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1. **Food availability drives plastic self-repair response in a basal metazoan- case study on the ctenophore Mnemiopsis leidyi A. Agassiz 1865**
   https://www.nature.com/articles/s41598-017-16346-w
   Many marine invertebrates including ctenophores are capable of extensive body regeneration when injured. However, as for the invasive ctenophore Mnemiopsis leidyi, there is a constant subportion of individuals not undergoing whole body regeneration but forming functionally stable half-animals instead. Yet, the driving factors of this phenomenon have not been addressed so far. This study sheds new light on how differences in food availability affect self-repair choice and regeneration success in cydippid larvae of M. leidyi. As expected, high food availability favored whole-body regeneration. However, under low food conditions half-animals became the preferential self-repair mode. Remarkably, both regenerating and half-animals showed very similar survival chances under respective food quantities. As a consequence of impaired food uptake after injury, degeneration of the digestive system would often occur indicating limited energy storage capacities. Taken together, this indicates that half-animals may represent an alternative energy-saving trajectory which implies self-repair plasticity as an adaptive trade-off between high regeneration costs and low energy storage capacities. We conclude that self-repair plasticity could lead to higher population fitness of ctenophores under adverse conditions such as in ships' ballast water tanks which is postulated to be the major vector source for the species' spreading around the globe.

2. **Direct evidence of an efficient energy transfer pathway from jellyfish carcasses to a commercially important deep-water species**
   从水母尸体到重要商业深水物种的有效能量传递途径的直接证据
   https://www.nature.com/articles/s41598-017-17557-x
   Here we provide empirical evidence of the presence of an energetic pathway between jellyfish and a commercially important invertebrate species. Evidence of scavenging on jellyfish carcasses by the Norway lobster (Nephrops norvegicus) was captured during two deployments of an underwater camera system to 250-287 m depth in Sognefjorden, western Norway. The camera system was baited with two Periphylla periphylla (Scyphozoa) carcasses to simulate the transport of jellyfish detritus to the seafloor, hereby known as jelly-falls. N. norveigus rapidly located and consumed a large proportion (>50%) of the bait. We estimate that the energy input from jelly-falls may represent a significant contribution to N. norvegicus energy demand (0.21 to 10.7 times the energy required for the population of N. norvegicus in Sognefjorden). This potentially high energetic contribution from jelly-falls highlights a possible role of gelatinous material in the support of commercial fisheries. Such an energetic pathway between jelly-falls and N. norvegicus could become more important with increases in jellyfish blooms in some regions.

3. **Benthic ctenophores (Platyctenida: Coeloplanidae) in south Florida: environmental conditions, habitats, abundances, and behaviors**
   南佛罗里达州的底栖栉水母（platyctenida：Coeloplanidae）：环境条件、生境、丰度和行为
   http://onlinelibrary.wiley.com/doi/10.1111/ivb.12189/full

Two benthic ctenophores, Coeloplana waltoni and Vallicula multiformis, are contrasted in terms of their coastal environments, habitats, abundances, seasonal occurrences, and behavior in south Florida. Coeloplana waltoni occurs as an epibiont on octocorals in open water settings, and V. multiformis is present in bio-fouling communities, associated with macroalgae, bryozoans, and inanimate substrates in protected, back-water habitats. In our study, individuals of C. waltoni were found under moderate to strong current flow and relatively constant temperature and salinity (T/S) conditions, whereas individuals of V. multiformis occurred at sites of low current flow and more variable T/S conditions. In C. waltoni, individuals generally adhered tightly to host colony surfaces, whereas in V. multiformis, individuals often disassociated from substrates and floated free. Mean population densities of C. waltoni ranged ~500–850 individuals 100 mL−1 (measured as the displacement volume of the octocoral habitat), and densities of V. multiformis ranged 5–360 individuals 100 mL−1 (measured as the displacement volume of the biofouling habitat). Abundance of C. waltoni was significantly highest in the 2014 warm season (June–October) when numerous minute (≤0.5 mm body length) juveniles were present. Vallicula multiformis was abundant in the 2015 and 2016 warm seasons (July–October), and also relatively abundant in the 2016 cool season (March–April). Ctenophore abundance and surface seawater temperature indicate a significant positive response to warm-season conditions in C. waltoni, whereas numbers of V. multiformis did not show any effect of seawater temperature. Recently settled individuals of V. multiformis (≤1.0 mm) occurred throughout the year. Individuals of V. multiformis recruited to fiber-coated sponges during warm and cool periods, with mean body sizes increasing in one cohort from 1.41 to 6.46 mm over a 39-d period, suggesting a growth rate of ~4% d−1. Feeding in both species involves tentacle capture of water-borne zooplankton and particulate organic matter. Individuals of C. waltoni were also observed inserting tentacles into octocoral polyps, possibly pilfering food. Chlorophyll a was detected in extracts of both ctenophore species. The high abundances and feeding behavior of benthic ctenophores could have a strong influence on octocoral and biofouling communities.

