

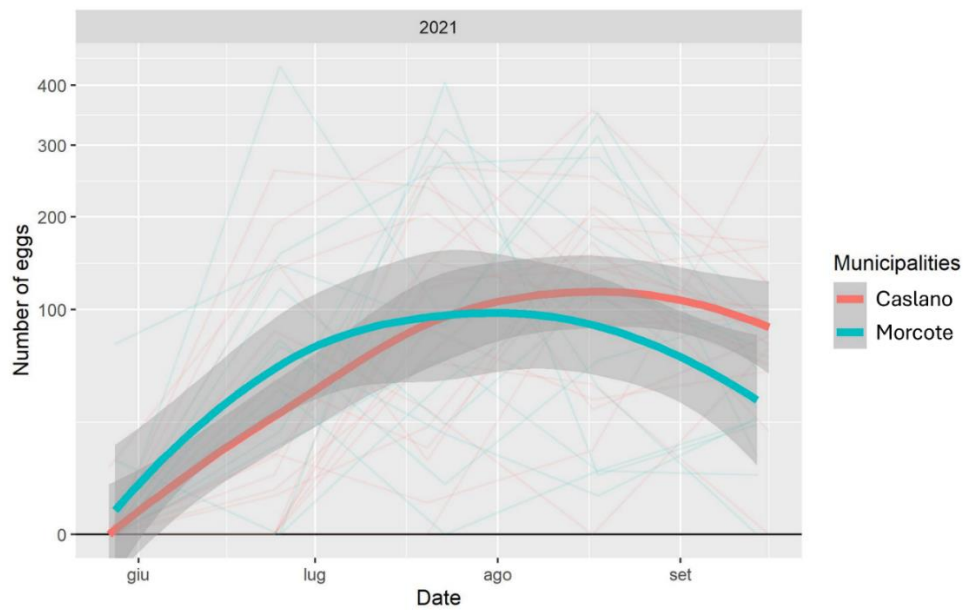
## **Supplementary file 1**

### **Method S1: Residual fertility of sterile males**

For this quality control test, a random sample of 200 sterile males was placed in a BugDorm rearing cage (W30 × D30 × H30 cm, BioQuip, Compton, CA, USA) along with 200 non-irradiated virgin females. An equal number of non-irradiated males and females were used as untreated control. The mosquitoes were provided with sugar and allowed to mate. Females were blood-fed twice, on days 3 and 4 after being introduced into the cage. The eggs produced were allowed to mature for one week before being subjected to the egg hatching protocol [1, 2]. Residual fertility was assessed by dividing the number of hatched eggs by the total number of eggs prior to the hatching protocol.

