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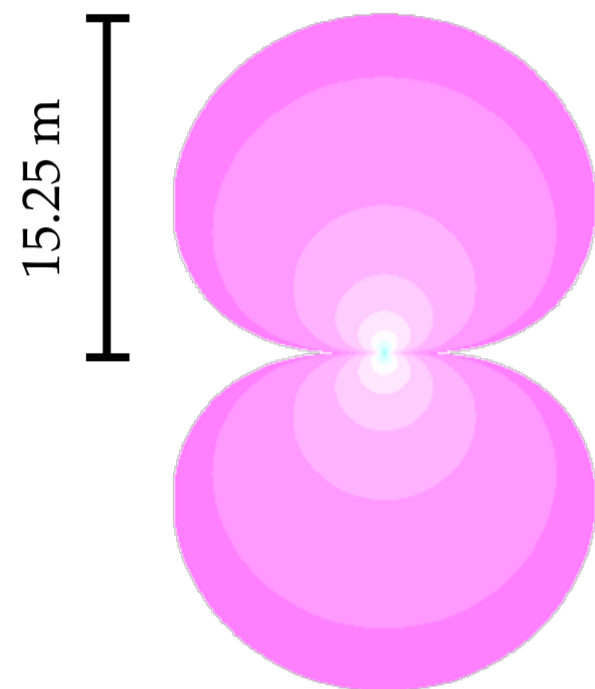
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# The range of attraction for light traps catching *Culicoides* biting midges

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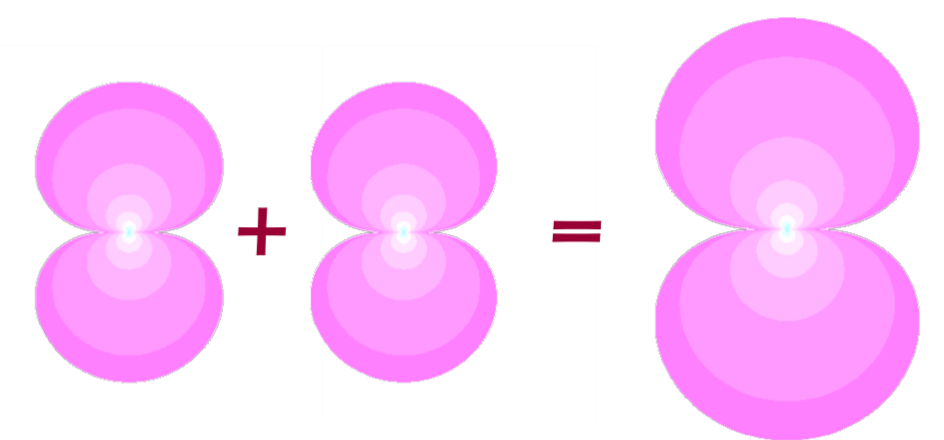
View from above:  
The light tube generates an asymmetric light-field around a trap.



Lighter colors indicate higher light intensity.

## Conclusion

We present a model that explains observed catches of *Culicoides* by assuming that they evaluate light sources in the horizon and fly towards the perceived strongest source of light. The model implicates that the range of attraction for a light trap is dependent on the intensity of the light emitted from the trap. Furthermore, traps placed closely together will collaborate to attract *Culicoides* from farther away. The maximum range of attraction for a single 4W CDC light trap is estimated to be 15.25 meters.

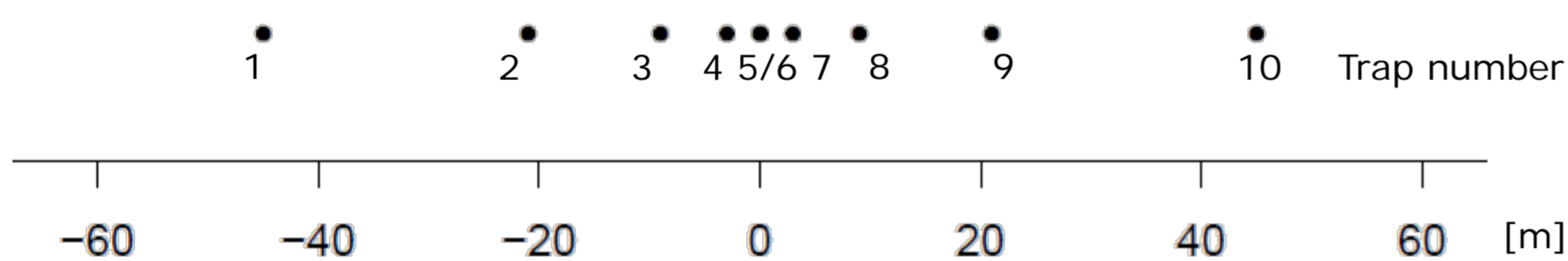


Two traps in the same location results in increased light intensity and therefore also increased range of attraction.

## Experiment



10 light traps were placed on a line in a symmetric pattern with less distance towards the middle.  
 In total 10,150 *Culicoides* were caught in 242 individual trap catches in 16 catch periods of one hour.  
 Surprisingly the two central traps caught the highest fractions of *Culicoides*.

