



**THE EFFECT OF HABITAT CHANGE ON THE  
STRUCTURE OF DUNG BEETLE ASSEMBLAGES  
IN THE NORTH-EASTERN FREE STATE: A  
COMPARISON OF CONSERVED AND FARMED  
LAND**

by

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## SUMMARY

The effect of habitat transformation on dung beetle assemblages in the north-western Free State was investigated by comparing the fauna of a nature reserve (Sandveld Nature Reserve (SNR) (27°37'S;25°46'E)) with that on neighbouring farms. Dung beetle sampling was done in four different localities within two different habitat types, a grassveld area and a bushveld (savanna) area. In these two habitat types dung beetle assemblages in SNR and on farms were compared. The grassveld habitats were dominated by larger dung beetles belonging to FG I and II, while in the bushveld habitats smaller dung beetles belonging to FG IV and V were dominant. None of the indices measuring species richness nor dominance showed significant differences between the four habitats. This does not, however, imply that the dung beetles were similarly affected by the different habitats, because the biomass of dung beetles was higher in the grassveld than the bushveld habitats and also higher in the natural habitats. A change in vegetational ground cover caused by overgrazing and trampling has a greater effect on the larger, more effective competitors in the assemblage, while the smaller less effective competitors do not seem to be affected by this change. Continued adverse environmental disturbances caused by farming activities such as overgrazing have placed stress on dung beetle assemblages on farms. These disturbances have influenced the dung beetle assemblages on farms in such a way that their ecological role in the grazing ecosystem has been affected. A simple model was constructed to describe the most important factors influencing dung beetle assemblages and the key variables responsible for changes in the assemblages were determined. The focus of this study was on the dung beetle assemblages in a particular habitat and their ecological role in an ecosystem. The important shared parameters in this system were human impact, season and habitat as external factors and succession, diel activity, aggregation and dung preferences in dung beetle assemblages as internal factors. Two key variables could be extracted, *ie.* influence of habitat and the size of the dominant species in this habitat. These two key variables represent the essentials of the system and by looking at them predictions can be made as to which direction the dung beetle assemblage in a habitat will move. This will then enable us to make predictions about the condition of the habitat.



**Key words:** Dung beetle assemblages; grazing ecosystem; overgrazing; habitat transformation; seasonal variation; diel flight activity; succession; dung preferences; aggregation; ecological role; dominant species; size index.





## OPSOMMING

Die invloed van habitat transformasie op miskruier gemeenskappe in die noord-wes<sup>005</sup> Vrystaat is ondersoek deur fauna in 'n natuurreservaat (Sanveld Natuurreservaat (SNR) (27°37'S;25°46'E)) te vergelyk met dié op aangrensende plase. Opnames van miskruier gemeenskappe is in vier lokaliteite binne twee habitat tipes gedoen, 'n grasveld habitat en 'n bosveld habitat. Binne hierdie habitat tipes is miskruiers in die natuurreservaat vergelyk met dié op die plase. In die grasveld habitatte was groter miskruiers wat aan FGI en II behoort dominant, terwyl kleiner miskruiers (FG IV en V) in die bosveld habitatte dominant was. Indekse wat spesies rykheid of dominansie meet het geen betekenisvolle verskille tussen die habitatte getoon nie. 'n Hoër biomassa van miskruiers in die natuurlike grasveld as in die bosveld en op die plase het egter daarop gedui dat miskruiers in die verskillende habitatte verskillend beïnvloed word. 'n Verandering in plantbedekking as gevolg van oorbeweiding en vertrapping het 'n groter invloed op die groter, meer effektiewe kompeteerdere, terwyl dit blyk asof die kleiner miskruiers nie deur hierdie verandering beïnvloed word nie. Aanhoudende versteuring van die habitat, a.g.v. verkeerde boerderypraktyke soos oorbeweiding het 'n negatiewe invloed op miskruier gemeenskappe op plase. Hierdie miskruier gemeenskappe word tot so mate beïnvloed dat hulle ekologiese rol in die omgewing benadeel word. 'n Eenvoudige model is opgestel om die belangrikste faktore wat miskruier gemeenskappe beïnvloed te beskryf en die kern veranderlikes verantwoordelik vir veranderinge in die gemeenskappe is bepaal. Die fokus van die studie was miskruier gemeenskappe in 'n spesifieke habitat en hul ekologiese rol in 'n ekosisteem. Die veranderlikes in hierdie sisteem was menslike impak, seisoen en habitat as eksterne faktore en suksessie, daaglikse fliegaktiwiteit, aggregasie en misvoorkeure as interne faktore. Die kern veranderlikes was invloed van habitat en grootte van die dominante spesies in die habitat. Hierdie veranderlikes verteenwoordig die kern van die sisteem en deur daarna te kyk kan voorspellings gemaak word oor die toestand van die habitat.





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