

Results of the project MON-I-DRON in the Regional Nature Park of Tepilora (Sardinia, Italy)

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Introduction. A monitoring program using different approaches has been developed and tested in the Regional Nature Park of Tepilora (Sardinia, Italy) by the project MON-I-DRON to evaluate the distribution and invasiveness of four alien plants, *Acacia saligna* (Labill.) H.L. Wendl. (golden wreath wattle), *Ailanthus altissima* (Mill.) Swingle (tree of heaven), *Sesbania punicea* (Cav.) Benth. (scarlet sesban), and *Ricinus communis* L. (castor oil plant) (Fig.1). Monitoring activities started in the late Spring 2024, with drone surveys, botanical field surveys, and citizen science (CS).

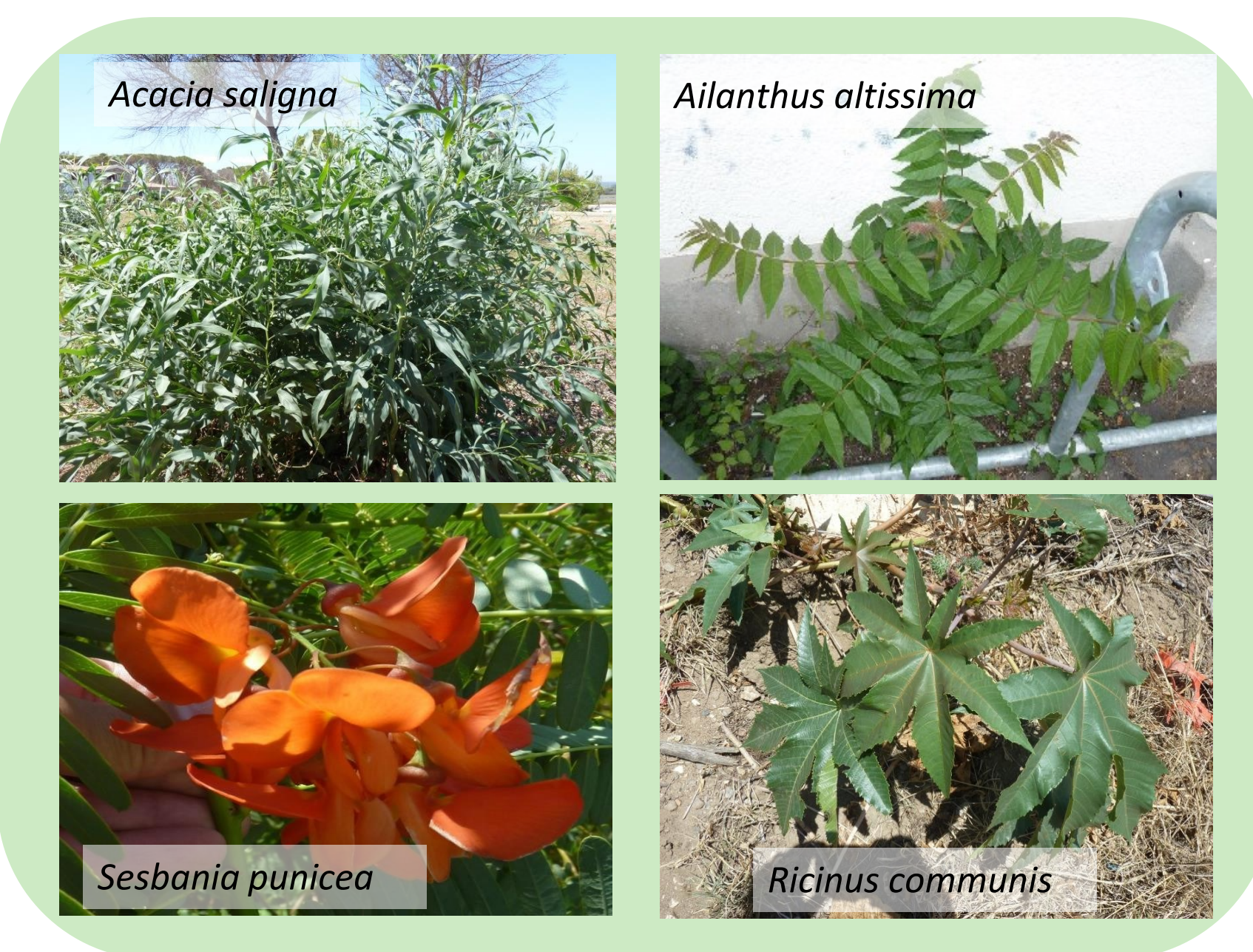


Fig. 1. The monitored alien species.

