Desert Locust monitoring and forecasting

Early June 2020

Desert Locust monitoring in Asia and Africa and loss assessment in Yemen

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.

This report focuses on forecast of possible breeding areas and migration paths from June to July 2020 and the locust plagues in Yemen. The results showed that, the desert locusts are mainly distributed in the spring breeding areas of Indo-Pakistan border, the west of Pakistan, the coastal and inland areas of the Arabian Peninsula, southern Ethiopia and most of Kenya at the moment, and has begun to move to central Sudan, Indo-Pakistan border and the countries of West Africa to start Summer breeding. From April to May 2020, Desert

Content

Locust in Yemen harmed about 529.3 thousand hectares of vegetation area (including 85.4 thousand hectares of cropland, 27.8 thousand hectares of grassland, and 416.1 thousand hectares of shrub), accounting for 8.5%, 4.8% and 7.4% of the total cropland, grassland, and shrub, respectively.

At present, locusts in Asia and Africa are multi-generation breeding. The period from June to July coincides with the important crops sowing season, growing season or harvesting season in Asian and African countries. If not properly controlled, locusts will bring a major threat to agricultural and pasture production. It is necessary to continue the monitoring and early warning of the intercontinental Desert Locust plague, and organize joint prevention

and control in multiple countries, ensuring the safety of agricultural and pasture production, as well as regional stability.

Migration path and prediction of Desert locust in Africa and Asia

In February 2020, the desert locusts in east Africa and southwest Asia were mainly distributed on the Indo-Pakistan border, in the west of Pakistan, coastal and inland areas of the Arabian Peninsula (coastal and inland areas of eastern and western Saudi Arabia, southeastern Kuwait, eastern Oman, western and southern Yemen), southern Ethiopia and most of Kenya. In addition, there were small groups of locusts in northeastern Afghanistan, southern Iran, northeastern Sudan, eastern Eritrea, northwestern Somalia, southern South Sudan, northeastern Uganda and northern Tanzania.

In early March 2020, locust swarms in Kuwait continued to spread to southeastern Iraq, while locust swarms along eastern coast of Saudi Arabia moved to the western coast of the United Arab Emirates. At the same time, locust swarms in southern Ethiopian began to move northward. In mid-March, immature locusts were found along Red Sea coast in southeastern Egypt. At the end of March, immature locusts appeared on the east coast of Djibouti. In April, large amounts of precipitation occurred in East Africa, and locusts continued to breed in spring and mature into groups. The locust in Ethiopia and Somalia continued moving north, while the

locust in the northern Arabian Peninsula spread to central Iraq, and the density of locusts along Iran/Pakistan border continued to increase. In May, locust eggs continued to incubate and breed. In the middle and late of that month, locust swarms began to migrate from spring breeding areas such as Kenya, Ethiopia and western Pakistan to summer breeding areas such as central Sudan, southwestern Saudi Arabia and Indo-Pakistan border. At the end of the month, locust swarms moved eastward from the Indo-Pakistan border to northern India (Fig. 1).

