

In This Issue

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HUMAN HEALTH

Sustainable Livelihoods (SL) and Ecosystem Health (ESH) are two approaches used for the study of human health and well-being. Within ESH and SL, there are both ecological scientists who have adopted the concept of health, as well as social scientists who have adopted the concept of sustainability. **Connell** explores methodological aspects of this relationship, revealing interdependence among variables: The dependent variables of one approach can be used as the independent variables of the other. This suggests that by deliberately selecting interdependent variables, it is possible to use this structural relation as a point of collaboration among researchers and practitioners. In another article, **Cline et al.** discuss Sin Nombre virus (SNV), which causes Hantavirus Cardiopulmonary Syndrome (HCPS) in humans. Cases of HCPS predominate from spring–summer, and are generally contracted in peridomestic settings associated with human activities which aerosolize dust, resulting in inhalation of virus-contaminated deer mouse excreta. Little is known about how human use of outbuildings contributes to SNV exposure. The authors evaluated the frequency and seasonality of outbuilding use, via survey of rural residents in western Montana. Human behavior is a component of SNV transmission, and activities identified in this study provide a basis from which to further evaluate this route of SNV exposure.

FOOD SECURITY

In the Philippines, fish are an essential source for human consumption. Pamana, a Philippine alliance of marine protected area managers, is introduced as an organization that responds directly to the linkage between environmental

and human health. **Añabieza et al.** make conclusions that are supported by survey results involving Pamana fisherfolk and community health workers. The history and function of this grassroots organization is outlined to justify their designation as Ecohealth Practitioners. The Pamana process of leadership development for Philippine Ecohealth is traced from the personal action of individual fisherfolk to national consensus and ongoing strategic development. Emphasis is placed upon the potential Ecohealth role of grassroots organizations in less-developed countries. An article by **Wesche and Chan** shows the effects of climate change on availability and accessibility of key species of traditional food in the western Canadian Arctic, and potential impacts on the health of the Inuit. Traditional food is important to maintain the nutritional health of the Inuit. This article also illustrates the factors affecting regional versus local differences in vulnerability and adaptive capacity. Such information provides a basis for the local health authorities to plan for adaptation options to maintain food security. This study serves as an example of the need for an interdisciplinary approach to study impacts of global climate change on Ecohealth.

HEMATOLOGY OF SOUTHERN BEAUFORT SEA POLAR BEARS

Changes in climate and sea ice conditions are predicted to affect arctic ecosystem health. In two studies, **Kirk et al.** investigate the southern Beaufort Sea polar bears. In the first, the authors establish hematological reference ranges, based on 3 years of data for Beaufort Sea polar bears, so that they may serve as a sentinel for the arctic ecosystem. Data suggest that females with dependent young may be most vulnerable to these climate changes and may be ideal

sentinel species. In the second study, hematological parameters and serum antibodies to *Toxoplasma gondii*, and four morbilliviruses were measured in polar bears captured in the southern Beaufort Sea. The results indicate that hematology may be an effective biomarker for monitoring the health of polar bears.

SCATOLOGICAL INDICATORS

Respiratory disease represents one of the major threats for wild great apes habituated to human presence in either research or tourism settings. The evaluation of the prevalence of respiratory pathogens in wild primate populations is key to designing successful conservation strategies. In this study, **Köndgen et al.** demonstrate that fecal samples collected from chimpanzees during outbreak times can be used for the detection of respiratory pathogens. Using such methods, systematic noninvasive disease investigation of respiratory outbreaks in wild chimpanzees becomes possible.

IMPACT OF POLLUTION ON WILD ANIMALS

Oxidative stress (OS) may be characterized by the increased production of oxidizing agents or the decreased ability to defend using antioxidants. OS is a unifying feature underlying the toxicity of pollutants, and the ultimate culprit in the development of many diseases. A meta-analysis by **Isaksson** reveals that, as predicted, there is an overall increase in OS when living in polluted environments, mainly due to increased oxidative damage. Regarding more specific biomarkers, glutathione is the most reliable. This result is important when using noninvasive sampling of endangered species. To predict future population outcomes and possible treatments, a better integration of micro- and macro-physiology and population ecology is needed.

MODELING AVIAN INFLUENZA IN WILD WATERBIRDS

In an article by **Penny et al.**, the authors use seasonal wild waterbird dynamics at Lake Constance in Europe to estimate the incidence risk of an outbreak of Highly Pathogenic Avian Influenza (HPAI) H5N1 in April 2006. To achieve this, they parametrize a simple deterministic model of HPAI transmission among wild waterbirds. The out-

break was self-limiting, most likely because of the outward migration of the susceptible bird population at that time of the year. The estimated incidence risk is used further to estimate the risk of transmission to domestic poultry. **Cappelle et al.** combine two different spatial distribution modeling approaches (GLM and BRT model) of a wildlife reservoir with an epidemiological indicator to identify areas with a higher risk of circulation of avian influenza viruses in the Inner Niger Delta, Mali. This area—where over a million wild waterbirds originating from the Palearctic and Africa congregate—is a potential hub for avian influenza circulation. The model uses high-temporal resolution, environmental, remotely sensed indicators to predict, in real-time, the spatial distribution of different groups of species. The use of 10-day composite environmental indicators allows taking into account the high variability of the Inner Niger Delta ecology and characteristics of tropical ecosystems. This method does not rely on data from past outbreaks, which makes it particularly interesting for the surveillance of emerging infectious diseases.

SALMONELLOSIS AND GARDEN BIRDS

Lawson et al. found salmonellosis to be the most frequent infectious cause of death of garden birds in England and Wales from 1993 to 2003. Only seven of 45 bird species examined were diagnosed with salmonellosis, with the greenfinch and the house sparrow most frequently affected. Most salmonellosis deaths occurred in the winter months. In all cases, the cause was *Salmonella typhimurium* infection, but there was variation in the temporal and spatial distribution of the phage types involved. It is important to find out if salmonellosis impacts wild bird populations or if outbreaks may be caused by human factors.

AMPHIBIANS: NEW INVESTIGATIONS

Intersex in amphibians has been linked with exposure to agricultural pesticides, based on laboratory exposure experiments. Studies of free-living amphibians have confirmed a positive association between proximity to agriculture and intersex, but other landscape types have not been studied. **Skelly et al.** show that intersex in wild populations of the green frog (*Rana clamitans*) is higher in suburban areas than in agricultural or other landscape types. These results suggest that hypotheses for intersex

other than exposure to agricultural pesticides deserve consideration. Despite the increasing evidence suggesting that some amphibian species never develop chytridiomycosis upon infection with *Batrachochytrium dendrobatidis*

(Bd), the mechanisms of disease resistance are not well understood. **Márquez et al.** demonstrate a temperature-independent, and likely immunological, mechanism for the clearance of Bd in a resistant amphibian species.