



Phenology and host-plant association of spittlebugs in Mediterranean olive groves

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RC/EFSA/ALPHA/2015/01:

“Collection of data and information on biology and control of vectors of *Xylella fastidiosa*”

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Spittlebugs are the most common xylem-sap feeders in Europe
(Hemiptera: Cercopoidea)



Photo: Nicola Bodino

Cercopoidea

Aphrophoridae

Philaenus spumarius, the major vector

Philaenus italosignus competent vector

Neophilaenus campestris competent vector



Article

Transmission of *Xylella fastidiosa* Subspecies *Pauca* Sequence Type 53 by Different Insect Species



Photo: Nicola Bodino

Membracoidea

Cicadellidae Cicadellinae

Cicadella viridis

Competent, although inefficient, vector of *Xylella fastidiosa*

ST 53 to periwinkle (not to olive)

[See presentation by Bodino et al.](#)



Photo: Nicola Bodino



Spittlebug species in olive groves of Italy

Population dynamics



Host-plant associations

Phenology

Nymphs and adults abundance

Sex ratio

Predictive models

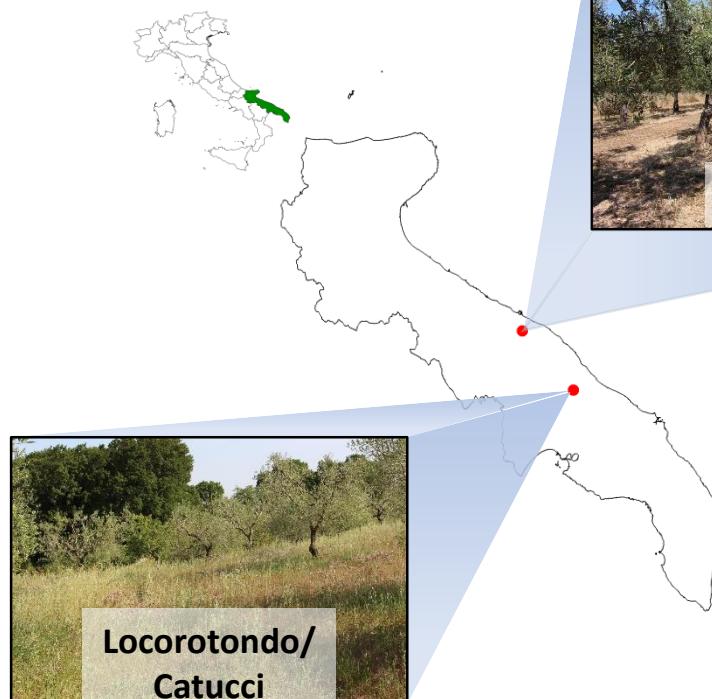
Design control measures

slowing disease progression

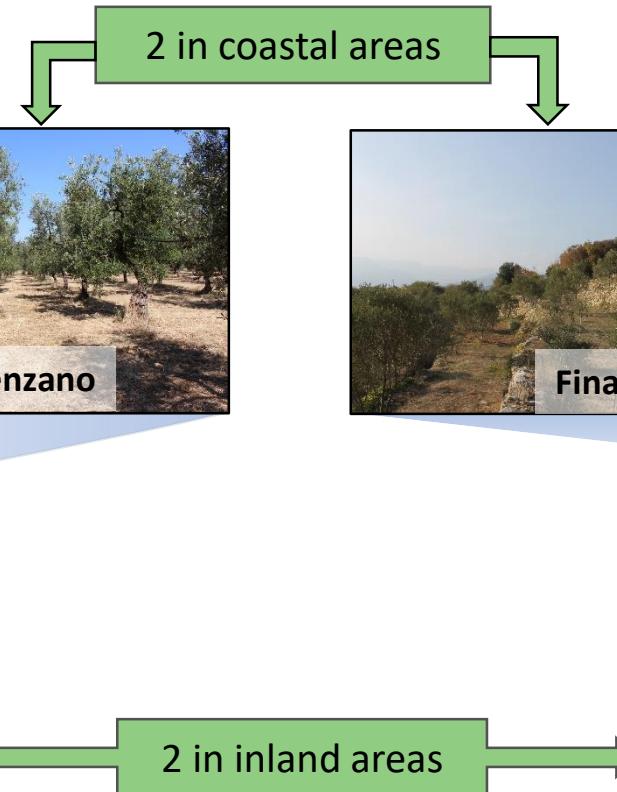
assessing risk in
non-infected areas

Experimental sites

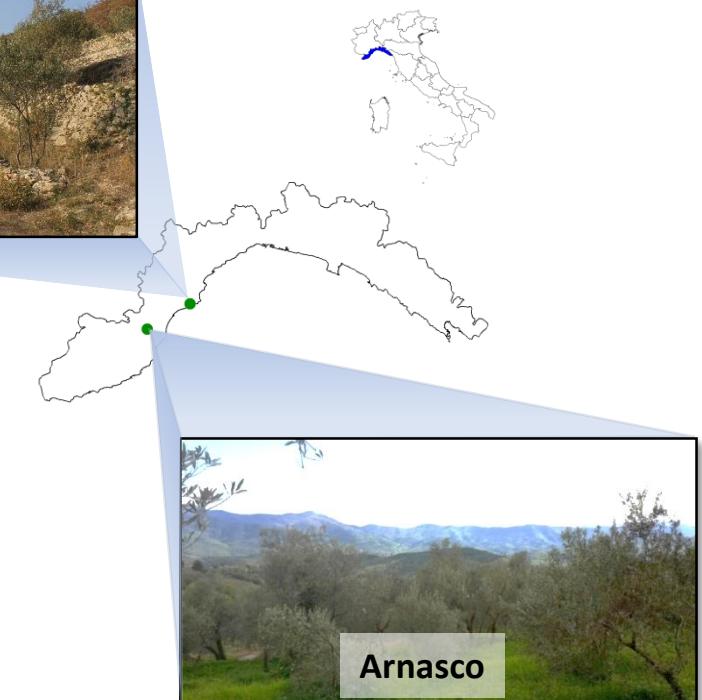
4 olive groves



2 in Apulia (South Italy)



3 year study



2 in Liguria (North Italy)