Observations by citizen scientists were collected in different periods and contributed to understand the distribution of the species within and outside the study area. CS aimed not only at engaging local communities in the collection of distribution data of the four species by using the application iNaturalist, but also at creating capacities at local level by offering trainings and learning material, and at sensitizing the public about biodiversity loss and biological invasions (Fig. 3). CS activities included the organization of four public events for different target groups (bioblitz and trainings) and communication activities. CS activities have been facilitated by the Environmental Education and Sustainability Centers (CEAS) of the Nature Park located close to the study area.



The **study area** is located in the territories of the Tepilora Park along the course of the Rio Posada river and its delta, a large wetland near Posada, which is a UNESCO Biosphere Reserve and Wetland of International Importance under the Ramsar Convention. The area hosts considerable biodiversity, which is threatened by invasive alien species, among other factors. The study area has a total surface of 100 hectares (Fig. 2).

Methodology and activities. Botanists and experts for drone monitoring worked closely together. Preliminary tests with drones evaluated the most convenient flight height for the different species. Drone flights were then conducted at a height of 35 m from the ground at all investigated sites. This height has been defined as the optimal one for a rapid photo-interpretation of the orthophotos and for optimizing the flight times and costs. Altogether, six drone flights were carried out in four seasons in accordance with the local phenology of each species, which was detected during field surveys. Furthermore, in a total of 9 test plots (20 x 20 m) the diameters and heights of individual plants of the alien species under study were recorded.

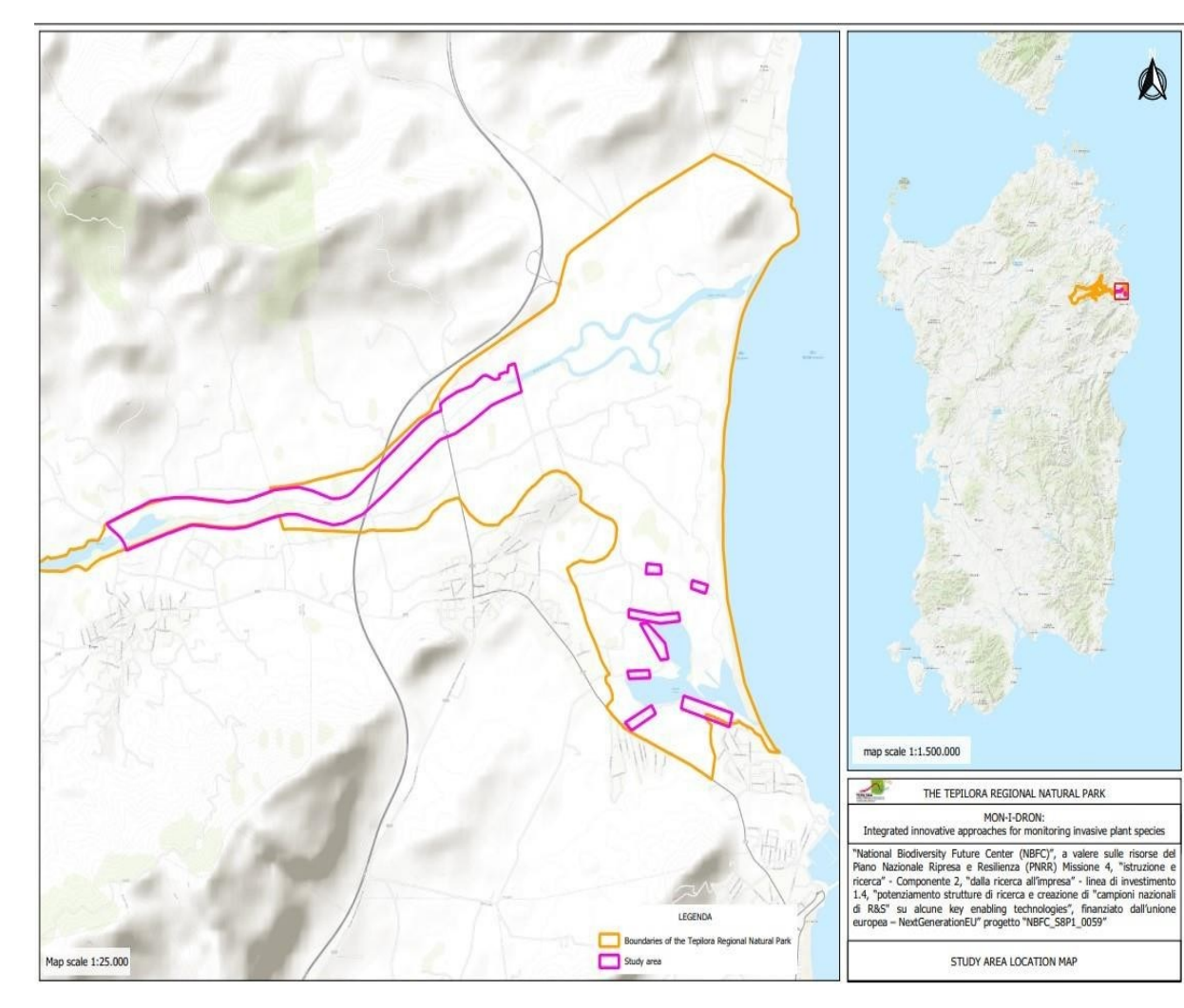


Fig. 2. Location of the Tepilora Park in Sardinia (right) with boundaries of the park (orange) and of the study area (pink) (left).



