

## Project update

The field visits to conduct the studies stated in the project proposal started in August 2025. The second visit took place in September 2025. A total of 19 sandy beaches (Fig. 1) were visited to measure the ghost crab burrow abundance, average ghost crab sizes, and environmental variables in relation to the level of human disturbance (Fig. 2, 3). Two areas of Antalya were visited during those two field trips. During the first visit, samples were taken from the western beaches, including Patara National Park and the beaches in its vicinity. Southern beaches in Antalya were visited in September 2005.

Urbanization index (a proxy for the levels of human disturbance on sandy beaches) indicates that eastern beaches experience a notably higher human disturbance compared with western beaches in Antalya. Specifically, the eastern beaches are disturbed by vehicles and a higher number of visitors without any time or space limitations, due to being equipped with amenities for tourists. On the contrary, Western beaches have strict time and space limitations. For example, tourists are allowed to visit a very small portion of the Patara Beach (almost 1/16 km of the beach) even during daylight, and the beach is closed at night for any kind of human activities. The beaches in the vicinity can be visited during the day and at night; however, tourists can only use a small portion of them. Furthermore, no vehicles are allowed on the western beaches, and almost no amenities are available for the visitors.

Measured ghost crab burrow density and average sizes indicate that the precautions against human disturbance have provided strong protection for the ghost crab populations. The abundance of the ghost crab populations on the western beaches (where strict time and space limitations exist) was significantly higher than on the eastern beaches (with no time and space limitations available). Organic tissue from ghost crabs was also collected to understand population connections under human disturbance (Fig. 4), which are currently under examination.

A specific finding of the eastern beaches should be stated here: using vehicles on the beaches literally destroyed the ghost crab populations (Fig. 5). Only 4 of 12 visited eastern sandy beaches had ghost crab individuals. No ghost crab individual or burrow was encountered on other beaches, suggesting that severe human disturbance got rid of the individuals from those sites, as we found some individuals on the same sites during our previous visits in 2020. Average density was  $0.003 \text{ ind/m}^{-2}$  for the eastern beaches, which is much lower than the average density on the western beaches.

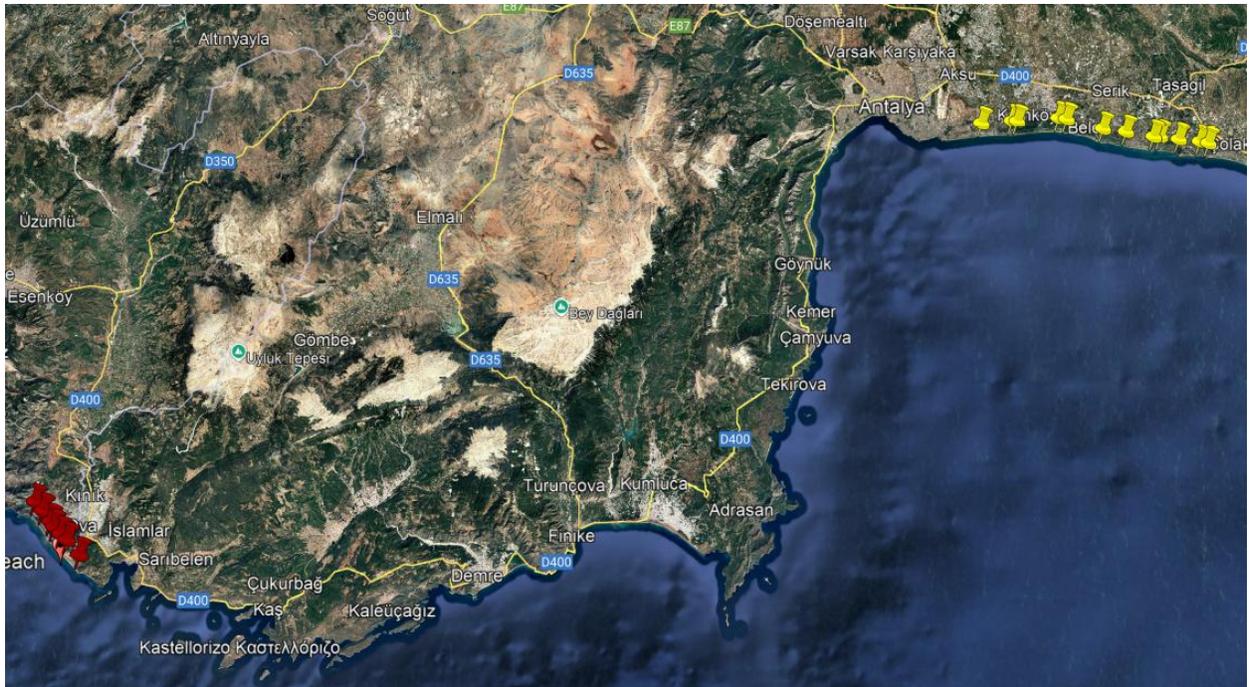


Fig. 1. Study sites. Red pins stand for western beaches, and yellow pins stand for eastern beaches.



Fig. 2. Measuring ghost crab burrow opening diameter.



Fig. 3. A ghost crab burrow



Fig. 4. A ghost crab individual collected during the beach visit



Fig. 5. Tire marks on a visited beach. Vehicles altered the morphology of the whole beach surface