Sampling methodology

Nymphs on herbaceous plants

- **30 samples** per olive grove (0.25 m² each) → simple random sampling
- Count of nymphs and spittles (instar ID) → conservative sampling
- ID of host-plants (species/genus level)
- Plant community sampling (inside the quadrat)
- **weekly field samplings**



Temperature and RH
registered hourly in
each olive grove



Sampling methodology

Adults

- Sweeping net → simple random sampling
- Count and sexing → conservative sampling
- every two weeks



Herbaceous cover → 30 samples (4 sweeps each)

Vegetation ID

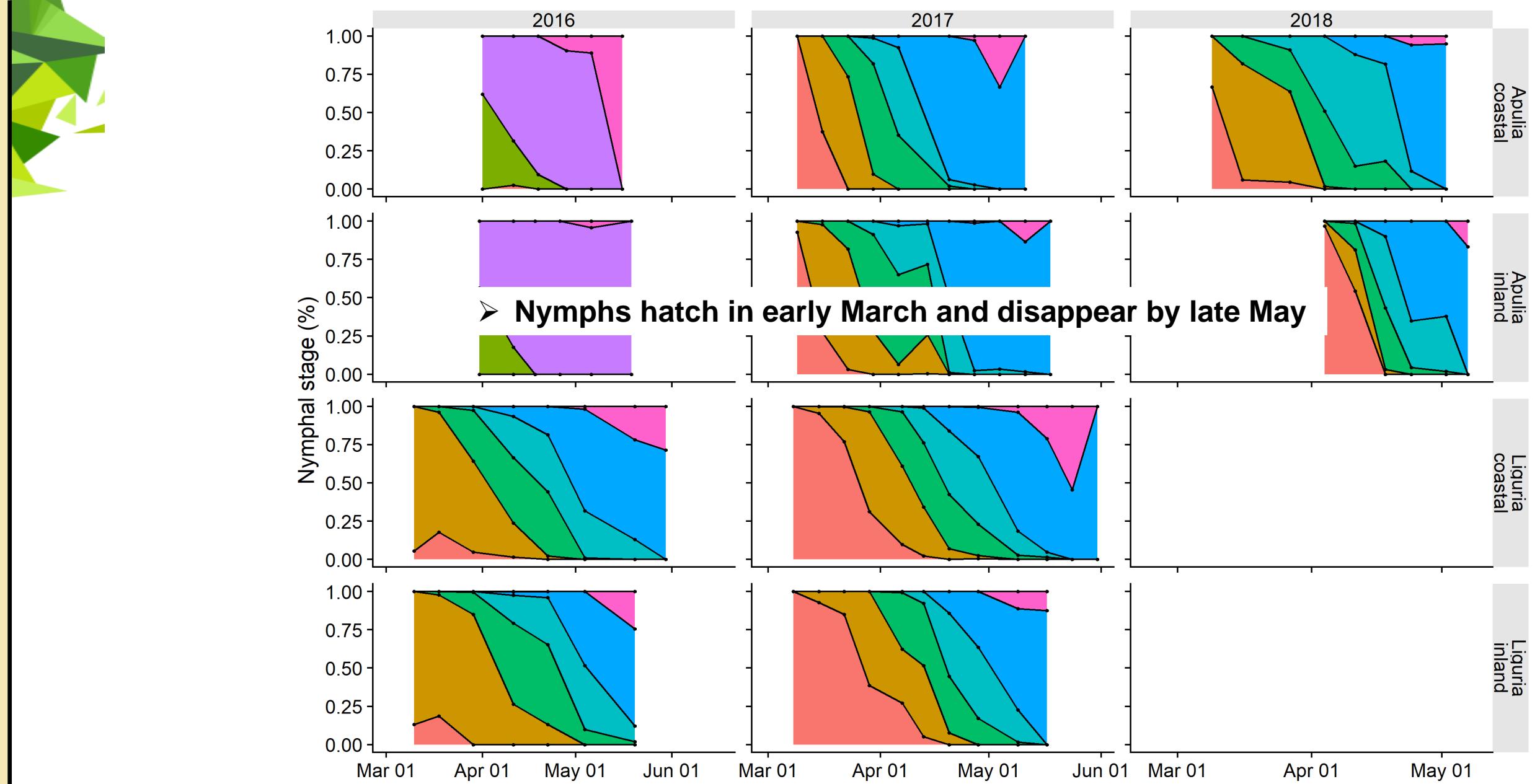
Olive trees → 20 samples (10 sweeps each)

Phenology of olive trees (BBCH)

Shrubs/trees → 10/30 samples
(10 sweeps each)



