospecting Frameworks Future → Scenario)



Solusi Melalui Bioteknologi & Biologi Sintetik

- ❑ **Pengkulturan Mikroorganisme Laut** (hindari panen berlebih).



- ❑ **Rekayasa Genetik:** Pengekspresian gen dari strain laboratorium organisme laut



- ❑ **AI & Bioinformatik:** Skrining genom untuk mengetahui jalur-jalur biosintesis.

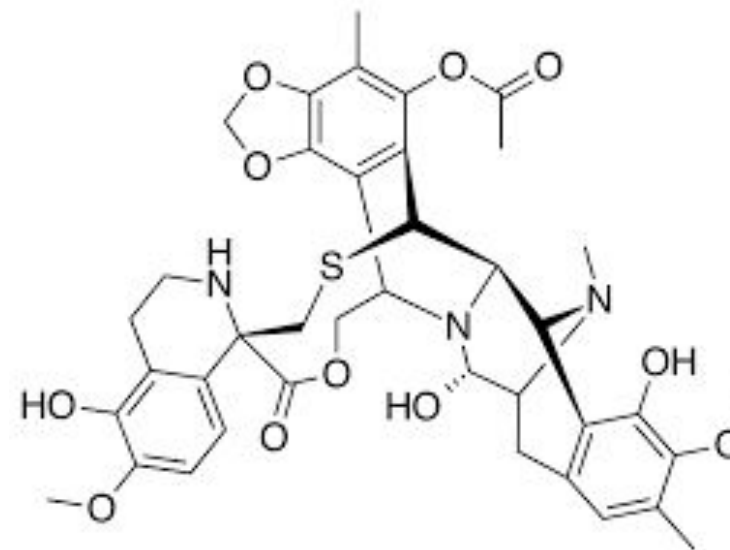


Studi Kasus: Pengembangan Obat dari Organisme Laut

- ❑ **Trabectedin (Yondelis):**
- ❑ Didapat dari organisme *sea squirt* (*Ecteinascidia turbinata*), teruji untuk kanker sarkoma jaringan lunak dan kanker ovum
- ❑ Menunjukkan potensi efek terapeutik dari senyawa yang didapat dari organisme laut dan pentingnya konservasi ekosistem laut



Ecteinascidia turbinata



(Montaser & Luesch, 2011)



Orientasi di Masa Depan

- ❑ **Eksplorasi Laut Dalam:** Kawah hidrotermal, spesies yang belum terjamah.
- ❑ **Dampak Perubahan Iklim:** Hilangnya biodiversitas = hilangnya potensi
- ❑ **Kolaborasi interdisipliner:** Kimiawan, biolog, dan pembuat kebijakan

(Rogers *et al.*, 2012)



Kesimpulan

- ☐ Ekosistem laut penuh dengan harta karun, yakni bahan-bahan alami (termasuk yang baru ditemukan)
- ☐ Penelitian dan konservasi sangat penting untuk sepenuhnya membuka potensi di bidang kesehatan dan inovasi industri



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