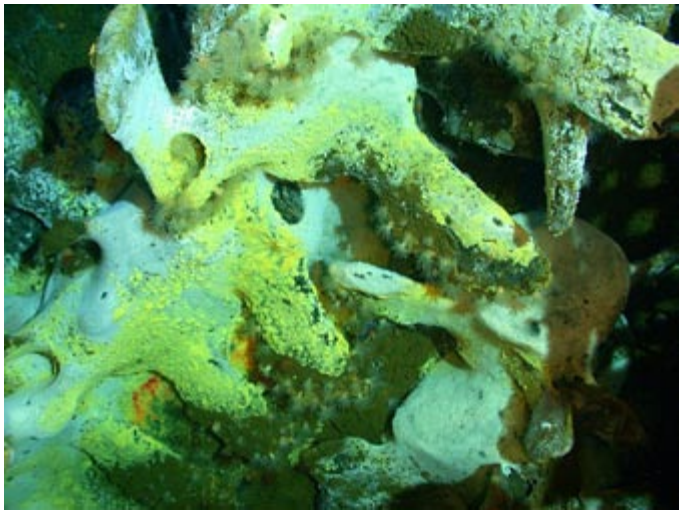

Whale carcass in Santa Cruz (California) after 6 years on the seafloor showing yellow mats as well as other filter feeding animals such as deep-sea anemones attached to the bone. (Copyright, Craig Smith).

the removal of the blubber, but the abandonment of the muscle and tissues. White sharks do concentrate their efforts around these carcasses on the fatty tissues, which may provide more energy per unit of effort in terms of feeding and digestion. However, once the remains of the whale wash ashore, a different community may take advantage. Intertidal communities and other opportunistic ecological entities on shore may profit of the situation. Whale detritus is however a relatively minor source of carrion on beaches and coastal environments, but has been observed to be important for Polar Bears and Artic Foxes. Invertebrates from the intertidal realm, as well as shore birds are the main animal groups exploiting such a massive source of food.

The most normal destiny of a whale carcass is however the deep-sea floor, once the animal has sunk and settled on to the seabed. Ecosystems of the deep-sea are thus a matter of interest and speculation in the way they may respond to these massive inputs of organic matter from the surface waters. Despite of being poorly studied, deep-sea ecosystems created by the whale parcels delivered are known to create significant habitats and could be subjected to periodicity. Four main stages have been recognized (mainly after the work of Prof. Craig R Smith from the University of Hawaii, which provides footage in this article and colleagues), which follow the deposition of a whale body on to the seabed. (a) A mobile-scavenger stage, during which necrophagous fish and invertebrates rapidly remove whale soft tissues. (b) An enrichment-opportunist stage, during which dense assemblages of heterotrophic bacteria and invertebrates colonize the lipid-laden skeleton and surrounding sediments enriched by whale tissues "fallout". (c) A sulphophilic stage, during which chemoautotrophic assemblages colonize the skeleton as it emits sulphide from anaerobic decomposition of internal lipids. (d) A reef stage, during which the hard, elevated skeletal remains are colonized by suspension feeders exploiting flow enhancement.

Unique biodiversity microislands

Deep-sea whale-fall communities, particularly those in the sulphophilic stage, may sustain remarkable levels of both local and global species richness. Whale falls are perhaps the least studied chemosynthetic habitats in the deep-sea, having been intensively sampled only along the California slope as pointed out by Prof. Craig Smith (University of Hawaii). The high species richness sustained in these reservoirs acting as biodiversity microislands against a background of low productivity in the deep-sea, is probably the result of the ample range of nutritional modes that can be derived from the organic matter detritus. A whale skeleton remains supports sulphophiles (e.g., species with chemoautotrophic endosymbionts), bone-matrix feeders, saprophages, generalized organic-enrichment respondents, and typical deep-sea deposit feeders and suspension feeders, all in close proximity (Baco and Smith, 2003). Evidence is becoming available that these habitats may provide shelter for a highly specialized fauna that has adapted to specifically live in whale parcels. Specialists may come from an ample range of taxonomic groups, which diversity suggests that a variety of taxa and trophic "links" have become specifically adapted to whale-fall niches and depend on a variety of resources provided by the whale-fall habitat.