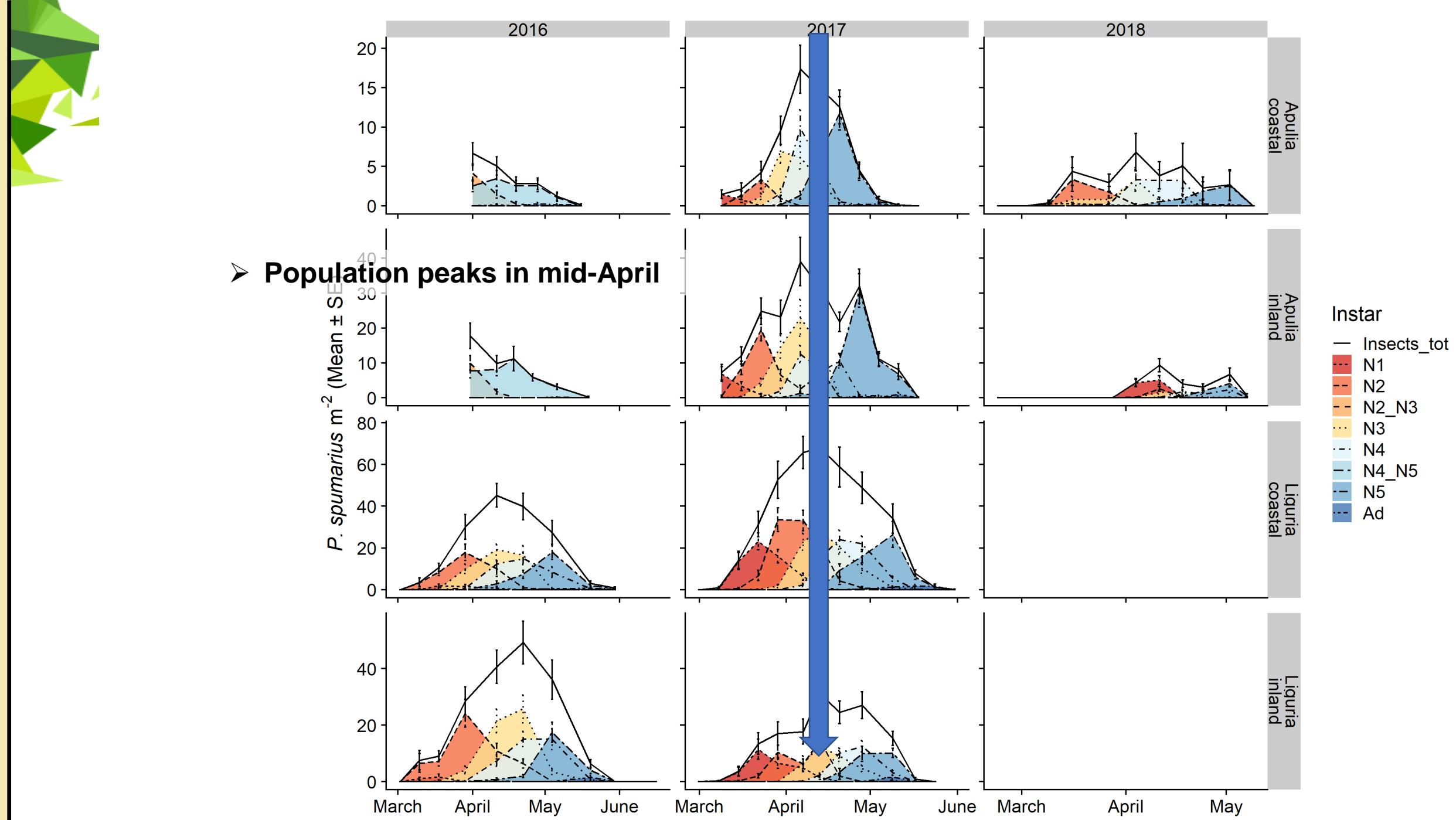
Results



1 *Xylella fastidiosa* 2017:

Instar N1 N2_N3 N4 N4_N5
N2 N3 N5 Ad

Results

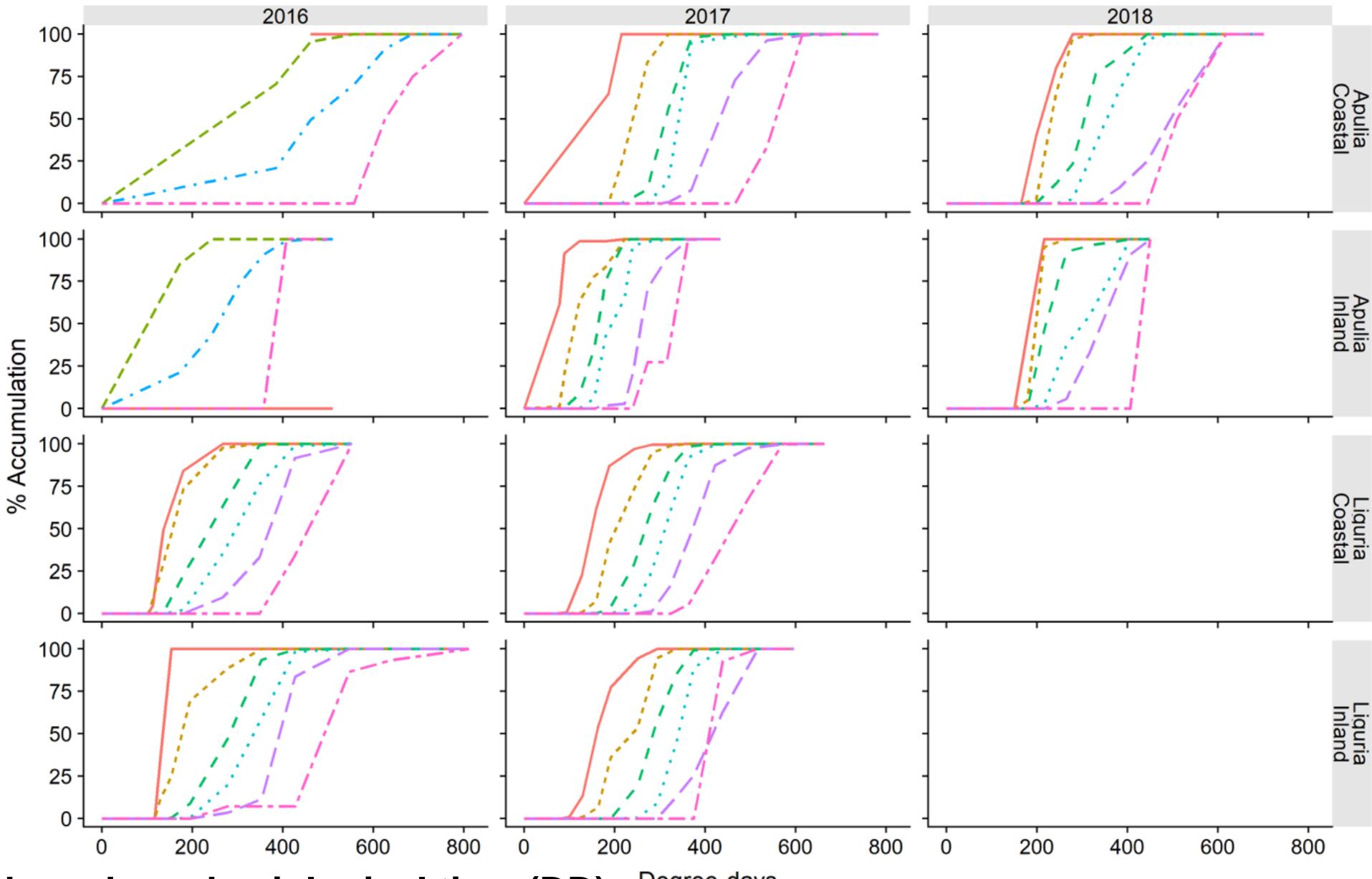


Results

Phenological data based on physiological time (DD)