At present, locust breeding is underway in most areas. It is expected that in early June, locust swarms in eastern and northern Saudi Arabia will move to summer breeding areas, such as southern Yemen and central Sudan, and locust swarms in eastern Oman will continue to migrate to eastern Yemen. From mid-late June to July, locusts in spring breeding areas such as Kenya, Ethiopia and Somalia will move to central Sudan and Indo-Pakistan border for summer breeding. Meanwhile, locusts in southern Iran will move to western Pakistan, and locusts in northern India will continue to breed and spread eastwards. The period from June to July coincides with the important harvesting season in Pakistan and India, the sowing season, growing season and the harvesting season in the Horn of Africa countries. If the locust plague continues, agricultural and pasture production, national economy and people's livelihood will be seriously threatened.
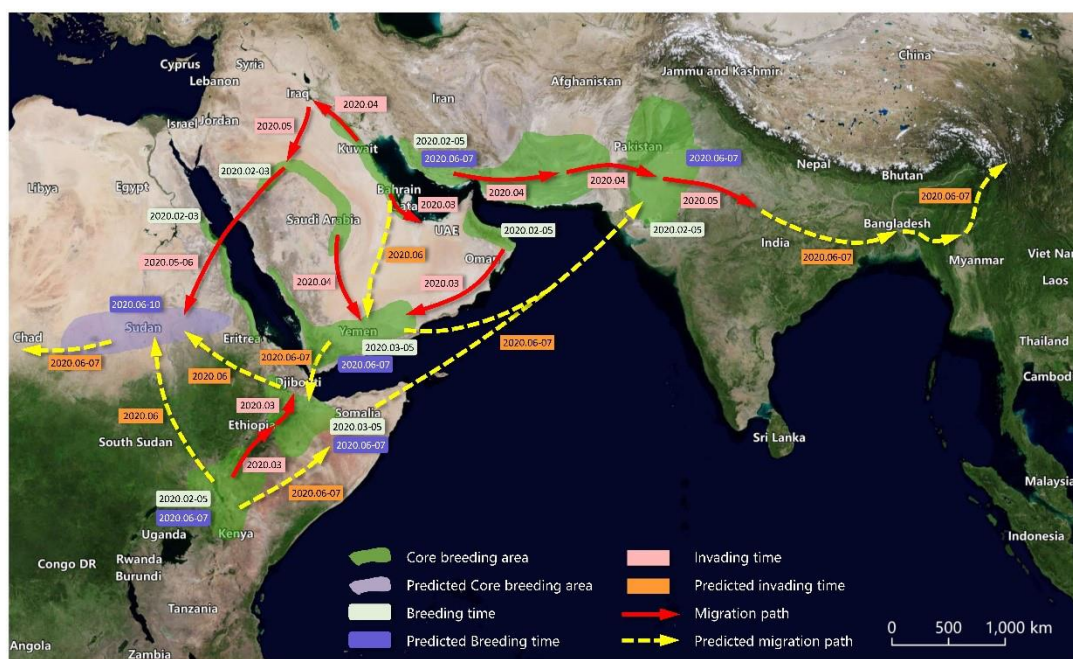
Figure 1 *Migration path of Desert Locust in Asia and Africa (March-July 2020)*

Monitoring and assessment of Desert Locust in Yemen

In April 2020, in the western of Hajjah province, most of Al-Hudaydah province, the eastern of Ta'izz province, the southern of Ad-Dāli province, the western of Lahij province and Abyān, central Hadramawt and central Al-Mahrah, locusts continued their spring breeding. In late April, inland rainstorms and flooding promoted locust breeding. The results showed that by the end of April, locust in Yemen harmed about 287.3 thousand hectares of vegetation area, including 39.0 thousand hectares of cropland, 13.9 thousand hectares of grassland, and 234.4 thousand hectares of shrub. In early May, locusts in the southern coast, the edge of Ramlat Sabatyn and the plateau area north of Wadi Hadhramaut continued to mature and lay eggs. In mid-May, locusts in Saudi Arabia and Oman moved to Yemen from the north and east respectively. In late May, the number of locusts in southern Yemen continued to increase, and the damaged area further expanded. By the end of May, locusts in Yemen harmed about 242.0 thousand hectares of vegetation area, including 46.4 thousand hectares of cropland, 13.9 thousand hectares of grassland, and 181.7 thousand hectares of shrub (Fig 2).

The results showed that from April to May 2020, Desert Locust in Yemen harmed about 529.3 thousand hectares of vegetation area (including 85.4 thousand hectares of cropland, 27.8 thousand hectares of grassland, and 416.1 thousand hectares of shrub), accounting for 8.5%, 4.8% and 7.4% of the total cropland, grassland, and shrub, respectively. The harmed areas are mainly located in western and southern coastal areas of Yemen. Among them, the southwestern province of Ta'izz has the largest damage area of 106.9 thousand hectares, followed by the Al-Hudaydah province along the west coast of Red Sea with an area of 97.3 thousand hectares. The