Human impact on whale detritus: the other side of the story

Among the many ways humans influence negatively in the oceans, whale hunting frenzy in the past centuries has caused massive reductions in populations throughout the world oceans. The patterns of whale population depletion, carcass utilization, and, in some cases, whale population recovery, have differed substantially over time, among cetacean species, and among ocean basins. The consequence is that whaling has had complex effects on the availability of great-whale detritus to marine ecosystems. Whaling efforts intensified in the tropical and temperate Pacific in the mid nineteenth century, in Antarctic waters after 1910, and in higher latitudes of the North Pacific and in

Humpback whale (Megaptera novaeangliae) in Dyer Island (South Africa), after being dead and stranded. Note the removal of fat from the body caused by White Sharks activities, but the presence of the muscle and tissues, which are normally not consumed.

the Bering Sea as late as the 1950s. However, for many large species (e.g., Fin, Sperm, Blue, Humpback, and Minke whales), the bulk of the worldwide take occurred between approximately 1920 and 1980 (i.e., during 1-2 generations of a great whale), with the International Whale Commission estimating that roughly 2 million great whales were harvested from the oceans over this period.

Modern whaling leaves little detritus anywhere for the marine ecosystem because entire carcasses are processed on factory ships or on shore. Thus, with very localized exceptions (e.g., the inter- and subtidal in the immediate vicinity of whaling stations), harvested carcasses were essentially removed from pelagic, shelf, and intertidal ecosystems. As in the case of shallow marine systems, whaling could potentially have caused a dramatic decline in whale-fall habitats at the deep-sea floor, leading to extinction of whale-fall specialists and limiting the dispersal capabilities of species dependent on sulphide-rich whale skeletons as habitat steppingstones. Natural whale mortality is likely to have spread along migration routes, in calving grounds, or in regions where whales spend substantial portions of their life cycles. Second, ultimately, whaling decreased the flux of carcasses to the deep-sea floor because whale populations were driven downward, leaving far fewer whales to suffer natural mortality and sink to the seafloor. All this may have caused a retarded effect on episodic extinction events, and the oceans may now be suffering from the activities of the past.

Whale carcasses are defined as end members in a wide spectrum of marine detritus, constituting the largest, most energy-rich organic parcels in the ocean. Most great-whale carcasses sink in a semi-intact state to the deep-sea floor, where they are recycled by a succession of scavenger, enrichment-opportunist, and sulphophilic assemblages of biota. Commercial whaling has drastically reduced the flux of this whale detritus to the marine ecosystems. In i.e., intertidal habitats, this may have caused population declines in some highly scavenging species dependent on whale remains. At the deep-sea floor, whaling may have led to substantial habitat loss to whale-fall communities and probably caused the first anthropogenic extinctions of marine invertebrates in the 1800s in the North Atlantic. Once again, human intervention is changing the course of natural events in ways that may be highly unpredictable. Human beings are well-defined by their predatory nature, since it constitutes one of the only ways of successfully surviving in a complicate environment. Yet, we do not normally tend to think that our proximate actions may have a repercussion ultimately far away from us. If we keep ignoring the alerting signals that our surroundings give us we are only harming ourselves. Probably this will not happen in the near future, but unless a widespread public understanding of the science is achieved soon, natural events will be modified in ways with unprecedented consequences for all.

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Guidelines for contributors

The response to UwP has been nothing short of fantastic. We are looking for interesting, well illustrated articles about underwater photography. We are looking for work from existing names but would also like to discover some of the new talent out there and that could be you! UwP is the perfect pubication for you to increase your profile in the underwater photography community.

