

Käytännön bioindikaattorit, opintojakson kuulustelu
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1. Mitä yhteyttä on yhdyskunnan analyysillä ja bioindikoinnilla?
2. Ympäristömyrkykuormituksen bioindikointi
3. Mitä tarkoittaa ja merkitsee oheinen englanninkielinen teksti?
4. Valtakunnan metsien inventointi (VMI)
5. Vertaile käsitteitä bioindikaattori, biomarkkeri, ympäristövaikutusten arviointi

OPINTOJAKSOJA KOSKEVAT KOMMENTIT OLISIVAT TERVETULLEITA!
(Kirjoita parannusehdotuksia luennoista, harjoituksista, kuulusteluista, ym joko tähän paperiin tai jätä anonyyminä erillinen lappu!)

Poor reproduction of forest birds due to decline of snail abundance on acidified soils

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There is increasing evidence that a large proportion of birds breeding in acidified areas has a low reproductive success owing to calcium deficiency. Here we report on a study on Great Tits, *Parus major*, and other forest birds in The Netherlands. We found that 25-45% of the females nesting on acidified, calcium-poor soils produce eggs with defective shells. Defective eggs failed to hatch due to breakage of the shell or desiccation. Eggshell defects did not occur on nutrient-rich soils. A feeding experiment showed that the eggshell defects were caused by calcium deficiency. It was also demonstrated that proper eggshell formation in Great Tits and most other songbirds depends on the intake of calcium-rich material during the egg-laying period.

Snail shells were the main calcium source of Great Tits in forests where eggshell defects did not occur but snails were hardly present in forests with high rates of eggshell defects. Observational and experimental data showed that the scarcity of snails was mainly caused by the low calcium content of the soil and that snails were more abundant in the past. Since acid deposition has been the main cause of a decrease in the calcium content of such soils I conclude that the present high rates of eggshell defects are caused by calcium deficiency as a result of acid deposition.

Birds are very sensitive to low calcium availability owing to the high calcium demand and the limited time in which they can collect calcium for eggshell formation. It is unlikely that snail populations recover soon after emission reduction plans have become effective because the recovery requires an increase in the amount of calcium in the soil solution. We expect therefore that the rate of eggshell defects will continue to increase even if emissions are reduced as planned.