



Til Landbrugsstyrelsen

Vedr. bestillingen ”Antal bistader med honningbier i Danmark”

Landbrugsstyrelsen har i en bestilling dateret d. 24. januar 2018 bedt DCA – Nationalt Center for Fødevarer og Jordbrug – om at estimere hvor mange bistader der er i Danmark.

Besvarelsen i form af vedlagte notat er udarbejdet af seniorforsker Per Kryger og videnskabelig medarbejder Mette Balslev Greve fra Institut for Agroøkologi ved Aarhus Universitet. Seniorforsker Tove Steenberg fra Institut for Agroøkologi ved Aarhus Universitet har været fagfællebedømmer.

Besvarelsen er udarbejdet som led i ”Rammeaftale om forskningsbaseret myndighedsbetjening mellem Miljø- og Fødevareministeriet og Aarhus Universitet” under ID 1.36 i ”Ydelsesaftale Planteproduktion 2018-2021”.

Venlig hilsen

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Estimation of the number of honey bee colonies in Denmark

By Per Kryger and Mette Balslev Greve

The number of honey bee colonies estimated to live in Denmark from September to December 2017 is 140938.

Denmark does not have a mandatory registry of apiaries, hence data are lacking as to the exact number of honey bee colonies. In order to estimate the number of colonies, we produced a series of maps, which were distributed to the 68 bee inspectors who are employed to assist the Ministry in honey bee health questions. A total of 63 bee inspectors completed the task of inspecting their designated area and returned their maps with a list of apiaries found within their 3 by 3 km square area. The number of apiaries ranges from 0 to 17, the number of colonies per 9 km² square varies from 0 to 140, and the number of colonies per apiary ranges from 1 to 140 colonies. Seven maps were returned without a single apiary. A total of 1728 colonies were located on the 63 maps.

A few maps consist entirely of land and thus have 9 km² area available for bee colonies, but many maps cover a smaller area due to ponds and lakes. This results in a range in area from 5.28 km² to 9 km², leading to a total surveyed area of 519.29 km², which is less than the theoretical maximum of 63 x 9=567 km². The corresponding total area of Denmark, minus water bodies, is 42354.08 km².

Thus the best estimate for the number of colonies in Denmark is: 1728 colonies x 42354.08 km² / 519.29 km² = 140938 colonies.

On average there are 7.85 colonies per apiary. However the variation is considerable (standard deviation = 13) as numbers of colonies per apiary ranges from 0 to 140 colonies, including the 7 maps returned without an apiary. With the aim of estimating a confidence interval, a bootstrap calculation with 7000 random samples was performed on the 220 original observations, including the 7 empty maps. The resulting 95% confidence interval is 6.3 to 9.7 colonies per apiary, which translates to a lower limit of 113402 colonies and an upper limit of 174788 colonies for Denmark. Bootstrapping is done by resampling a new dataset based on the 220 actual observations by randomly drawing and replacing 220 new values from the full data of 220 observations, and calculating a new mean for each random selection.

The occurrence of 7 empty maps, i.e., up to 9 km² without a single apiary, can be explained by bee inspectors being unable to locate apiaries. However, the majority of bee inspectors were certain or very certain that they had detected all apiaries in their designated area. Alternatively, the distribution of apiaries in Denmark is not even, as demonstrated by the fact that we have a range of 0 to 17 apiaries per map, with an average of 3.49 apiaries per 9 km². In the future, we plan to inspect a larger area to avoid too many empty maps. A simple solution would be to change the map size from a square of 3 by 3 km to a circle with a radius of 3 km, increasing the areas surveyed by the factor of π , to cover 28 km² on each inspector's map.

When we designed the maps, we attempted to position the areas of 3 by 3 km² close to the bee inspectors' home in order to facilitate the data sampling. Of the 63 returned maps, 33 were centered around the bee inspectors' home, while 30 of the maps were located a short distance away. It appears that there are a slightly higher density of bee colonies on the maps that are centered around the homes. We will compensate for this problem next year by having fewer maps centered on the bee inspectors' homes.