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Desert Locust monitoring and forecasting

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Assessment of Desert Locust migration and loss in Asia and Africa

Overview

Integrated with multi-source Earth Observation data, e.g. meteorological data, field data, and remote sensing data (such as GF series in China, MODIS and Landsat series in US, Sentinel series in EU), and self-developed models and algorithms for Desert Locust monitoring and forecasting, the research team constructed the 'Crop pests and diseases monitoring and forecasting system', which could regularly release thematical maps and reports on Desert Locust.

Last week, researchers conducted following research on dynamic monitoring of Desert Locust migration and damage in Asian and African countries based on the Digital Earth Science Platform, and forecasting of the possible breeding areas and migration paths from March to June 2020 (Fig.1). The result shows that currently the Desert Locusts are mainly located in the winter breeding areas of the Red Sea and the Gulf of Aden coast and Pakistan, and the winter-spring breeding areas of Ethiopia and Kenya in southern Horn of Africa. These places are seriously ravaged. At

Content

present, the Desert Locusts in Pakistan have harmed 1035 thousand hectares of wheat planting area, accounting for 11% of the total national wheat planting area. In Ethiopia, which is mainly engaged in agriculture and pasture, the vegetation damaged area has reached 3753 thousand hectares, seriously affecting the local livelihood. In addition, Desert Locusts in Ethiopia, Kenya, southern Iran and Pakistan have entered the spring breeding season. Multi-generational breeding of locust will lead to a surge in pest populations over the next three months, which coincides with the growth season or harvest season of crop. Desert Locusts will pose a major threat to the food security of the above-mentioned countries. It is necessary to carry out the monitoring and early

warning of the intercontinental Desert Locust plague continuously and dynamically, and organize joint prevention and control in multiple countries, to ensure the safety of agricultural and pasture production and regional stability.

Migration path and prediction of Desert Locust in Africa and Asia

By the end of 2019, the core breeding areas of Desert Locust in East Africa and southwest Asia were mainly located along the Red Sea (eastern Sudan and Eritrea, western Saudi Arabia and Yemen), Indo-Pakistan border, central Sudan and eastern Ethiopia, as well as eastern Oman, southeastern Iran and central Saudi Arabia.

In January 2020, the locust swarms invaded south and central rift valley of Ethiopia and northeast Kenya, and then continued to invade south and northwest Kenya. Meanwhile, the locust swarms along the Indo-Pakistan border moved to northeast Oman, while the locust swarms in northeast Oman also moved south to south Yemen and north Somalia. In February, the swarms in Kenya moved northwest into southern South Sudan, south into northeastern Tanzania, and west to northeastern Congo through northern Uganda. Locust swarms from Saudi Arabia and western Yemen moved North-East through central Saudi Arabia to Bahrain, Qatar and Kuwait and reached southeastern Iraq by the end of February; Parts of locust swarms in northern Pakistan migrated to the southwest, and parts crossed the border into Afghanistan.

At present, locusts spring breeding are underway in most areas. New spring breeding areas are expected to form in central Saudi Arabia, Iran-Pakistan border, and India-Pakistan border from March to June. Locust swarms in these areas are supposed to move into the summer breeding areas in May or June, such as central Sudan, southern Yemen, northern Ethiopia and Indo-Pakistan border, and the locusts may even migrate eastwards with the Southwest Monsoon, if the adults along Indo-Pakistan border are not controlled effectively in May. In the next three months (March-June 2020), countries will step into the key growing season or harvest season of crop, and if the Desert Locusts continue to invade, agricultural and pasture production and national livelihoods in Asian and African countries will be seriously threatened. FAO has issued a worldwide Desert Locust warning, calling for high alert for an ongoing locust plague and raising funds globally to help inflicted countries to fight locusts plague and troubleshoot the food crisis.

Monitoring and assessment of Desert Locust in Pakistan

In January 2020, the locust in Nara, Tharparkar, Cholistan areas along Indo-Pakistan border continued to breed and migrate northwards to Bahawalpur in southern Punjab. Desert Locust harmed about 256 thousand hectares of vegetation area (including 234 thousand hectares cropland and 22 thousand hectares grassland), mainly distributed in the border areas between Sind and Punjab (Fig.2). In February, locust swarms moved northwest to Okara in Punjab, Lucky Marwat in Khyber Pakhtunkhwa and Dera Ismail Khan, damaged 298 thousand hectares of vegetation (including 265 thousand hectares cropland and 33 thousand hectares grassland).