4. **The preparation of jellyfish for stable isotope analysis**

用于稳定同位素分析的水母制备

http://onlinelibrary.wiley.com/doi/10.1111/ivb.12189/full

Gelatinous zooplankton are important predators, prey, and nutrient conduits within marine ecosystems. Information obtained from jellyfish stable isotope compositions can be invaluable to biological and environmental research and management. Protocols for best practice in preparing jellyfish for stable isotope analysis, however, require standardisation to provide consistently comparable data, with ecologically significant changes in values due to freezing reported in the literature. Jellyfish are easily sampled during standard marine fieldwork, and usually frozen before analysis. Here, mesoglea from freshly caught moon jelly, Aurelia aurita, were treated by thorough washing and/or freezing, viduals. Jellyfish were captured in July 2013 from Buckler's Hard Marina in southern UK (latitude: 50.801, longitude: - 1.423). Isotope and element ratio changes of carbon and nitrogen composition due to the treatment of the mesoglea were quantified. Both washing and freezing elevated delta N-15 values, with washing also decreasing the variance observed in these values. Untreated mesoglea showed the

lowest delta C-13 values. Carbon-to-nitrogen elemental ratio increased with both washing and freezing. These results imply the presence of a water-soluble, isotopically depleted nitrogenous component in fresh jellyfish mesoglea. The concentration of this component varies among individuals, and thorough washing or freezing are recommended to ensure consistent stable isotope analyses of jellyfish mesoglea. This study describes a methodology aimed at improving the consistency and repeatability of stable isotope analyses of jellyfish.

5. **A gonad-expressed opsin mediates light-induced spawning in the jellyfish Clytia**
光诱导水母 Clytia 产卵
https://elifesciences.org/articles/29555
Across the animal kingdom, environmental light cues are widely involved in regulating gamete release, but the molecular and cellular bases of the photoresponsive mechanisms are poorly understood. In hydrozoan jellyfish, spawning is triggered by dark-light or light-dark transitions acting on the gonad, and is mediated by oocyte maturation-inducing neuropeptide hormones (MIHs) released from the ectoderm. We determined in Clytia hemisphaerica that blue-cyan light triggers spawning in isolated gonads. A candidate opsin (Opsin9) was found co-expressed with MIH within specialised ectodermal cells. Opsin9 knockout jellyfish generated by CRISPR/Cas9 failed to undergo oocyte maturation and spawning, a phenotype reversible by synthetic MIH. Gamete maturation and release in Clytia is thus regulated by gonadal photosensory-neurosecretory cells that secrete MIH in response to light via Opsin9. Similar cells in ancestral eumetazoans may have allowed tissue-level photo-regulation of diverse behaviours, a feature elaborated in cnidarians in parallel with expansion of the opsin gene family.

