An invertebrate with a backbone

by Gregory D. Larsen

SCIENTIFIC NAME
Sepia officinalis

TAXONOMY
PHYLUM: Mollusca
CLASS: Cephalopoda
ORDER: Sepiida
FAMILY: Sepiidae

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Physical description

The common cuttlefish is a cephalopod mollusk that predominantly inhabits shallow waters of the Mediterranean, North and Baltic seas. Common cuttlefish are found near sandy or muddy substrates, where they predate on small fish and invertebrates. They can grow up to 49 cm in mantle length and 4 kg in weight in temperate waters.

Cuttlefish are equipped with eight suckered arms and two longer, fully retractable tentacles, which they use to snatch prey. Cuttlefish lack an external shell and contain their viscera in an exposed mantle located behind the head and arms. A fringe extends from this mantle to form lateral fins.

Like many cephalopods, cuttlefish are colorblind but can discern linearly polarized light, owing to their orthogonally arranged retinal photoreceptors. This ability allows cuttlefish to detect both substrate patterns and other organisms in challenging conditions, such as low light intensity and high water turbidity[1,2]. Such enhanced acuity supports the cuttlefish's activities as a visual predator and camouflage specialist.

Research résumé

Ironically, their impressive camouflage abilities attract substantial research attention to cuttlefish. Cuttlefish make extensive use of visual information to manipulate their skin coloration, texture and arm postures to blend in with complex backgrounds[3,4].

Cuttlefish complement these behaviors with unique physiological features that visually disrupt their discernible body shape, including light-scattering chromatophores and complex papillary muscles[5,6]. These adaptations have inspired biomimetic designs for camouflage technology that attempt to synthetically reproduce the dynamic coloration and texture of cuttlefish skin[7,8].

The field of biomedical materials has also taken a strong interest in the cuttlefish, particularly in a feature that sets it apart from its phyletic peers: its backbone. The cuttlebone, a chambered internal shell composed of calcium carbonate, provides structure to cuttlefish and allows them to control their buoyancy. Researchers have manufactured osteoinductive scaffolds from cuttlebone by transforming its chemical composition to hydroxyapatite while maintaining its natural porous structure to encourage tissue growth and vascularization[9,10]. *In vivo* experiments with rabbits have shown successful tissue growth and bone replacement in cuttlebone-derived scaffolds[11]. With high abundance and low cost, cuttlebone might become an important component in bone reconstruction.

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