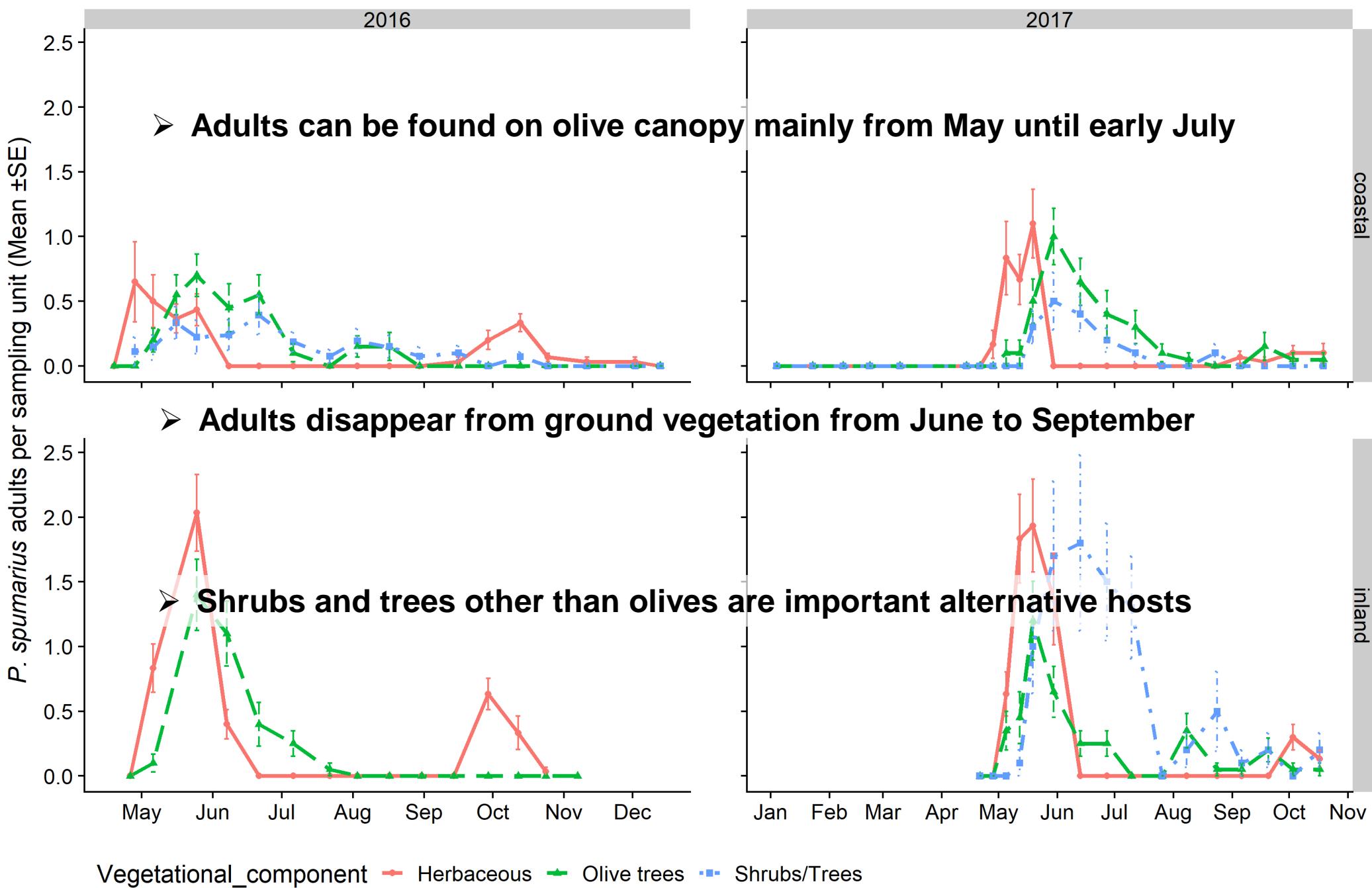
Instar

1st	2nd-3rd	4th	5th
—	—	—	—
2nd	—	—	—
3rd	—	—	—
4th-5th	—	—	—
Early adults	—	—	—



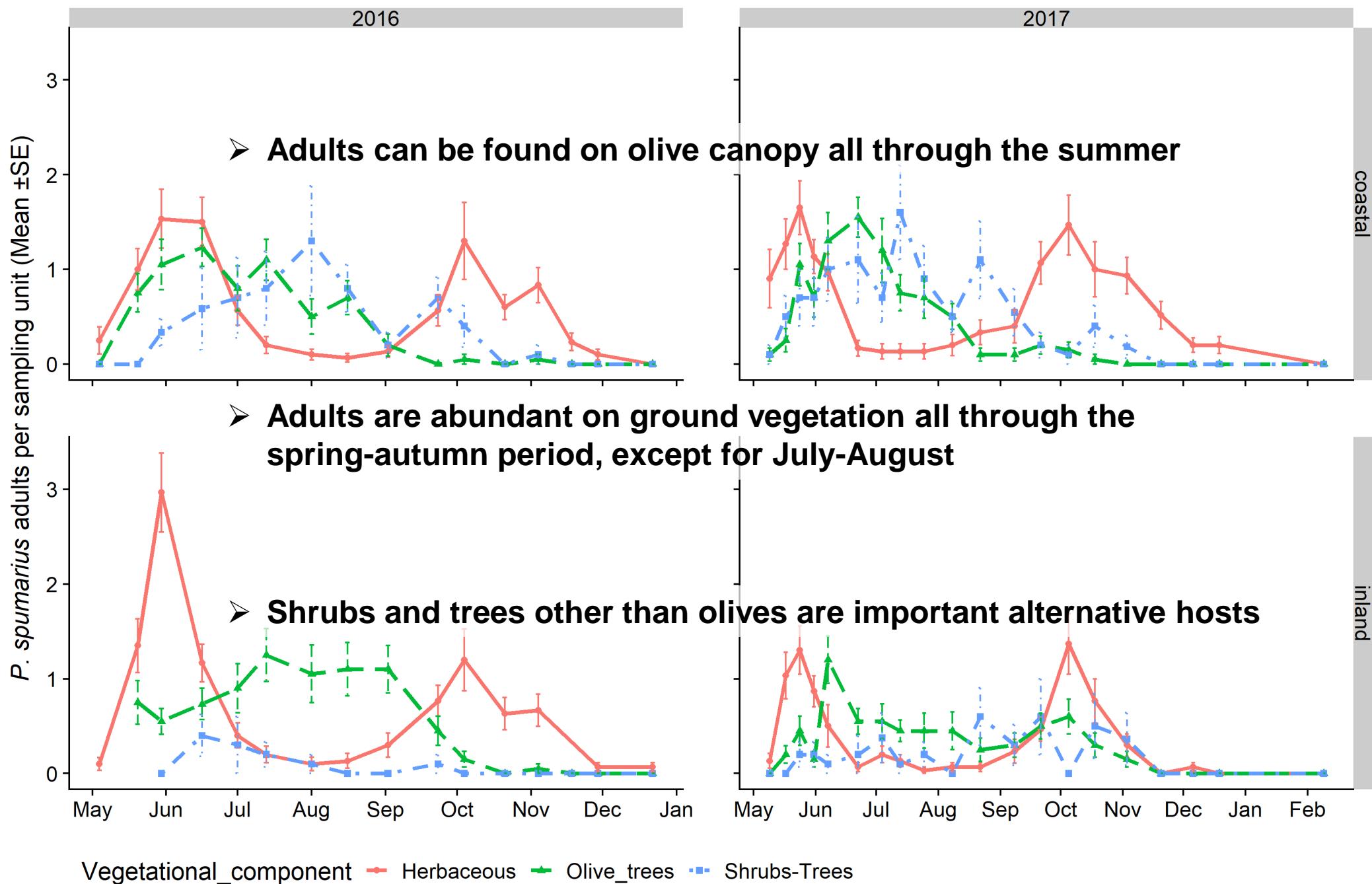
Adult populations of *P. spumarius* in Apulia