6. **Indoles induce metamorphosis in a broad diversity of jellyfish, but not in a crown jelly (Coronatae)**
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0188601
Many animals go through one or more metamorphoses during their lives, however, the molecular underpinnings of metamorphosis across diverse species are not well understood. Medusozoa (Cnidaria) is a clade of animals with complex life cycles, these life cycles can include a polyp stage that metamorphoses into a medusa (jellyfish). Medusae are produced through a variety of different developmental mechanisms—in some species polyps bud medusae (Hydrozoa), in others medusae are formed through polyp fission (Scyphozoa), while in others medusae are formed through direct transformation of the polyp (Cubozoa). To better understand the molecular mechanisms that may coordinate these different forms of metamorphosis, we tested two compounds first identified to induce metamorphosis in the moon jellyfish Aurelia aurita (indomethacin and 5-methoxy-2-methylindole) on a broad diversity of medusozoan polyps. We discovered that indole-containing compounds trigger metamorphosis across a broad diversity of species. All tested discomedusan polyps metamorphosed in the presence of both compounds, including species representatives of several major lineages within the clade (Pelagiidae, Cyaneidae, both clades of Rhizostomeae). In a cubozoan, low levels of 5-methoxy-2-methylindole reliably induced complete and healthy metamorphosis. In contrast, neither compound induced medusa metamorphosis

in a coronate scyphozoan, or medusa production in either hydrozoan tested. Our results support the hypothesis that metamorphosis is mediated by a conserved induction pathway within discomedusan scyphozoans, and possibly cubozoans. However, failure of these compounds to induce metamorphosis in a coronate suggests this induction mechanism may have been lost in this clade, or is convergent between Scyphozoa and Cubozoa.

7. **In vivo imaging of epithelial wound healing in the cnidarian Clytia hemisphaerica demonstrates early evolution of purse string and cell crawling closure mechanisms**
   https://bmcdevbiol.biomedcentral.com/articles/10.1186/s12861-017-0160-2
   Background: All animals have mechanisms for healing damage to the epithelial sheets that cover the body and line internal cavities. Epithelial wounds heal either by cells crawling over the wound gap, by contraction of a super-cellular actin cable ("purse string") that surrounds the wound, or some combination of the two mechanisms. Both cell crawling and purse string closure of epithelial wounds are widely observed across vertebrates and invertebrates, suggesting early evolution of these mechanisms. Cnidarians evolved similar to 600 million years ago and are considered a sister group to the Bilateria. They have been much studied for their tremendous regenerative potential, but epithelial wound healing has not been characterized in detail. Conserved elements of wound healing in bilaterians and cnidarians would suggest an evolutionary origin in a common ancestor. Here we test this idea by characterizing epithelial wound healing in live medusae of Clytia hemisphaerica.

   Results: We identified cell crawling and purse string-mediated mechanisms of healing in Clytia epithelium that appear highly analogous of those seen in higher animals, suggesting that these mechanisms may have emerged in a common ancestor. Interestingly, we found that epithelial wound healing in Clytia is 75 to >600 times faster than in cultured cells or embryos of other animals previously studied, suggesting that Clytia may provide valuable clues about optimized healing efficiency. Finally, in Clytia, we show that damage to the basement membrane in a wound gap causes a rapid shift between the cell crawling and purse string mechanisms for wound closure. This is consistent with work in other systems showing that cells marginal to a wound choose between a super-cellular actin cable or lamellipodia formation to close wounds, and suggests a mechanism underlying this decision.

   Conclusions: 1. Cell crawling and purse string mechanisms of epithelial wound healing likely evolved before the divergence of Cnidaria from the bilaterian lineage similar to 600mya 2. In Clytia, the choice between cell crawling and purse string mechanisms of wound healing depends on interactions between the epithelial cells and the basement membrane.