Fig. 5. Distribution of *Sesbania punicea* within the study area (red spots).



Fig. 6. Distribution of *Ricinus communis* within the study area (green spots).

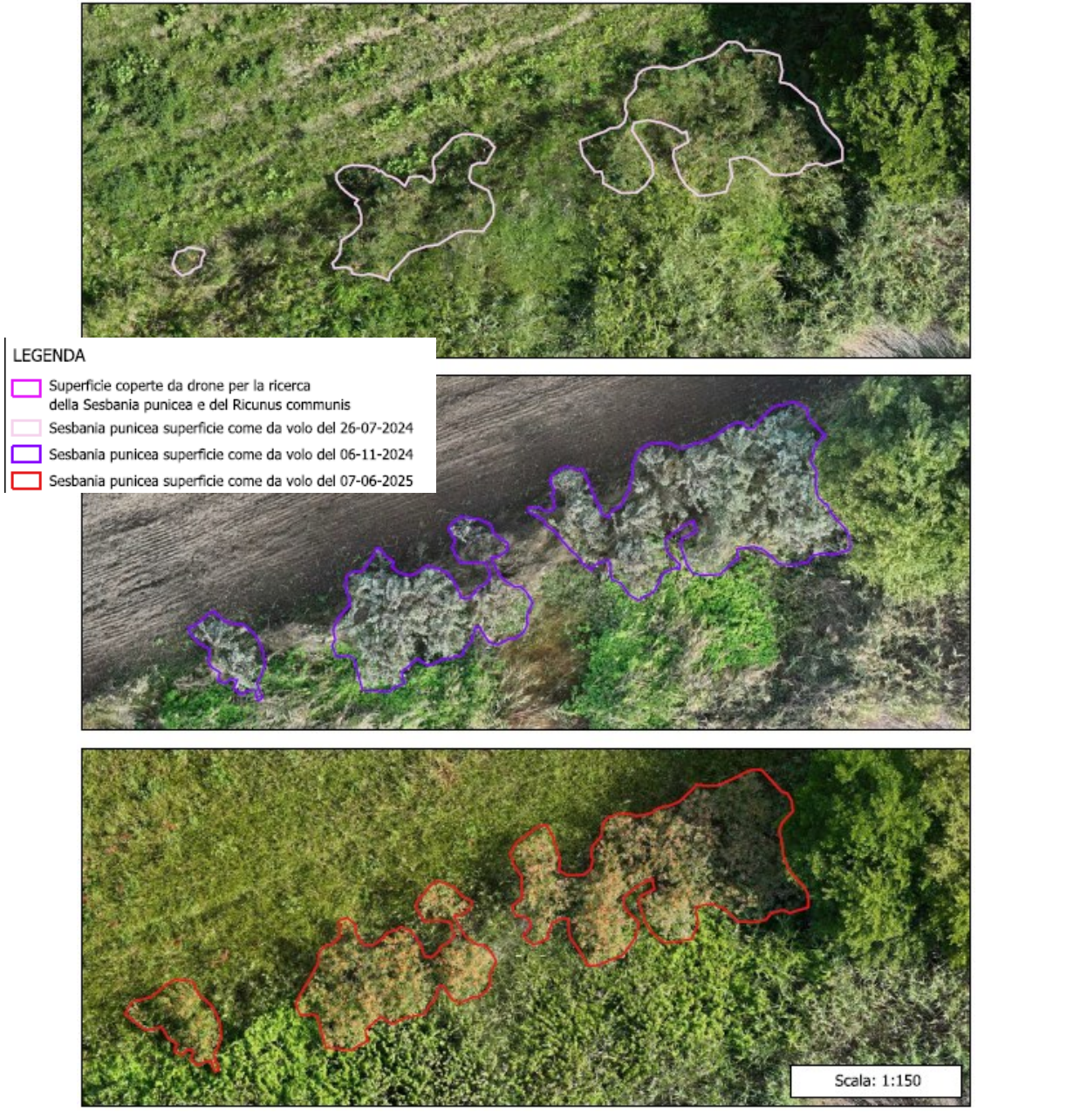


Fig. 4. Examples of orthophotos taken with the drone in different seasons, and of photointerpretation (*S. punicea*).