Till late February, part of locust swarms from northern Pakistan moved into Khost, Afghanistan. Locusts along the Indio-Pakistan border and the southern coast of Baluchistan will start a second generation of spring breeding from March to June. Part of the locusts are expected to migrate to the Iran/Pakistan boundary in March; locust swarms in southern Iran are expected to move into southwestern Pakistan along with the summer monsoon, and locust swarms along the Indio-Pakistan border may migrate to eastern India in May (Fig.3).

At present, most wheat areas of Pakistan are within the booting stage of growth, effectively control of locust must be conducted to protect wheat yield security. Our results showed that by the end of February, the locust had affected 1035 thousand hectares of wheat in Pakistan, accounting for 11% of Pakistan's seeded area, In which, Sind has the damaged area about 234 thousand hectares, accounting for 20% of the province's seeded area; Punjab has the damaged area of about 701 thousand hectares, accounting for 11% of the whole province's seeded area; Baluchistan has the damaged area of about 48 thousand hectares, accounting for 9% of the whole province's seeded area; Khyber Pakhtunkhwa has the damaged area of about 52 thousand hectares, accounting for 17% of the whole province's seeded area. Combined with the recent regional agrometeorological conditions such as the precipitation, temperature, etc., it is estimated that the wheat yield in the damaged areas of these four provinces will decrease by about 28%, 14%, 24% and 11% respectively, which brings a significant impact on the food security of Pakistan.

Monitoring and assessment of Desert Locust in Ethiopia

In June 2019, mature locust swarms from Yemen invaded northwest Somali in Ethiopia, and sufficient rainfall provided favorable conditions for the breeding of Desert Locusts (Fig.4). From July to September, some locust swarms spread to the northeast of Amhara and the central Afar for summer reproduction, endangering about 638 thousand hectares of vegetation in western Somali, Amhara and southern Afar (including 199 thousand hectares cropland, 108 thousand hectares grassland, and 331 thousand hectares shrub). From October to December, the swarms continued breeding, with some of the swarms moving north along Amhara to Tigray, and some of local swarms moving east into the area around Dire Dawa and towards Ogaden in eastern Somali. While part of locust swarms in northern Somalia invaded into Ethiopia across the country border, then migrated southward from the northern Ogaden and invaded southeast Ethiopia and southern Somalia, reached northeastern Kenya at the end of February. Local pasture and cropland in Ethiopia had been badly damaged with an increased area of about 978 thousand hectares (135 thousand hectares cropland, 81 thousand hectares grassland, and 762 thousand hectares shrub). In January 2020, locusts in Harar and Jijjiga of eastern Somali, Warder, Kebridehar, Gode were constantly hatching and growing, and migrating westwards and southwards to Yabello of southern Oromiya and the edge of the Rift Valley in eastern Southern Nations Nationalities and People Region (SNNPR). An area of 1038 thousand hectares of plant were

increased (69 thousand hectares of cropland, 35 thousand hectares grassland, and 934 thousand hectares of shrub). In February, swarms moved into the Rift Valley from the north and the south, larger swarms were formed combined with the local locust breeding. The hazard areas are mainly distributed in Somali, Oromiya and SNNPR with an increased area of about 1099 thousand hectares, (540 thousand hectares cropland, 149 thousand hectares grassland, and 410 thousand hectares shrub) (Fig.5). The results showed that since June 2019, Desert Locust has caused the damage of 3753 thousand hectares of vegetation in Ethiopia with 943 thousand hectares cropland, 373 thousand hectares grassland and 2437 thousand hectares shrub, accounting for 4.7%, 2.5% and 3.9% of the total cropland, grassland and shrub in Ethiopia, respectively. The Rift Valley, known as the Ethiopia's granary, has also been badly

devastated. Since 80% of Ethiopia's population are agricultural and pastoral, this locust plague has seriously threatened national livelihood and regional stability.