8. **Benthic hydroids (Cnidaria, Hydrozoa) from bathyal and abyssal depths of the Northeast Atlantic held in the modern Discovery Collections**
https://biotaxa.org/Zootaxa/article/view/zootaxa.4347.1.1

The deep-sea benthic hydroid fauna remains poorly known, in part because of less frequent sampling than the shelf fauna, in part owing to the immense study area, and partly also because available samples have been little studied by experts. In order to correct this, deep-sea benthic hydroid material from the modern Discovery Collections has been studied. Samples come from localities in the North-East Atlantic including the Porcupine Seabight, Porcupine Abyssal Plain, Rockall Trough, Rockall Bank, and the Mid-Atlantic Ridge. Sixteen species belonging to 12 families and 16 genera were found. Leptothecata are clearly dominant, being represented by 14 species; the remaining species belong to Anthoathecata. Lafoeidae and Tiarannidae are the most diverse families with three species each; the remaining families being represented by a single species. The low species diversity is remarkable at the generic level, with each genus being represented by a single species. Hydroid occurrence is low: twelve species were found in <= 9% of stations; Amphinema biscayana has the highest occurrence (27% of stations). Fifteen species were recorded in the Porcupine Seabight, two in the Rockall Trough, one at Rockall Bank, one on the Porcupine Abyssal Plain, and two at the Mid-Atlantic Ridge. The known bathymetric range for a third of the species is extended; the increase is particularly noteworthy in Amphinema biscayana, Acryptolaria crassicaulis, Clytia gigantea and Schizotricha profunda. Two distinct bathymetric groups are recognized: strictly deepsea inhabitants and eurybathic species. Most species are globally distributed, some are widely distributed in the Atlantic, and others are limited to the North Atlantic or the Northeast Atlantic.

9. **Morphological plasticity in Aurelia polyps, with subsequent effects on asexual fecundity and morphology of young medusae**
http://www.int-res.com/abstracts/meps/v582/p79-92/

A key step toward better knowledge of the causes and mechanisms of mass occurrences (blooms) in scyphozoan jellyfish is to assess the extent of environmentally induced effects on the phenotype of different phases in their complex life cycle. Laboratory experiments were carried out to quantify the extent of environmentally induced changes in Aurelia sp.9 polyp morphology, and subsequent effects on asexual propagation and ephyra morphology, in response to temperature and food quantity. Size and shape of polyps was highly plastic to environmental variation, and environmentally induced morphology had a significant effect on asexual fecundity and propagation strategy. Polyp size positively correlated with the number of buds, new polyps, and ephyrae produced per polyp, but negatively correlated with investment per bud. Environmentally induced polyp morphology had a significant effect on the morphology of ephyra at release. These findings suggest that asexual fecundity in Aurelia sp.9 polyps is likely ultimately limited by body size, which can be environmentally mediated. This work also shows, for the first time, that polyp and ephyra traits are linked. Environmentally induced variation in polyp morphology can be carried into the next life-cycle phase and affect the morphology of ephyrae at release. We conclude that environmentally induced effects on polyp morphology can potentially control the number of new polyps produced, as well as the number of medusae released into the

water column. Hence, in scyphozoan jellyfish, metamorphosis is not necessarily a new beginning, and environmental conditions experienced by the polyp can have a significant effect on traits of subsequent phases.

10. **Concurrent jellyfish blooms and tenacibaculosis outbreaks in Northern Norwegian Atlantic salmon (Salmo salar)farms**
http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0187476
Tenacibaculosis is an increasing problem in the Norwegian Atlantic salmon aquaculture industry causing significant economic losses. In September 2015, two separate outbreaks of suspected tenacibaculosis occurred at two Atlantic salmon farms in Finnmark County in Northern Norway. The events resulted in major losses of smolts newly transferred into seawater. Prior to, and during the outbreaks, large numbers of small jellyfish, identified as *Dipleurosoma typicum* (Boeck) were observed in the vicinity of the farms and inside the net-pens. This study investigates the possible link between the jellyfish, *Tenacibaculum* spp. and the tenacibaculosis outbreaks. Bacteriology, histology, scanning and transmission electron microscopy, and real-time RT-PCR screening were performed on both fish and jellyfish samples. Based on the findings, *Tenacibaculum finnmarkense*was found to be the dominant bacteria associated with the tenacibaculosis outbreaks at both sites and that *D. typicum* is unlikely to be a vector for this fish pathogenic bacterium. However, results do show that the jellyfish caused direct damage to the fish's skin and may have exacerbated the bacterial infection by allowing an entry point for bacteria.

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