affected areas were 78.2 thousand hectares and 74.7 thousand hectares in Ad-Dāli and Lahij. The affected areas of Ibb in the Midwest and Abyān in the southern coast are 45.7 and 44.9 thousand hectares. The affected area of Dhamar is 37.6 thousand hectares. The affected area of Al-Baydā is 20.4 thousand hectares. In middle east of Hadramawt province, the affected area is 10.2 thousand hectares. The affected areas in other provinces are relatively small. The affected area of Al-Mahrah is 4.5 thousand hectares. The affected area of Shabwah is 2.4 thousand hectares. The affected area of Hajjah is 2.3 thousand hectares. The affected area of Ma'rib is 2.2 thousand hectares. The affected areas of Al-Mahwīt, San'a, Aden and Raimah are 1.0 thousand hectares, 0.5 thousand hectares, 0.3 thousand hectares and 0.2 thousand hectares, respectively. Yemen is a typical agro-pastoral country where 75% of its population are engaged in agriculture. The locust plague has caused a huge impact on local agricultural and pastoral production, which seriously threatened the local agricultural and pastoral safety and national livelihood. The domestic disaster situation is severe.

In this study, Planet data with a spatial resolution of 3m in August 2018 and August 2019 were also used to monitor the Desert Locusts damage in heavily affected vegetation areas in central Al-Hudaydah Province of Yemen (Fig.3). The study area is located in the junction of Raimah and Al-Hudaydah, about 15 km to the northwest of Al Mansuriyah, and about 13 km to the southeast of Nafhan. The vegetation types are mainly grassland, shrub and cropland, with a total area of 12.5 thousand hectares (6.2 thousand hectares of grassland, 2.4 thousand hectares of shrub and 3.9 thousand hectares of cropland.) The monitoring results showed that, the affected area of vegetation in the study area was 1.6 thousand hectares, accounting for 12.8% of the total area of the study area. Among them, the grassland were affected the most severely with 0.8 thousand hectares, while the affectedcropland is 0.4 thousand hectares and shrub 0.4 thousand hectares, accounting for 12.9%, 10.3%, and 16.7% of the total area of grassland, cropland and shrub in the study area, respectively. The results show that desert locusts can cause great loss to vegetation, and its outbreaks will seriously affect the agricultural and pastoral production and food security in Yemen.

