Edited by **Jennifer Sills**

Grieving environmental scientists need support

Rates of environmental destruction are greater today than at any previous point in human history (*1*). This loss of valued species, ecosystems, and landscapes triggers strong grief responses in people with an emotional attachment to nature (*2*). However, environmental scientists are presented with few opportunities to address this grief professionally.

Environmental scientists tend to respond to degradation of the natural world by ignoring, suppressing, or denying the resulting painful emotions while at work (*3*). The risks that this entails are profound. Emotional trauma can substantially compromise self-awareness, imagination, and the ability to think coherently (*4*). As Charles Darwin put it, one "who remains passive when overwhelmed with grief loses [the] best chance of recovering elasticity of mind" (*5*).

Academic institutes must allow environmental scientists to grieve well and thus emerge stronger from traumatic experiences to discover new insights about our rapidly changing world. Much can be learned from other professions in which distressing circumstances are commonplace, such as health care, disaster relief, law enforcement, and the military. In these fields, well-defined organizational structures and active strategies exist for employees to anticipate and manage their emotional distress (*6*). Effective systems can facilitate healthy grieving processes, enhance psychological recovery, and reduce the risk of long-term mental health impacts, potentially leading to better practice, decision-making, and resilience in future periods of trauma (*7*–*10*). Improved psychosocial working environments for scientists might include systematic training of employees, early-intervention debriefing after disturbing events, social support from colleagues and managers, and therapeutic counseling.

The pervasive illusion that scientists must be dispassionate observers is dangerously misguided. Rather, grief and post-traumatic recovery can strengthen resolve and inspire scientific creativity. To understand and find solutions for our increasingly damaged natural ecosystems, environmental scientists must be allowed to cry and be supported as they move forward.

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10.1126/science.aaz2422

Tibetan hot-spring snakes under threat

Endemic to the Tibetan Plateau, the hot-spring snake (*Thermophis baileyi*) is a relict species that depends on the heat in geothermal zones to survive (*1*–*4*). The only snake species found on the Changthang Plateau (*5*), this sole survivor of the suborder Serpentes (*5*) has lived for millions of years (*2*, *3*) in natural caves, stone seams, and crannies (*6*). These shelters, along with wetlands harboring the snake's diet (tadpoles, toads, frogs, and fish) (*7*), are essential for the survival of the hot-spring snake in this high, cold, and arid habitat.

The local Tibetans believe that hot-spring water can cure many diseases and that the hot-spring snake is the patron saint of these waters [e.g., (*8*)]. In recent years, most of the hot springs in the areas where the snakes live have been put to use for commercial exploitation (*6*). Although Tibetans do not directly hurt snakes, their modifications to the natural stone topology and wetland landscape have unwittingly resulted in the loss of the snake's shelters and food (*6*). In turn, these local snake populations face extinction (*6*). The construction of roads and thermoelectric plants is even more devastating for the species (*6*). It is estimated that a total of 15 billion yuan (equivalent to US$2.1 billion) will eventually be invested in Tibet for the comprehensive exploitation of geothermal resources (*9*). The hot-spring snake urgently needs help.

It is possible to protect and restore hot-spring–snake populations without compromising the economic development and well-being of Tibetans. To do so, both the government and the public must give more attention and financial support to this species. Scientists must conduct comprehensive and detailed population resurveys, and natural shelters must be protected or artificial snake dens built. Stillwater wetlands should be restored and frogs and toads reintroduced to the habitats. Finally, it will be crucial to monitor the snake population before, during, and after any construction projects involving geothermal resources.

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10.1126/science.aay9077

Recovered Tibetan antelope at risk again

The Tibetan antelope (*Pantholops hodgsonii*) is an iconic species endemic to the Tibetan Plateau and is the last long-distance migratory ungulate in the region (*1*). From 1950 to the early 1990s, the species' population declined by 90% due to rampant illegal poaching (*2*). Thanks to the joint conservation efforts of the Chinese government and international community since the late 1990s, the population has recovered to 200,000 individuals (*3*). However, the Tibetan plateau is currently experiencing accelerating climate change (*4*), and the antelope now faces severe climate change–related threats.

Every summer, tens of thousands of antelopes from multiple wintering areas migrate hundreds of kilometers to a shared calving site at Zonag Lake in Hoh Xil Nature Reserve (*5*). However, in September 2011, a combination of heavy precipitation, increased glacier melting, and permafrost thawing increased water levels, causing the natural dam containing Zonag Lake to burst (*6*). The resulting flood formed deep-cutting riverbanks along the traditional antelope migration route, flowing eastward and converging on downstream Yanhu Lake, known for its high salinity (*7*). A potential spillover of Yanhu Lake is expected in the next 1 to 2 years (*6*). Meanwhile, the drained Zonag Lake's area is 40% smaller than its original size (*8*).

These changes to the landscape have serious ramifications for antelope survival. The newly formed riverbanks obstruct the traditional migration route. Antelopes have been observed diverging from the route and are forced to calve along the shore of the downstream Kusai Lake (*8*). The few individuals that have managed to migrate to the Zonag Lake have had limited access to water surfaces because of its decreased size. Disruptions to migration routes and calving sites are known to cause decreased reproductive success and fitness in ungulate populations (*9*, *10*). If Yanhu Lake were to spill over, the high salinity would lead to catastrophic degradation of the Hoh Xil grassland ecosystem, upon which Tibetan antelopes rely for survival.

Extreme climate-related hazards to wildlife and ecosystems, now occurring worldwide, must be recognized and addressed decisively. To ensure the continued conservation of Tibetan antelopes, the ecological integrity of their current home range must be preserved.

We call on policy-makers to facilitate scientific monitoring and research, explore evidence-based management options, and act swiftly to save one of China's historic conservation success stories.

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10.1126/science.aaz2900

Tibetan antelopes, a conservation success story, now suffer from climate change–driven habitat disruption.

TECHNICAL COMMENT ABSTRACTS

Comment on "Cultural flies: Conformist social learning in fruitflies predicts long-lasting mate-choice traditions"

Stephen Thornquist and Michael Crickmore

The claims of Danchin *et al.* (Research Articles, 30 November 2018, p. 1025) regarding long-lasting mate preference based on conformity may result from systematic experimental error. Even if mate copying were a genuine phenomenon, it is unlikely to result in persisting culture in the wild.

Full text: dx.doi.org/10.1126/science.aaw8012

Response to Comment on "Cultural flies: Conformist social learning in fruitflies predicts long-lasting mate-choice traditions"

Arnaud Pocheville, Sabine Nöbel, Guillaume Isabel, Etienne Danchin

Thornquist and Crickmore claim that systematic experimental error may explain the results of Danchin and colleagues. Their claim rests on mistakes in their analyses, for which we provide corrections. We reassert that conformity in fruitflies predicts long-lasting mate-preference traditions.

Full text: dx.doi.org/10.1126/science.aaw9549

Science

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Science **366** (6462), 193.
DOI: 10.1126/science.aaz2422

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