Comprehensive analysis showed that the locust located in Rift Valley of Oromiya and SNNPR will continue its spring breeding from March to June in 2020 and may migrate to summer breeding area in northern Amhara, Afar and Jibouti between April and June. At the same time, the locust in eastern Somali will conduct spring breeding from March to June and the swarms are expected to migrate to Indio-Pakistan border in June with the southwest monsoon. Currently, a large number of locusts in Ethiopia have laid eggs on the ground and next generation of spring breeding is about to begin. If the locust couldn't be controlled effectively, the plague will continue, which may bring a heavy blow to the agricultural and pasture production in Ethiopia.
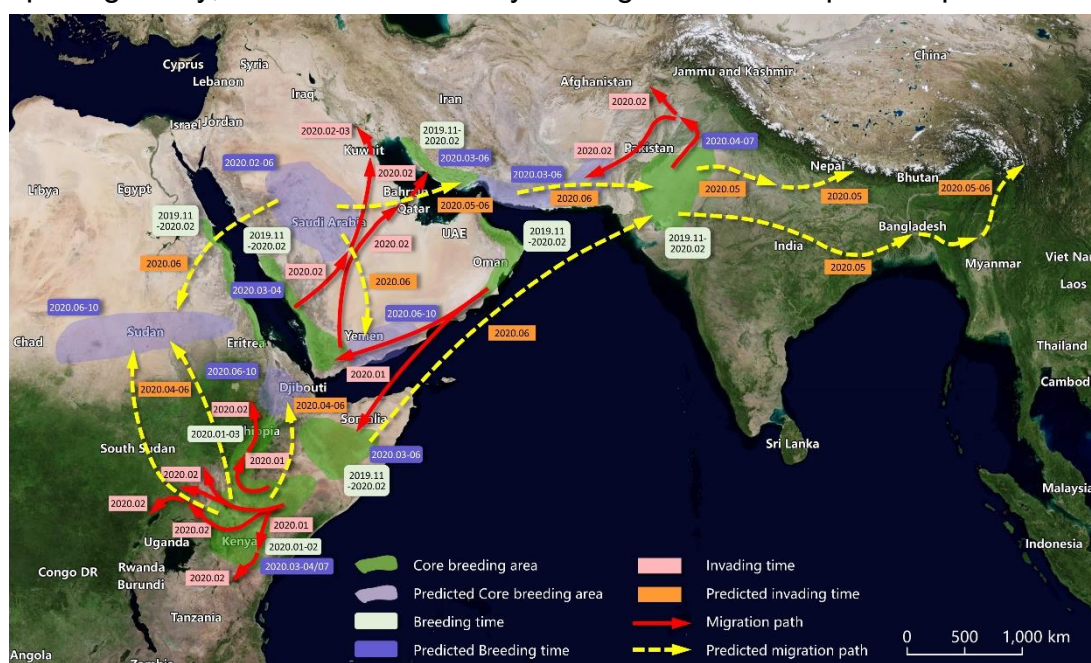
***Figure 1** Migration path of Desert Locust in Asia and Africa (January-June 2020)*
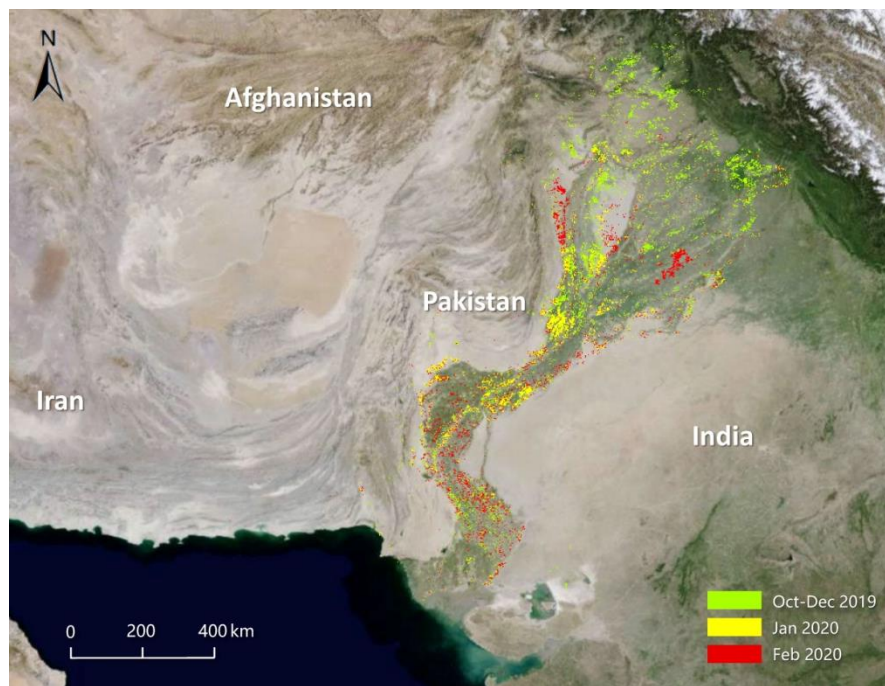
Figure 2 *Monitoring of Desert Locust damage in Pakistan (October 2019-February 2020)*