Results

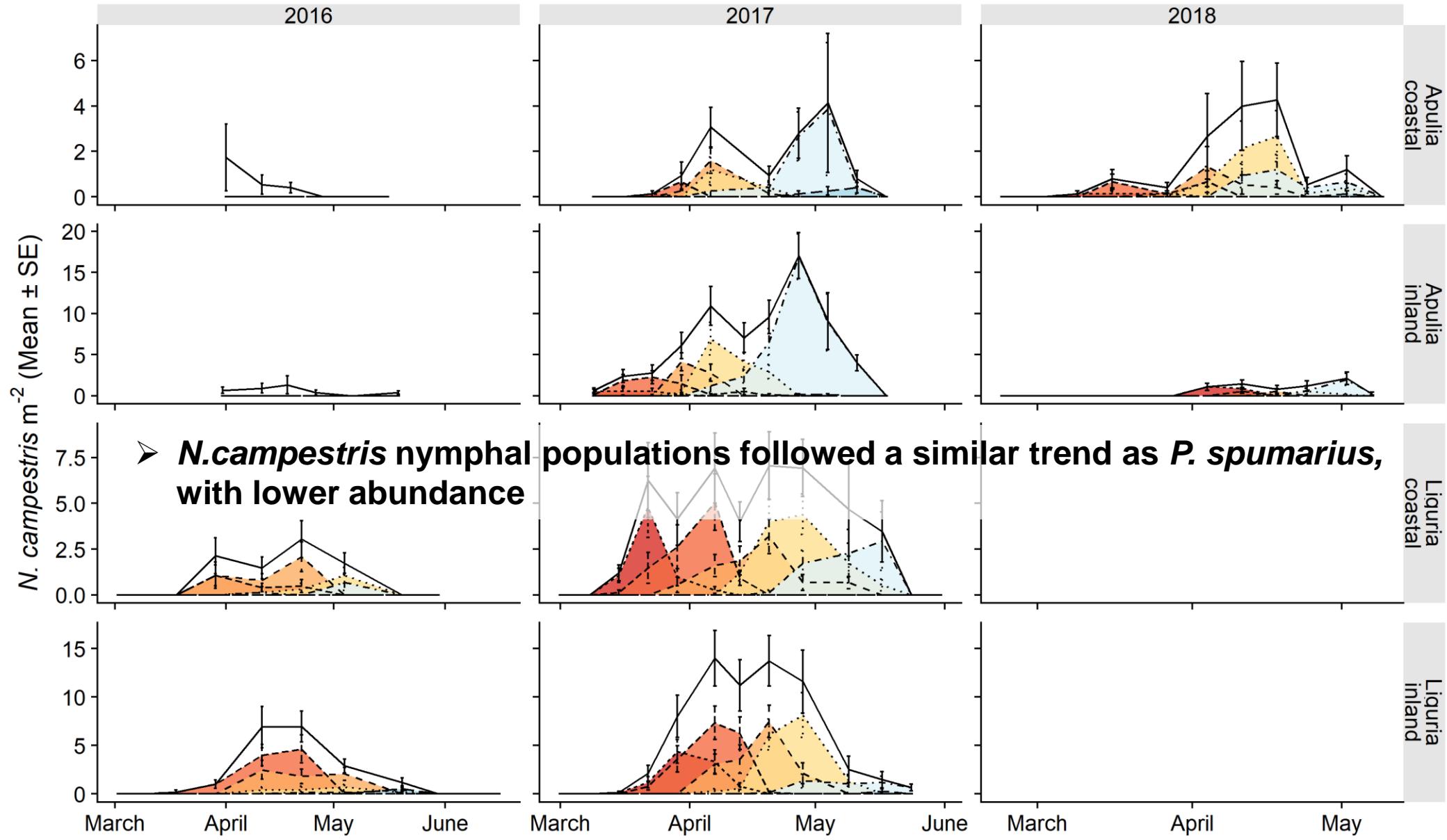


Results

Adult populations of *P. spumarius* in Liguria

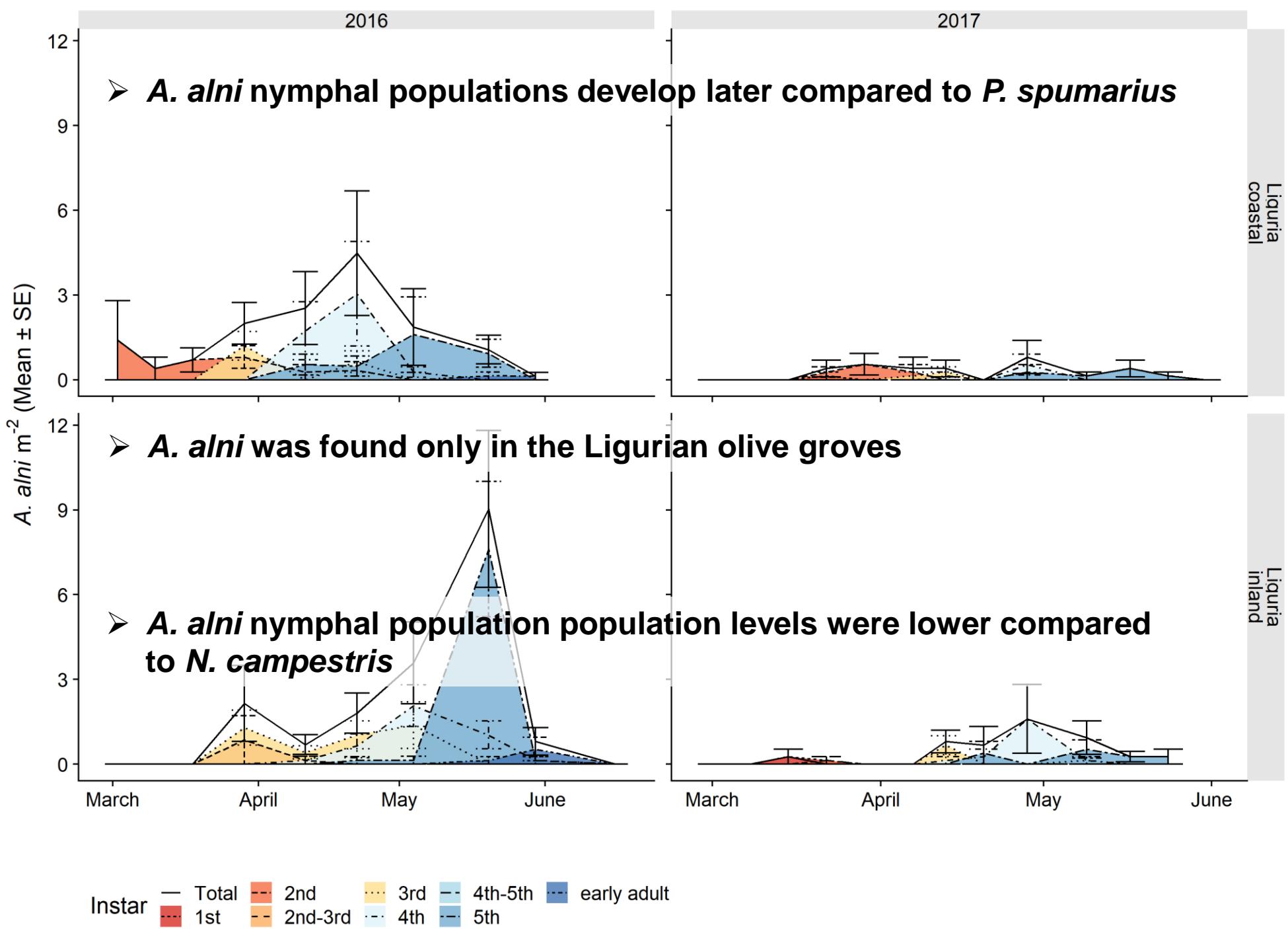