### **Method S2: Human landing collection**

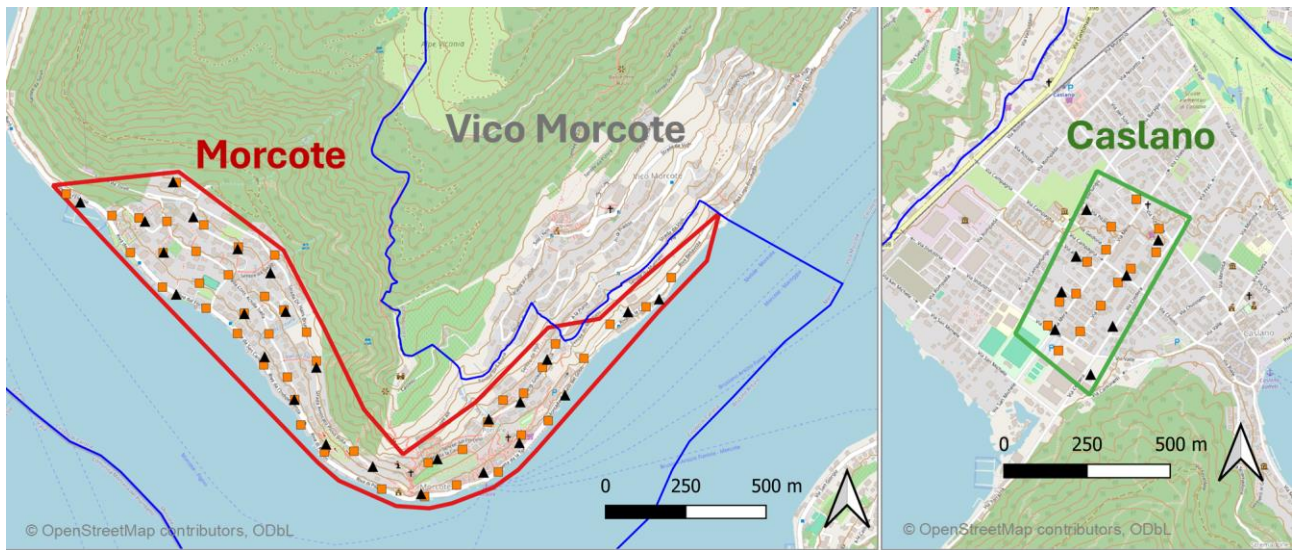
Human landing collections (HLC) were conducted every 24 hours from the 3<sup>rd</sup> to the 9<sup>th</sup> of August 2022, following the release of marked sterile males on the 2<sup>nd</sup> of August. The mark release and recapture (MRR) test area (Fig. S2) was divided into four concentric circles, 50 m apart, within which 32 HLC points were evenly distributed (distance between contiguous points: 50–100 m). The HLC points were located in areas favourable for mosquitoes resting (shaded and close to vegetation). Four field technicians rotated daily through the 32 collection points (8 collection points per technician) between 18:00 and 19:30 local time. HLCs were not conducted on the 6<sup>th</sup> and 7<sup>th</sup> of August due to stormy winds. Each HLC session lasted 5 minutes, during which mosquitoes were captured with manual aspirators.



**Fig. S1** Average number of invasive *Aedes* species eggs per ovitrap collected in 2021 in the municipalities of Morcote and Caslano.



**Fig. S2** 2022 and 2023 MRR study at the release site. The yellow star marks the release point, while the red points indicate the 32 recapture stations. The concentric yellow circles indicate the recapture distances from the release point.



**Fig. S3** Monitoring of *Ae. albopictus* eggs and adults at the release (left) and control (right) sites. Forty-five ovitraps (orange squares) were placed at the release site, and 14 at the control site. The number of adult female traps (black triangles) was 25 at the release site and 8 at the control site. The brownish lines represent contour lines at 20-meter intervals. The boundaries of the study municipalities, Morcote and Caslano, are outlined in blue.

