Waterfowl indispensable for wetland biodiversity

Waterfowl play an increasingly important role in maintaining the biodiversity of wetland areas. That is the conclusion reached by Doctoral Candidate Erik Kleyheeg based on his research into the dispersal of plant seeds by mallard ducks. He discovered that each individual mallard can distribute thousands of seeds each year, and that they transport seeds over longer distances in drier areas than in wetland regions. This is good news, because the farther suitable habitats for a plant are from one another, the more difficult it is for them to disperse without the help of birds. Erik Kleyheeg will defend his dissertation on 23 September at Utrecht University.

For the plants that live in them, wetlands are, in the words of Charles Darwin, 'islands in a sea of land'. Their seeds are very unlikely to reach other wetland areas carried by water or wind, so the distribution of seeds by waterfowl is crucial for the survival of these plant species. Erik Kleyheeg has shown that the mallard (*Anas platyrhynchos*) plays a vital role in seed dispersal. Each year, approximately one million mallards spend the winter in the Netherlands.

Kleyheeg's research has shown that mallards eat large amounts of plant seeds. With their inefficient digestive systems, many of the seeds that pass through the ducks are still capable of germination. Most mallards visit several different water bodies each day in search of food, so there is a good chance that the seeds will end up in another suitable habitat.

By attaching small GPS receivers to the backs of the ducks, Kleyheeg was able to observe how often mallards moved, and over which distances. He found that mallards covered much larger distances in drier areas than ducks in wetland regions. This ensured the effective dispersal of seeds from and towards more isolated wetlands. "This is good news for biodiversity, because the number of wetland areas is decreasing dramatically in many parts of the world", according to Kleyheeg.

In order to determine which plant species were spread by wild ducks, Kleyheeg studied the intestines of ducks that had been shot by hunters. The digestive tracts of these ducks contained a surprisingly diverse collection of seeds, from typical aquatic plants to cultivated garden plants and even acorns. Kleyheeg concluded that ducks are true omnivores: "Any seed that can be found in or around the water has a chance of being eaten."

However, the consumption of the seed is just the first step. The real challenge is surviving the duck's digestive system, because mallards eat the seeds in order to digest them. Feeding experiments and simulation of the digestive processes in the lab showed that small seeds with hard seed coats had a fairly good chance of survival. The duck's gizzard, where seeds are ground up using small stones, was the main obstacle along the way. But due to the large variation in digestive efficiency among individual ducks and over time, even weaker seeds have a good chance of being dispersed successfully.

On the day before Erik Kleyheeg defends his dissertation, a symposium will be held on Tuesday, 22 September on the importance of waterfowl for the ecology of wetlands. The speakers will include Theunis Piersma from the NIOZ, and Bart Nolet from NIOO-KNAW. The symposium will be held in the University Museum in Utrecht.

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Dissertation
Erik Kleyheeg will defend his dissertation titled: "Seed dispersal by a generalist duck: ingestion, digestion and transportation by mallards (*Anas platyrhynchos*)" on Wednesday, 23 September at 10:30 in the University Hall. His promotor is Prof. Jos Verhoeven, and his co-promotor is Dr. Merel Soons.