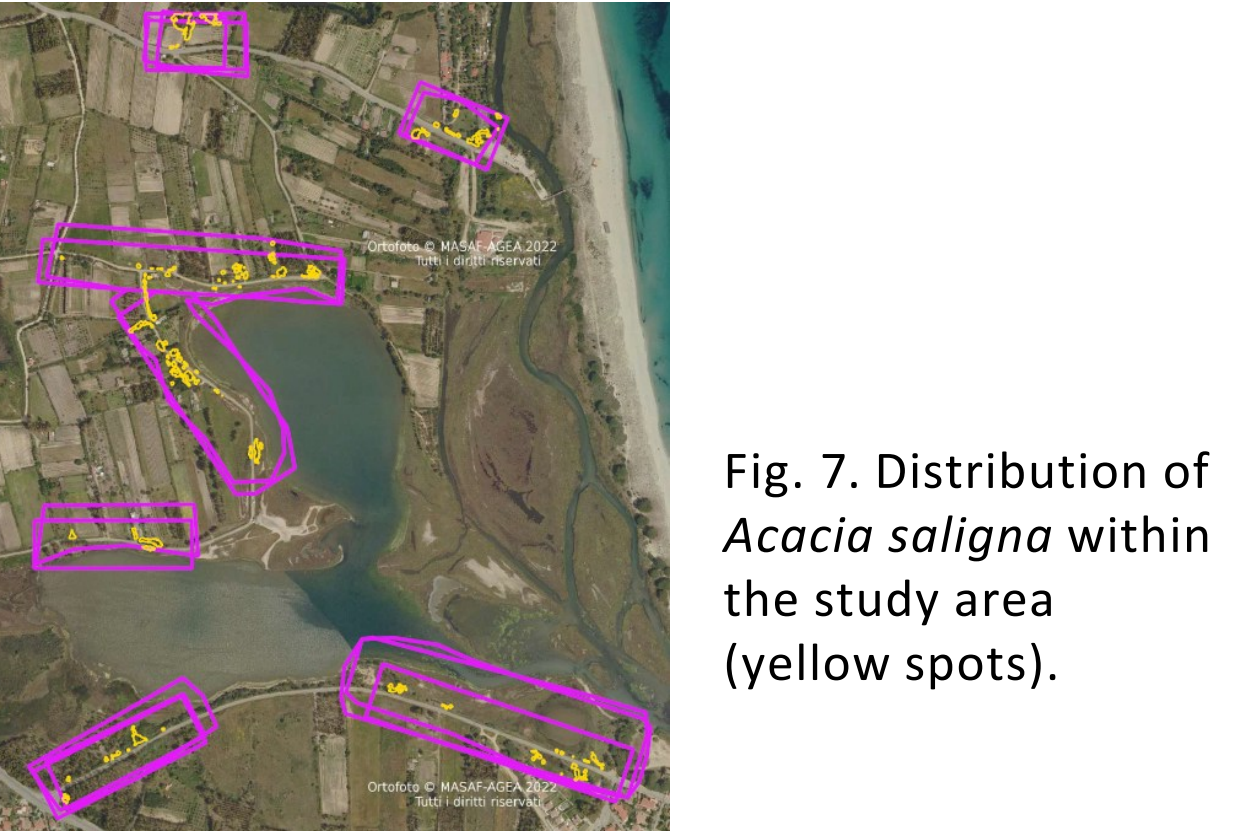


Fig. 7. Distribution of *Acacia saligna* within the study area (yellow spots).

Results. Photointerpretation is rather easy for *S. punicea* when the plants are in full bloom (June 2025) (Fig. 4). During the fruiting phase (July 2024), the recognition of this plant is less convenient but still possible. In November 2024, *S. punicea* suffered a severe attack by powdery mildew. This allowed to detect the species more easily, but less precisely than when it flowers. The castor oil plant could be more easily recognized in Autumn (November 2024) as it was the only shrub with leaves. *A. saligna* went into full bloom in early Spring (end of March 2025). However, as young plants do not flower, it is necessary to support the photointerpretation with in situ surveys. A distribution maps has been elaborated for each alien species (Figs. 5-7). *R. communis* is widespread throughout the area, while *S. punicea* occurs mainly along the riverbanks. *A. saligna* is common along the borders of cultivated fields and in uncultivated areas. The areas covered by *S. punicea* and *R. communis* are approximately 800 m² and 900 m² large respectively. As these areas are rather limited in size and both species behave invasive, they could be eradicated by mechanical weeding and subsequent manual removal of young seedlings. *A. altissima* has not been detected within the study area through drone and field surveys, but CS observations showed that it is widespread outside the Park, and could potentially invade the protected area as well. The tested approaches can be used complementary to further monitor the studied plants as well as other alien species in the Park of Tepilora to prevent and control invasions. A document summarize the results of the projects and includes recommendations for the Park to support its long-term monitoring and management strategy of invasive species.

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