Results *N. campestris* nymphs



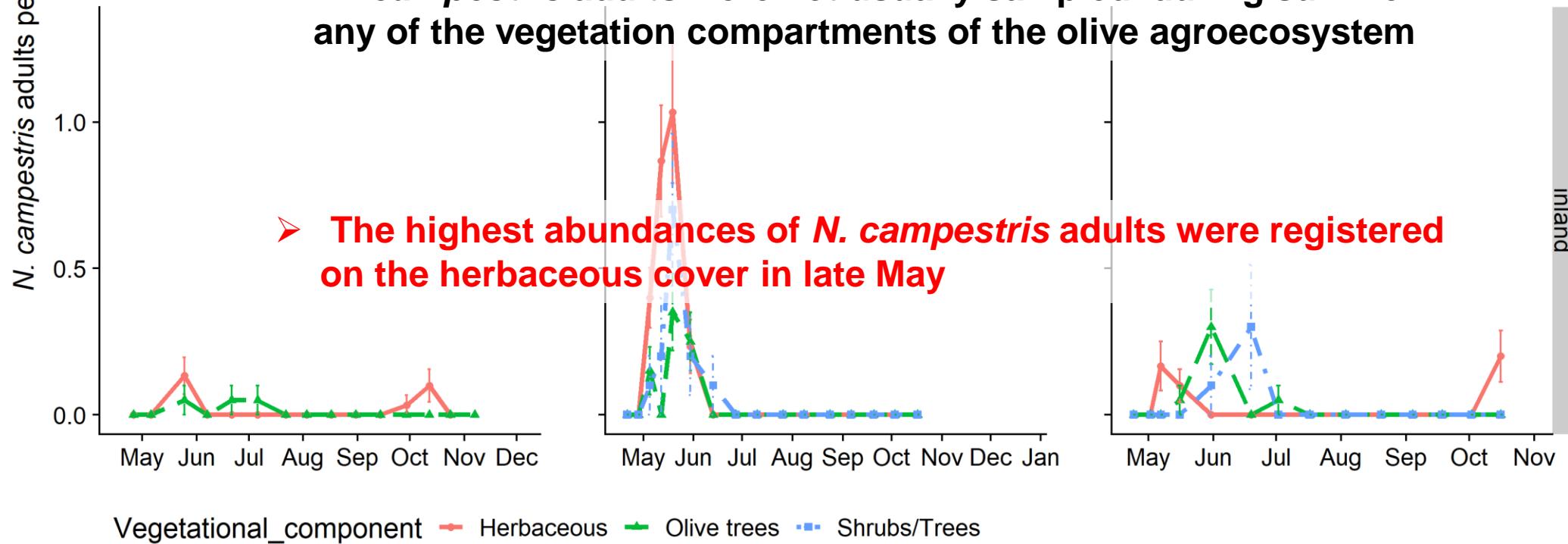
Instar — Insects_tot — N2 — N4 — Ad
— N1 — N3 — N5