The comprehensive analysis showed that, in June 2020, locusts in Yemen will continue their spring breeding. The locust swarms in eastern Saudi Arabia and northeastern Oman will continue to migrate north and east of Yemen, while the locust swarms in southwest Yemen will migrate to the southwest cross the Gulf of Aden to Djibouti, northwestern Somalia and northeastern Ethiopia. It is estimated that from late June to July, the locust swarms will move northeast to Indo-Pakistan border for summer breeding. At present, the desert locusts in Yemen continue to breed, mature and begin to lay eggs. June is the important growing season of crops in Yemen. If the locusts couldn't be controlled effectively, the locust plague will continue, which may bring a heavy blow to the agricultural and pasture production in Yemen.
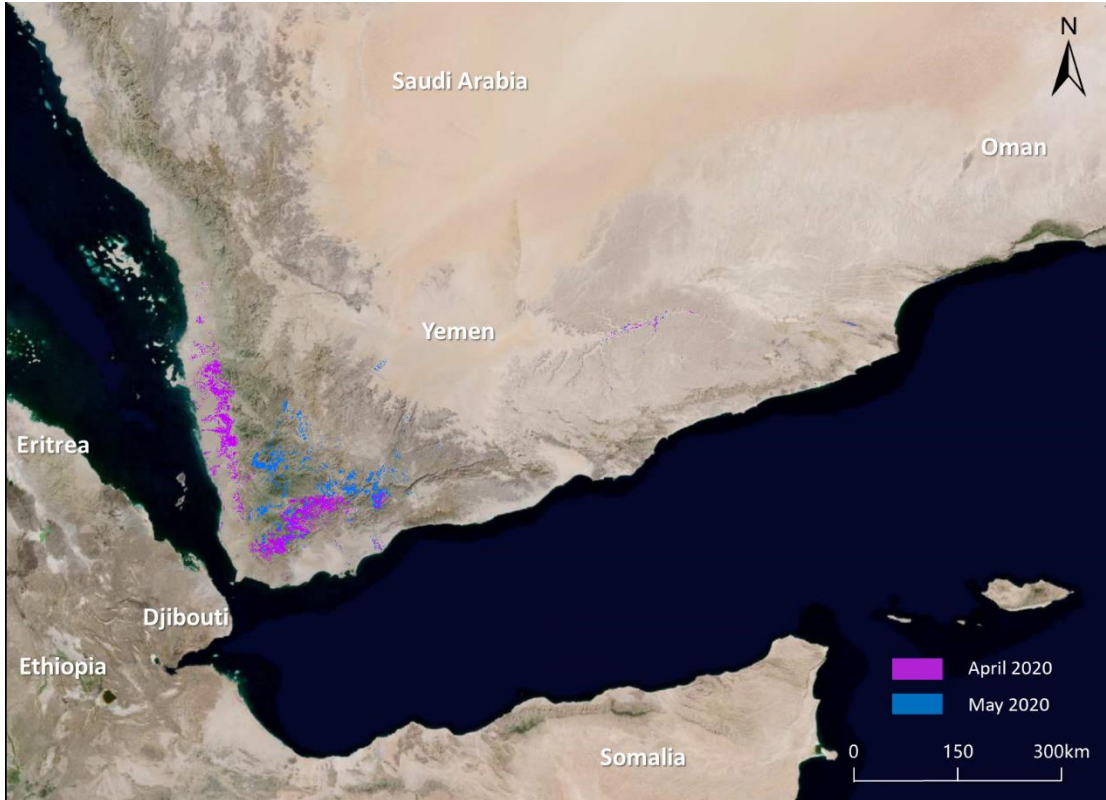
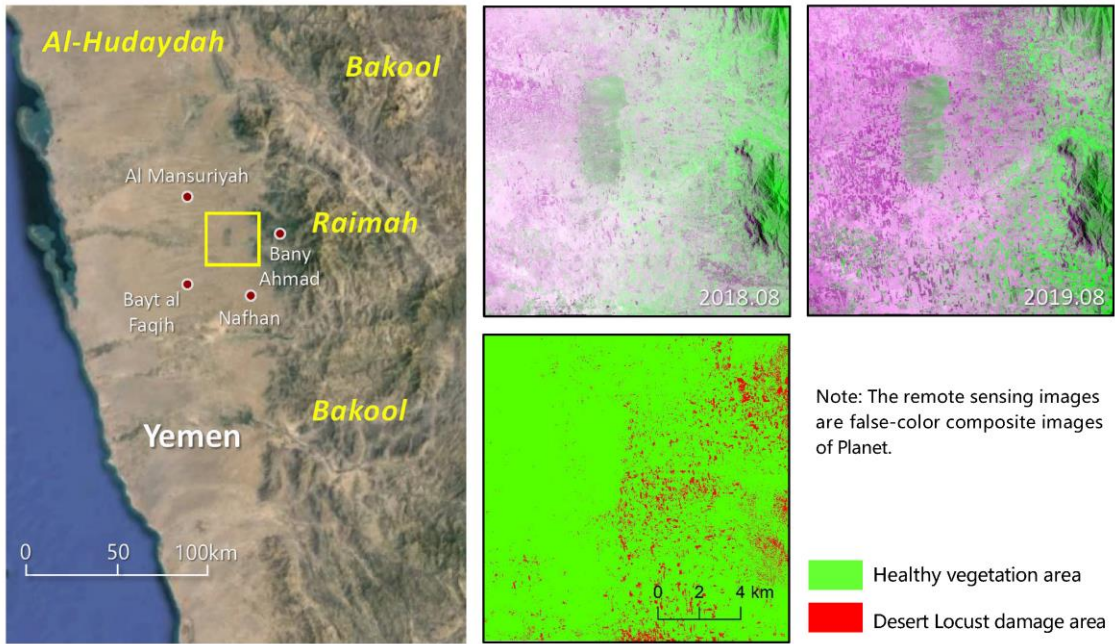***Figure 2*** *Monitoring of Desert Locust damage in Yemen (April to May 2020)*

Figure 3 *Monitoring of Desert Locust damage in the key damage area of Yemen based on Planet images*

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