

## Project information

### Project title

Effects of pollutants and other stress factors on northern raptors: RAPTOR

### Year

2012/2013

### Project leader

Jan O. Bustnes, NINA

### Participants

#### Leader

- Jan Ove Bustnes, NINA

#### Participants

- Dorte Herzke, NILU
- Sveinn Are Hanssen, NINA
- Adrian Covaci, University of Antwerpen
- Christian Sonne, DMU

### Flagship

Hazardous substances, Theme: Animal health and ecosystem

### Funding Source

Fram Centre

### Summary of Results

This project involves NINA and NILU along with numerous international collaborators. The main objective of this project is to understand variations in different environmental contaminants in populations of high trophic raptors; both marine and terrestrial species. Special focus is on how environmental contaminants may function in concert with other natural and anthropogenic stressors; i.e. a multi-stress perspective. Of special interest is how climate change will influence the accumulation and effects of POPs in such species (Bustnes et al. 2011). In 2012, we have analyzed and published data, in addition to collecting data on sea eagles as a part of a long-term monitoring of effects. Several effect parameters are measured over several years; oxidative stress, immunology and blood parameters, and how these parameters are affected by pollutant levels. Blood samples and ecological data have been collected from 17 sea eagle chicks last summer.

In 2012 focus has been on understanding accumulation of POPs in top predators of different ecosystems in northern Norway; woodland, mountain ecosystems and marine ecosystems. The results show species and ecosystem specific accumulation of POPs (Eulaers et al. submitted). It has also been documented that POPs are associated with blood chemical parameters, suggesting that it may have adverse effects in eagles and goshawk (Sonne et al. 2012). In addition, we have analyzed experimental data on stress effects in raptor nestlings. This shows that a natural stressor such as parasites influences stress levels (Hanssen et al. submitted). Finally, special focus has been on unraveling the factors that influence the accumulation of both lipid-soluble OCs and PFOS in raptor nestlings. This is particularly relevant in connection with monitoring long-term trends of POPs. A central question has been whether chicks accumulate POPs during the growth phase or, whether it is dominated by maternal transfer. The analyses showed that most POPs tend to increase over the growth phase, especially PFOS. In addition, for lipid-soluble POPs there was a strong relationship to diet. This suggests that plasma of raptor chicks quite well reflect local contamination and are thus suitable for monitoring projects (Bustnes et al. in revision).

### Published Results/Planned Publications

- Bustnes, J. O., Yoccoz, N., Bangjord, G., Herzke, D., Ahrens, L., & Skaare, J. U. 2011. Impacts of climate and feeding condition on the annual accumulation (1986-2009) of persistent organic pollutants in a terrestrial raptor. *Environmental Science & Technology* 45:7542-7547.
- Sonne, C., Bustnes, J.O., Herzke, D., Jaspers, V., Covaci, A., Halley, D., Minagawa, M., Moum, T., Eulaers, I., Ims, R.A., Hanssen, S.A., Erikstad, K.E., Johnsen, T.V., Shnug, L. & Jensen, A.L. 2012. Blood plasma clinical-chemical parameters as biomarker endpoints for organohalogen contaminant exposure in Norwegian raptor nestlings. *Ecotoxicology and Environmental Safety* 80: 76-83.

#### In revision:

- Bustnes, J.O., Bårdsen, B. J., Herzke, D., Johnsen, T.V., Hanssen, S.A., Eulaers, I., Ballesteros, M., Covaci, A., Jaspers, V.L.B., Eens, M., Sonne, C., Halley, D.J., Moum, T., Erikstad, K.E. & Ims, R.A. Persistent organic pollutants in plasma of raptor nestlings from marine and terrestrial ecosystems: the impact of growth rate and diet. *Environmental Science & Technology*

#### Submitted:

- Hanssen, S.A., Bustnes, J.O., Sonne, C., Herzke, D., Jaspers, V., Covaci, A., Halley, D., Moum, T., Eulaers, I., Ims, R.A., Erikstad, K.E., Johnsen, T.V., Shnug, L. & Jensen, A.L. Relieving the stress; anti parasite treatments reduces immune activity and oxidative stress in raptor nestlings.
- Eulaers, I., Jaspers, V.L.B., Bustnes, J.O., Covaci, A., Halley, D.J., Johnsen, T.V., Halley, D.J., Moum, T., Ims, R.A., Hanssen, S.A., Erikstad, K.E., Herzke, D., Sonne, C., Ballesteros, M., Pinxten, R., & Eens, M. Intra- and inter-specific ecology drives differences in bioaccumulation of persistent organic pollutants in subarctic nestling predatory birds.

#### Communicated Results

Results have been presented in different conferences; e.g. the Dioxin conferences in 2009, 2010 and 2011.

Bustnes J.O. *Exposure of persistent organic pollutants in avian top predators in a changing northern climate*. SETAC 6<sup>th</sup> world congress, 20-24 may 2012, Berlin, Germany.

#### Interdisciplinary Cooperation

Ecology, physiology, chemistry

#### Budget in accordance to results

It has been essential for continuing the research on raptors, which is especially important for the continuity of the multi-stress perspective.

#### Could results from the project be subject for any commercial utilization

No

#### Conclusions

- The project is the first to measure OCs, brominated flame retardants and PFCs in raptor chick blood and feathers (adults and young) in northern Norway. The future perspective of this project will be to understand the long-term dynamics of POP impacts in sea eagles.
- Validation of a promising new technique developed in this project is the use of raptor feathers to monitor POPs in populations.