Results



Results

Apulia



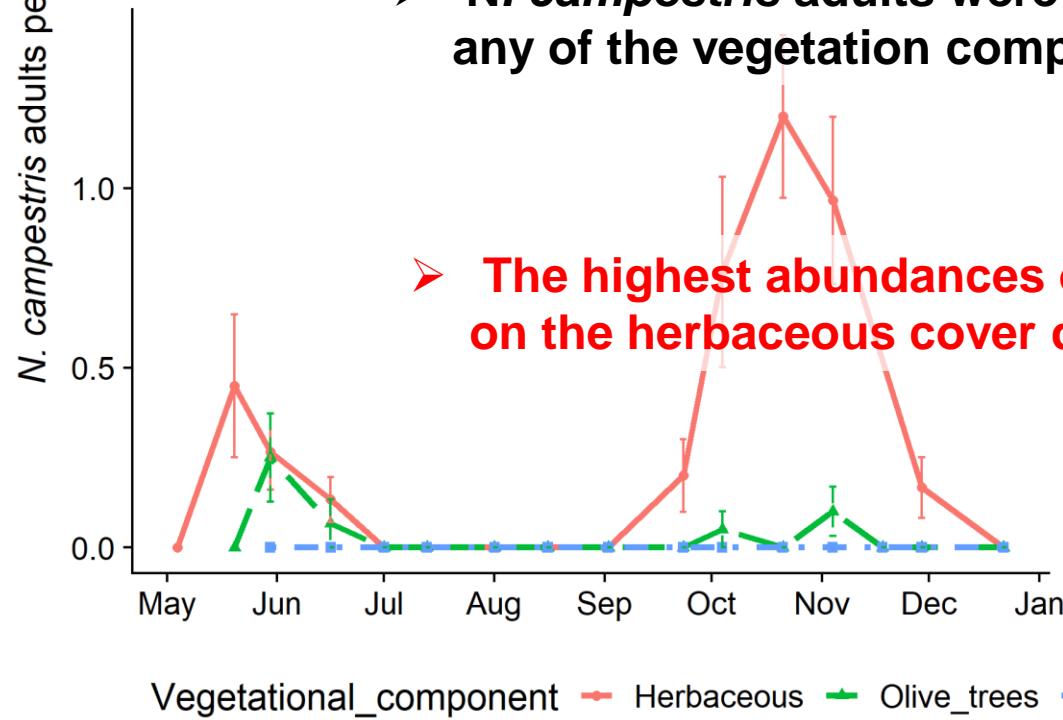
coastal

inland

Results *N. campestris* adults



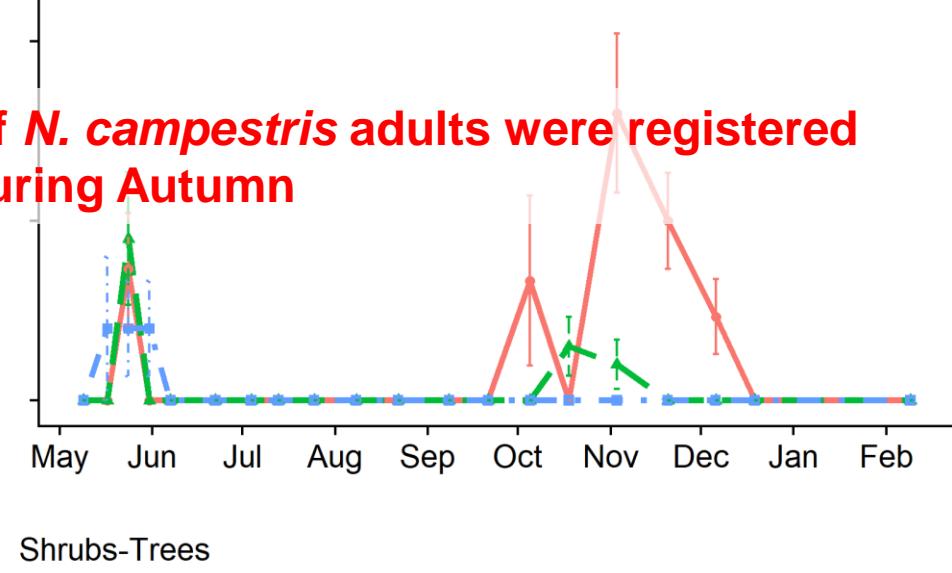
Liguria



- Adults of *N. campestris* were mainly collected in the herbaceous cover, especially where grasses (i.e. Poaceae) were dominant