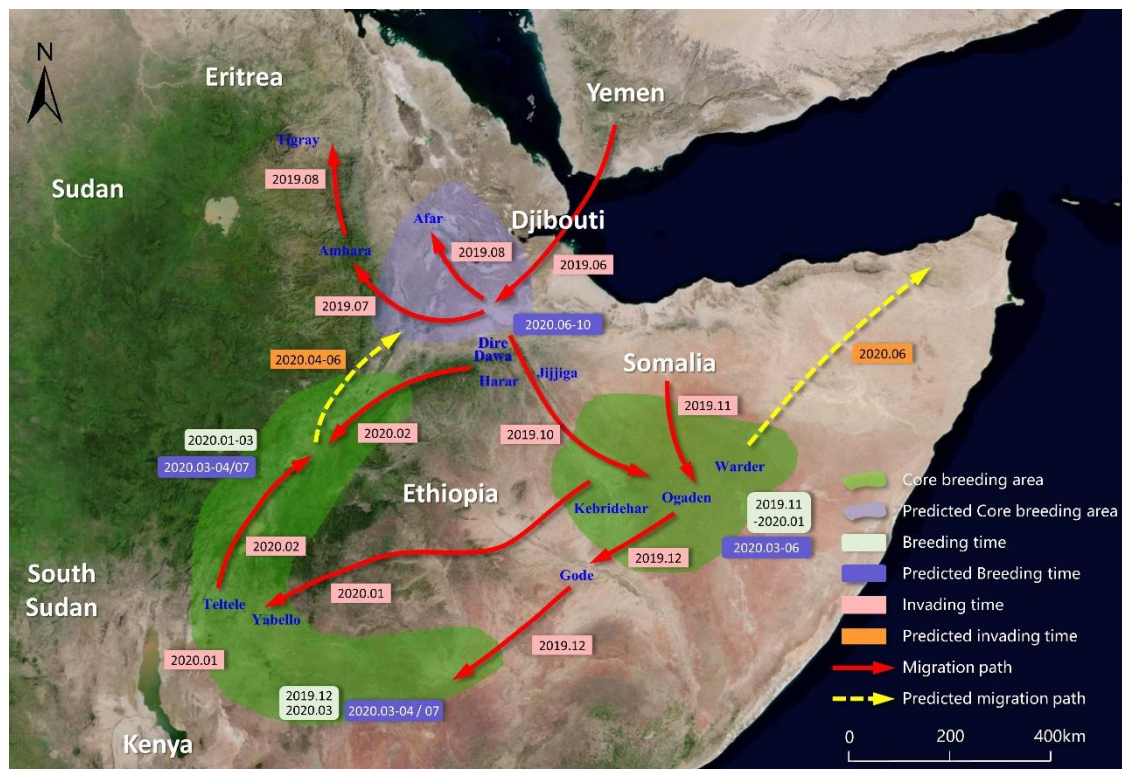***Figure 3*** *Migration path of Desert Locust in Pakistan (January-June2020)*

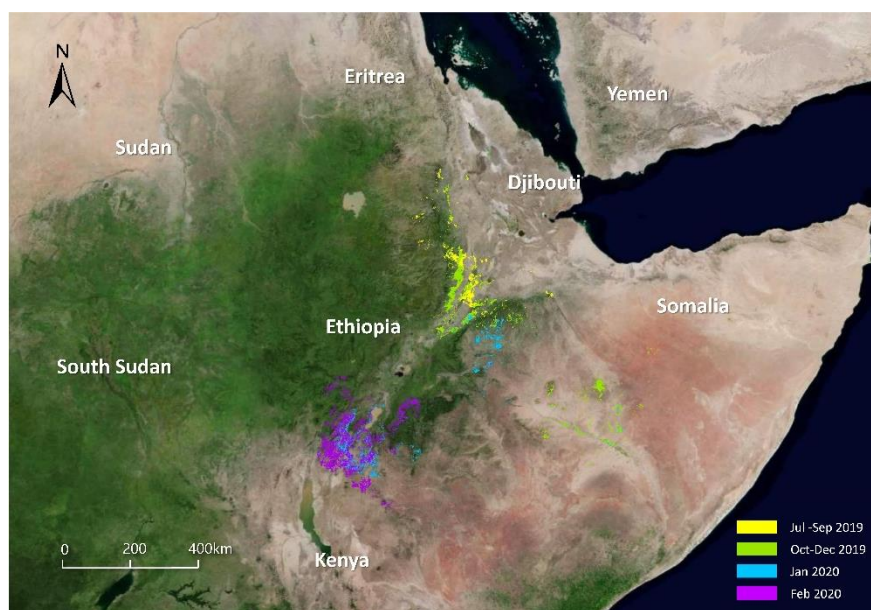*Figure 4* Migration path of Desert Locust in Ethiopia (2019-2020)

Figure 5 Monitoring of Desert Locust damage in Ethiopia (Year 2019-2020)

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The Crop Pests and Diseases Monitoring and Forecasting system are available under:
http://www.rscropmap.com/

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