The type of articles we're looking for fall into five main categories:

Uw photo techniques - Balanced light, composition, etc
Locations - Photo friendly dive sites, countries or liveaboards
Subjects - Anything from whale sharks to nudibranchs in full detail
Equipment reviews - Detailed appraisals of the latest equipment
Personalities - Interviews/features about leading underwater photographers

If you have an idea for an article,
contact me first before putting pen to paper.
E mail peter@uwpmag.com

How to submit articles

To keep UwP simple and financially viable, we can only accept submissions by e mail and they need to be done in the following way:

1. The text should be saved as a TEXT file and attached to the e mail
2. Images must be attached to the e mail and they need to be 144dpi

Size - Maximum length 15cm i.e. horizontal pictures would be 15 cm wide and verticals would be 15cm.

File type - Save your image as a JPG file and set the compression to "Medium" quality. This should result in images no larger than about 120k which can be transmitted quickly. If we want larger sizes we will contact you.

3. Captions - **Each and every image MUST have full photographic details** including camera, housing, lens, lighting, film, aperture, shutter speed and exposure mode. These must also be copied and pasted into the body of the e mail.

Parting Shot

My student Mat Kertesz and I were down at Jervis Bay on the east coast of NSW, Australia (about 2 hours south of Sydney) where he is doing his Honours project with the Marine Park Authority on Underwater Visual Census Techniques. Mat must have a charmed life, his Honours project consists of doing dozens of dives counting fish in one of the most beautiful bays in NSW and one that is teeming with fish life, of all shapes and sizes.

I had come down to see him in action and had brought my camera down to get some photos of him working so that he can use them in seminars once he completes his field work. I have a Nikon D70 in a NEXUS housing and splashed out earlier in the year to put a NikonN 12-24mm DX behind the dome port. A lovely system and my trusty old Nikonos SB105 still does a fair job for lighting even if I no longer have TTL now I've gone digital. What this means is that just for once I had the wide angle lens sitting ready to shoot.

We had just completed the first dive for the day when Sue our boat driver from marine parks received reports of an oil slick near the head of the bay. So we motored over to see if we could find the source. As we were moving Mat yelled out "Shark". Sue and I looked back and there was an enormous floppy fin sticking out of the water. I've seen sunfish on several whale surveys but never when I've had my dive gear, and especially not with my camera sitting in its housing.

So I suited up and slipped over the side and snorkeled towards where I thought the sunfish would be. We were in 40m water and it was not all that clear and Mat and Sue kept yelling "It's straight in front of you". Eventually it loomed up out of the gloom and I started firing away as I snorkeled as fast as I could. A dark shadow gradually became a huge, beautiful fish.

The Ocean Sunfish (Mola mola) is very common off these coasts and is a boating hazard for the Sydney Hobart yacht race (*Shouldn't that be the other way round? Ed*), but ones as big as this are not seen that often. I kept swimming closer and closer but as I was looking through my viewfinder I couldn't tell exactly how big it was. Mat joined me and when he swam around the back of the fish I realized it was probably 3.5 to 4m from wingtip to wingtip. Keeping the whole fish in the frame put me a long way away even on 12mm. We swam with it for only a few minutes and it graced us with several turns about then just before it left us it turned and headed straight for me which is when I got this shot of Mat and Mola mola.

As I said before Mat must have a charmed life. Not only has he swum with the biggest sunfish that I can find records for, but he has just been named the Inaugral OW-USS Australasian Rolex Scholar 2007/8 (www.owuscholarship.org/) and will spend the next 12 months sponsored to dive all over the place with all sorts of amazing marine creatures while promoting marine conservation.

Rob Harcourt
rharcour@gse.mq.edu.au

Ps we never did find the source of the slick but it smelt more like vegetable than motor oil and might have been cooking oil dumped by a passing yacht. Will they never learn?

Nikon D70 in Nexus Housing, 12-24mm DX lens set at 12mm, SB105 full power, f8, 1/125 sec

Do you have a nice shot with a short story behind it?
If so e mail me and yours could be the next "Parting shot".

peter@uwpmag.com