LANDSCAPE CONNECTIVITY OF THE FRUIT FLY PEST, *CERATITIS QUILICII* (DIPTERA: TEPHRITIDAE) IN SOUTHERN AFRICA

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Study Aims

Ceratitis quilicii (Figure 1) is an important agricultural pest attacking several fruit crops and is of quarantine importance. To enable safe trade, the phytosanitary risk in commercial fruit is mitigated by several management strategies. The spatial scale at which these management strategies should be employed can be improved by determining dispersal pathways based on landscape friction and identifying potential management units. Here, we determined the dispersal pathways of *Ceratitis quilicii* across southern Africa by constructing friction maps to identify potential management units.

Constructing Friction Maps

Gene flow (F_{ST} values) between trapped populations and environmental factors (annual temperature, rainfall and vegetation differences; NDVI) were integrated to generate friction maps and identify the most likely dispersal pathways of *C. quilicii*. Generalised least squares (GLS) were used to estimate the "least cost paths (LCP)" between the trapped populations (F_{ST} values as the response and the environmental factors as the predictors; Bouyer et al., 2015). Management units for control measures were identified based on genetic clusters determined using hierarchical clustering.

Results and Discussion

The LCP (black lines) were identified based on landscape friction (Figure 2; high F_{ST} reflects low connectivity), which were influenced by annual temperature, rainfall and NDVI. Genetic clustering indicates three possible management units in which management recommendations can be made. In the north of South Africa and in the south of Mozambique high levels of movement are observed, therefore this area should be managed as a single unit. Management practices should be focused on reducing the dispersal of *C.quilicii* along the LCP. For example, to reduce movement in and out of the Western-Cape management strategies should be implemented at the identified dispersal routes.

Figure 1: The Cape fruit fly, *C. quilicii* (courtesy A. Franck, CIRAD)

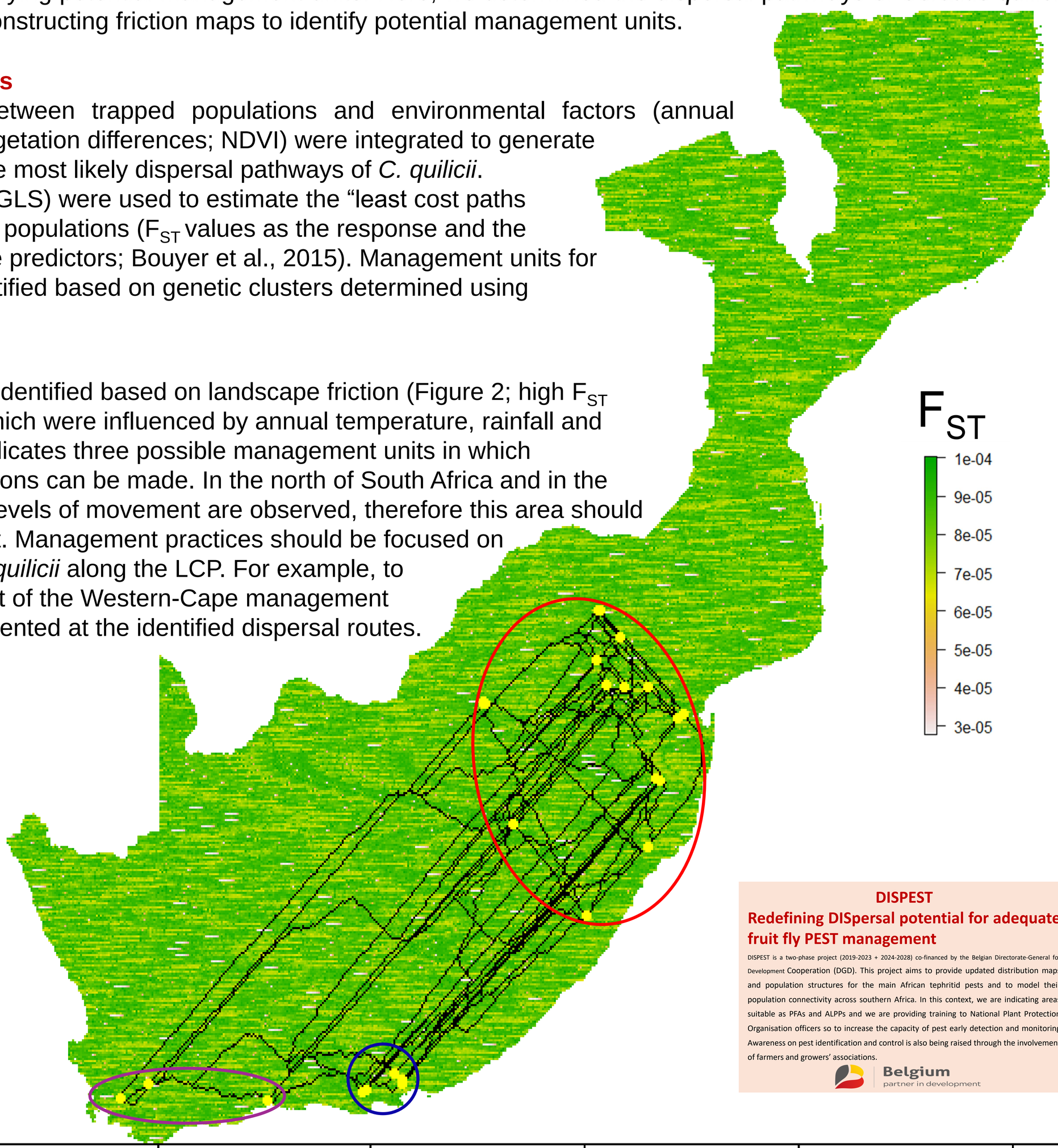

Figure 2: Friction map showing connectivity of *C. quilicii* populations across southern Africa with the paths of least resistance shown in black. Populations that cluster together into management units are indicated in blue (Eastern-Cape), purple (Western-Cape) and red (Mozambique, Limpopo, Mpumalanga, North-West, Kwazulu-Natal and Free state).

DISPEST

Redefining DISpersal potential for adequate fruit fly PEST management

DISPEST is a two-phase project (2019-2023 + 2024-2028) co-financed by the Belgian Directorate-General for Development Cooperation (DGD). This project aims to provide updated distribution maps and population structures for the main African tephritid pests and to model their population connectivity across southern Africa. In this context, we are indicating areas suitable as PFAs and ALPPs and we are providing training to National Plant Protection Organisation officers so to increase the capacity of pest early detection and monitoring Awareness on pest identification and control is also being raised through the involvement of farmers and growers' associations.

Belgium partner in development

Reference

Bouyer, et al. (2015). PNAS, 112(47), 14575–14580.