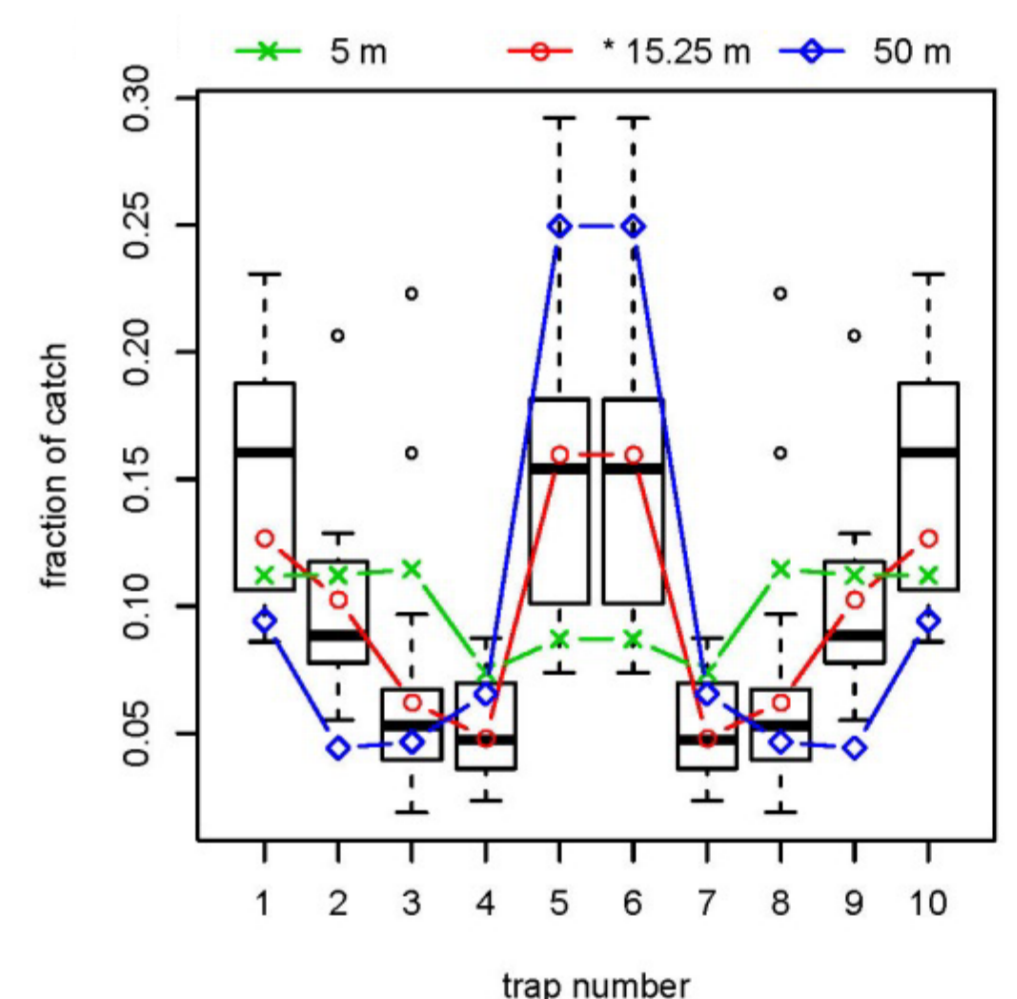


## Result

Data was transformed to fraction of catch per catch period, thus avoiding influence of fluctuations in the level of abundance.

The symmetrized experimental data is plotted as a boxplot with fractional catch as a function of trap number.

The red line shows the best fit of the model to the data, where the maximum range of attraction for a single trap is estimated to be 15.25 m.