**Table S1** Transportation and release methods and mortality rate of sterile males at release.

| Transportation        |                                          | Release       |            |                   | Average mortality rate inside the release cups after 1 hour |                          |      |
|-----------------------|------------------------------------------|---------------|------------|-------------------|-------------------------------------------------------------|--------------------------|------|
| No. sterile males/cup | Delivery method                          | Release event | Date       | No. releases/week | %                                                           | Notes                    |      |
| 2000                  | Express courier (18 h)                   | 1             | 03.05.2023 | 1                 | 45.4                                                        | Wake up 24h first in lab |      |
|                       |                                          | 2             | 09.05.2023 |                   | 56.4                                                        |                          |      |
|                       |                                          | 3             | 16.05.2023 |                   | 48.9                                                        |                          |      |
|                       |                                          | 4             | 23.05.2023 |                   | 55.0                                                        |                          |      |
| 5                     |                                          | 30.05.2023    | 62.7       |                   |                                                             |                          |      |
| 6                     |                                          | 06.06.2023    | 28.1       |                   |                                                             |                          |      |
| 7                     |                                          | 13.06.2023    | 27.4       |                   |                                                             |                          |      |
| 8                     |                                          | 20.06.2023    | 29.3       |                   |                                                             |                          |      |
| 1000                  |                                          | 9             | 27.06.2023 | 2                 | 18.4                                                        | 2 days delivery          |      |
|                       |                                          | 10            | 30.06.2023 |                   | 27.8                                                        |                          |      |
|                       |                                          | 11            | 04.07.2023 |                   | 9.0                                                         |                          |      |
|                       |                                          | 12            | 07.07.2023 |                   | 19.9                                                        |                          |      |
|                       |                                          | 13            | 11.07.2023 |                   | 26.1                                                        |                          |      |
|                       |                                          | 14            | 14.07.2023 |                   | 15.7                                                        |                          |      |
|                       |                                          | 15            | 18.07.2023 |                   | 37.6                                                        |                          |      |
|                       |                                          | 16            | 21.07.2023 |                   | 13.1                                                        |                          |      |
|                       |                                          | 17            | 25.07.2023 |                   | 16.7                                                        |                          |      |
|                       |                                          | 18            | 28.07.2023 |                   | 16.8                                                        |                          |      |
|                       |                                          | 19            | 02.08.2023 |                   | 24.6                                                        |                          |      |
|                       |                                          | 20            | 04.08.2023 |                   | 14.7                                                        |                          |      |
|                       |                                          | 21            | 08.08.2023 |                   | 14.5                                                        |                          |      |
|                       |                                          | 22            | 11.08.2023 |                   | 8.9                                                         |                          |      |
|                       |                                          | 23            | 16.08.2023 |                   | 39.4                                                        |                          |      |
|                       |                                          | 24            | 18.08.2023 |                   | 20.1                                                        |                          |      |
|                       |                                          | 25            | 22.08.2023 |                   | -                                                           |                          |      |
|                       |                                          | 26            | 24.08.2023 |                   | 17.1                                                        |                          |      |
|                       | Direct transportation by car/train (3 h) | 27            | 28.08.2023 |                   | 1                                                           |                          | 15.4 |
|                       |                                          | 28            | 01.09.2023 |                   |                                                             |                          | 19.1 |
|                       |                                          | 29            | 04.09.2023 | 6.2               |                                                             |                          |      |
|                       |                                          | 30            | 08.09.2023 | 6.3               |                                                             |                          |      |
|                       |                                          | 31            | 11.09.2023 | 5.4               |                                                             |                          |      |
|                       |                                          | 32            | 15.09.2023 | 8.2               |                                                             |                          |      |
|                       |                                          | 33            | 18.09.2023 | 14.1              |                                                             |                          |      |
|                       |                                          | 34            | 29.09.2023 | 6.2               |                                                             |                          |      |

**Table S2** Mark release and recapture (MRR) results in the trial area in 2022 and 2023.

| Release date | NAM    | FP  | MR   | $\theta$ | s    | ALE | MDD   |
|--------------|--------|-----|------|----------|------|-----|-------|
| 2022.08.02   | 22,500 | 0.4 | 10.7 | 0.21     | 0.59 | 1.9 | 91.0  |
| 2023.06.13   | 10,000 | 0.3 | 43.0 | 0.25     | 0.62 | 2.1 | 72.5  |
| 2023.07.11   | 20,000 | 0.4 | 48.5 | 1.57     | 0.40 | 1.1 | 71.9  |
| 2023.08.22   | 20,000 | 0.3 | 29.1 | 0.01     | 0.87 | 7.2 | 147.4 |

NAM: No. of adult males released

FP: Female presence (%)

MR: Mortality rate of the marked males at release (%)

$\theta$ : Male recapture rate (%)

s: Survival rate (linear correction) (%)

ALE: Average life expectancy (days)

MDD: Mean distance dispersed (m)

**Table S3** Range of dispersion of marked sterile males in 2022 and 2023.

| Range from release point (m) | No. of males recaptured |      | % of males recaptured |      |
|------------------------------|-------------------------|------|-----------------------|------|
|                              | 2022                    | 2023 | 2022                  | 2023 |
| 0–50                         | 30                      | 87   | 46.2                  | 35.5 |
| 50–100                       | 24                      | 108  | 36.9                  | 44.1 |
| 100–150                      | 8                       | 41   | 12.3                  | 16.7 |
| 150–200                      | 3                       | 9    | 4.6                   | 3.7  |

## References

1. Food and Agriculture Organization of the United Nations, International Atomic Energy Agency. Guidelines for Mark-Release-Recapture Procedures of *Aedes* Mosquitoes. Vienna: FAO & IAEA; 2020.
2. Joint FAO/IAEA Division of Nuclear Techniques in Food and Agriculture Vienna (Austria). Guidelines for Colonization of *Aedes* Mosquito Species. Version 1. 2018.