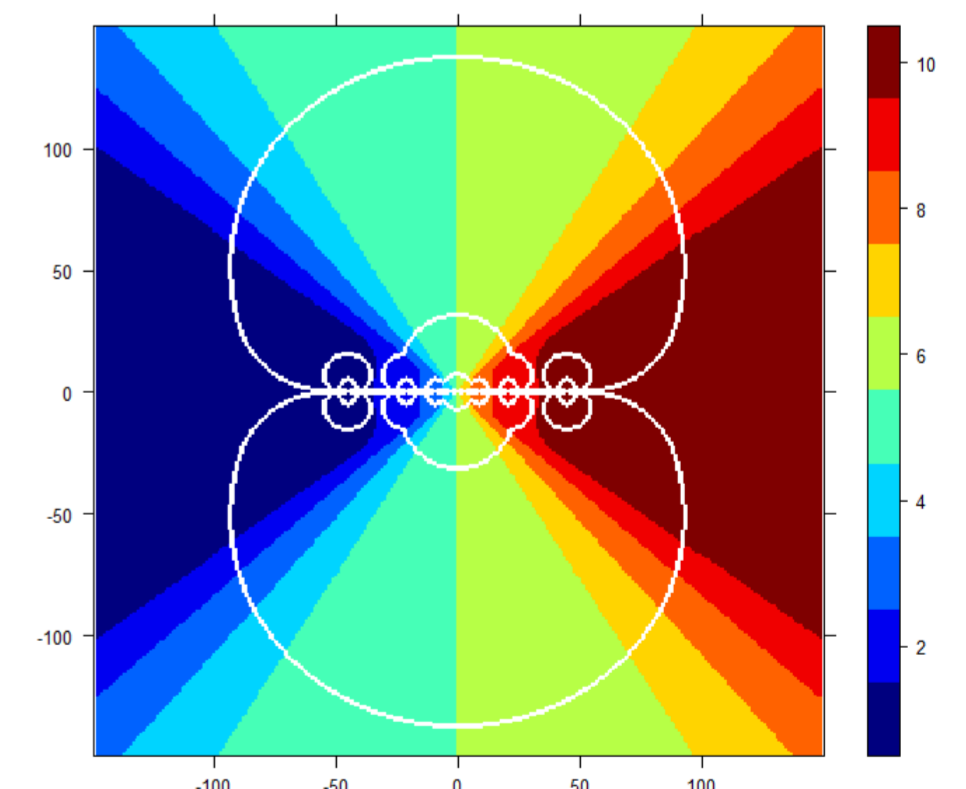
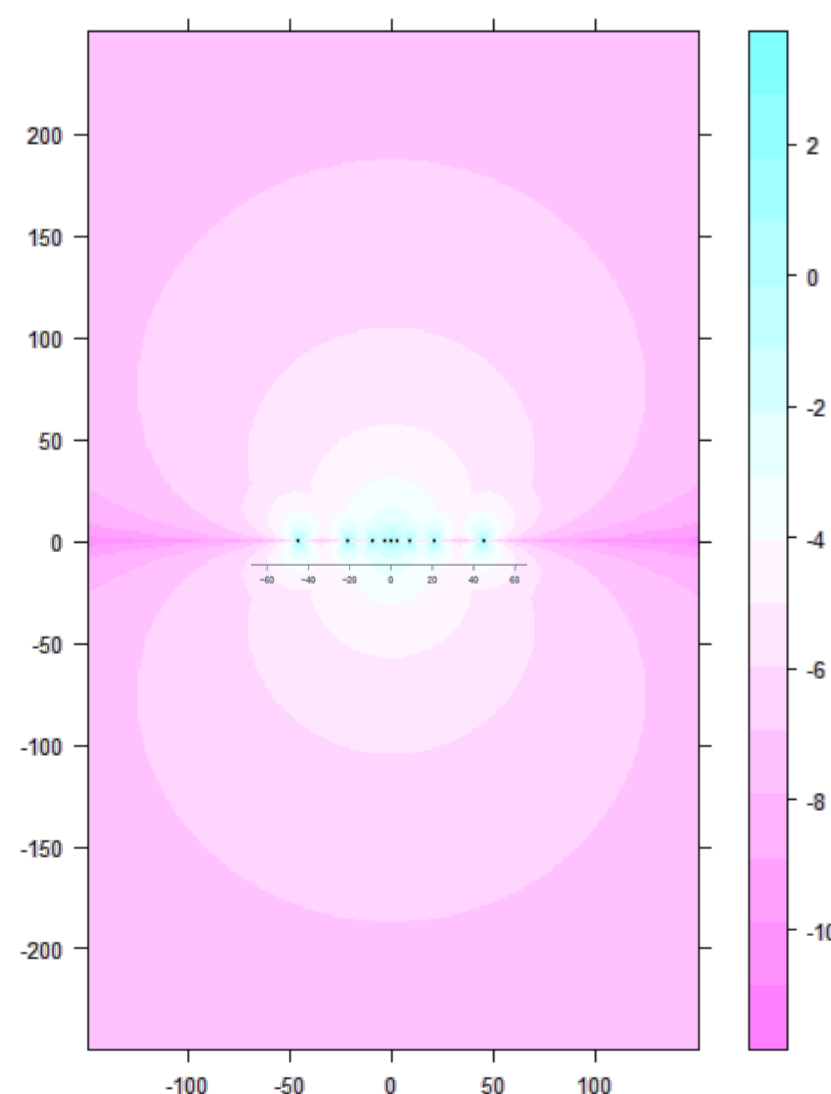
## Model

We developed a simulation model to fit the observed experimental data. The model simulates the flight of *Culicoides* towards the light traps. The light intensity from the traps is calculated up to at least 100 m away from any trap. Included in this calculation is that light is emitted asymmetrically from the light tubes in the traps.

**Left figure:** The experimental field visualized from above, with trap locations indicated by black dots: The colors show the maximum perceived light intensity by the *Culicoides* around the transect of light traps.

The direction of flight for each *Culicoides* is determined by the direction where they perceived the brightest light to originate, which most often is not in a straight line towards the traps.

**Right figure:** The experimental field visualized from above: The catch area for each trap is marked with an individual color. The center traps catch *Culicoides* from a large area because of the synergistic effect. The white lines represent the three different light intensity cutoff values used to determine the fits in the 'Result' figure.



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Background picture is of the experimental setup  
 Taken by: Carsten Kirkeby

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It calculates catch from a setup of traps that you decide.