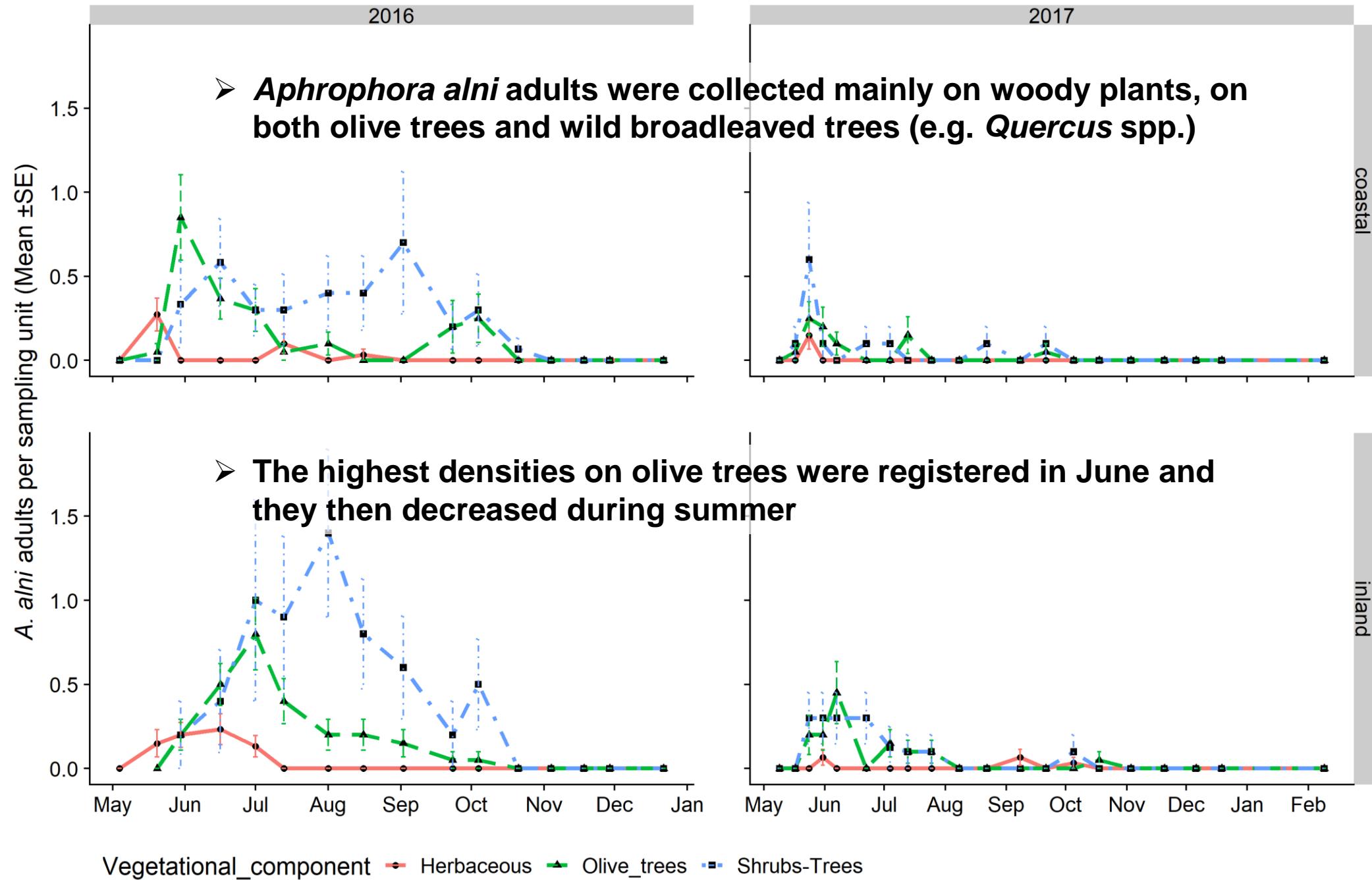
- *N. campestris* adults were not usually sampled during summer in any of the vegetation compartments of the olive agroecosystem

➤ The highest abundances of *N. campestris* adults were registered on the herbaceous cover during Autumn



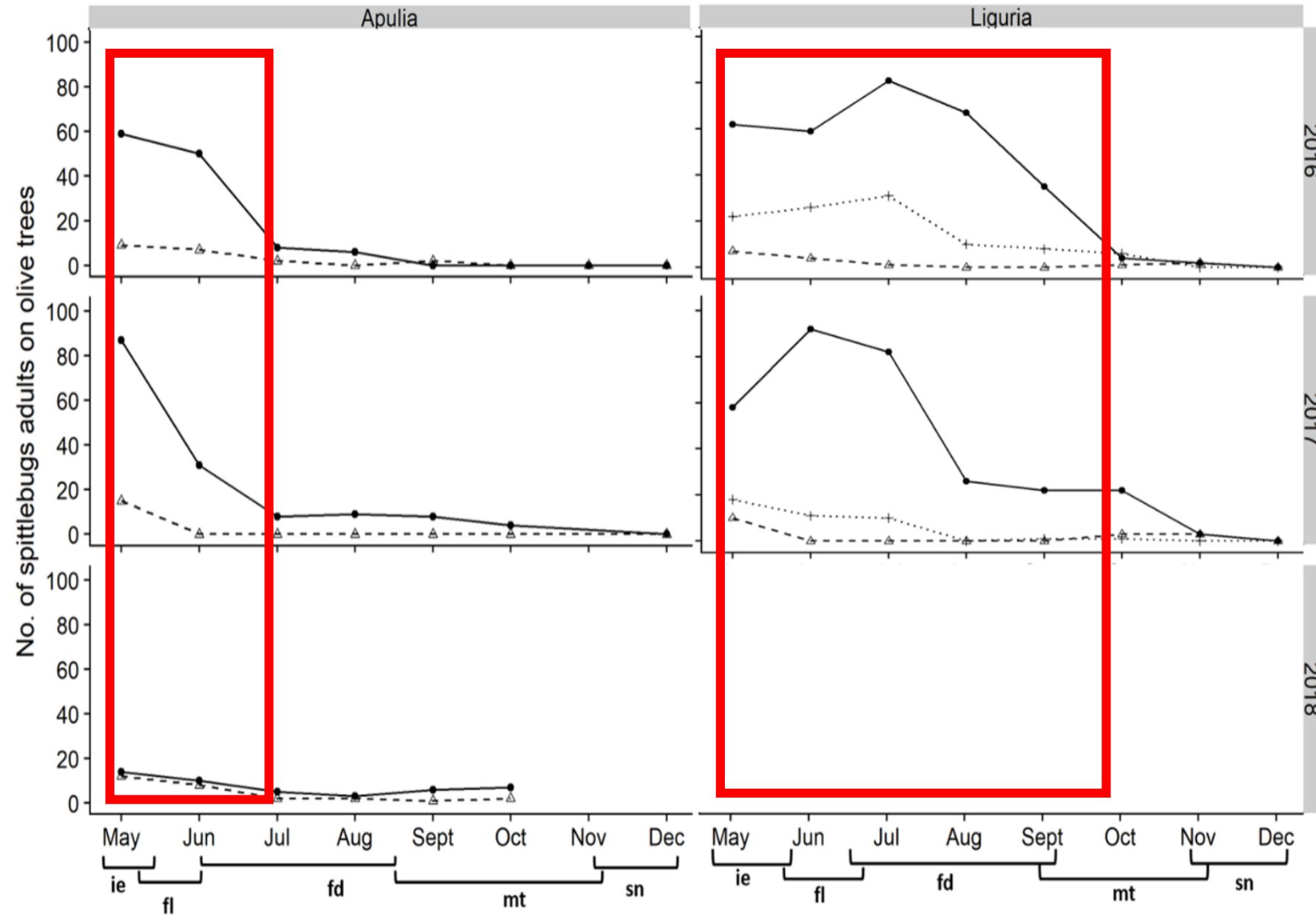
Results

Liguria



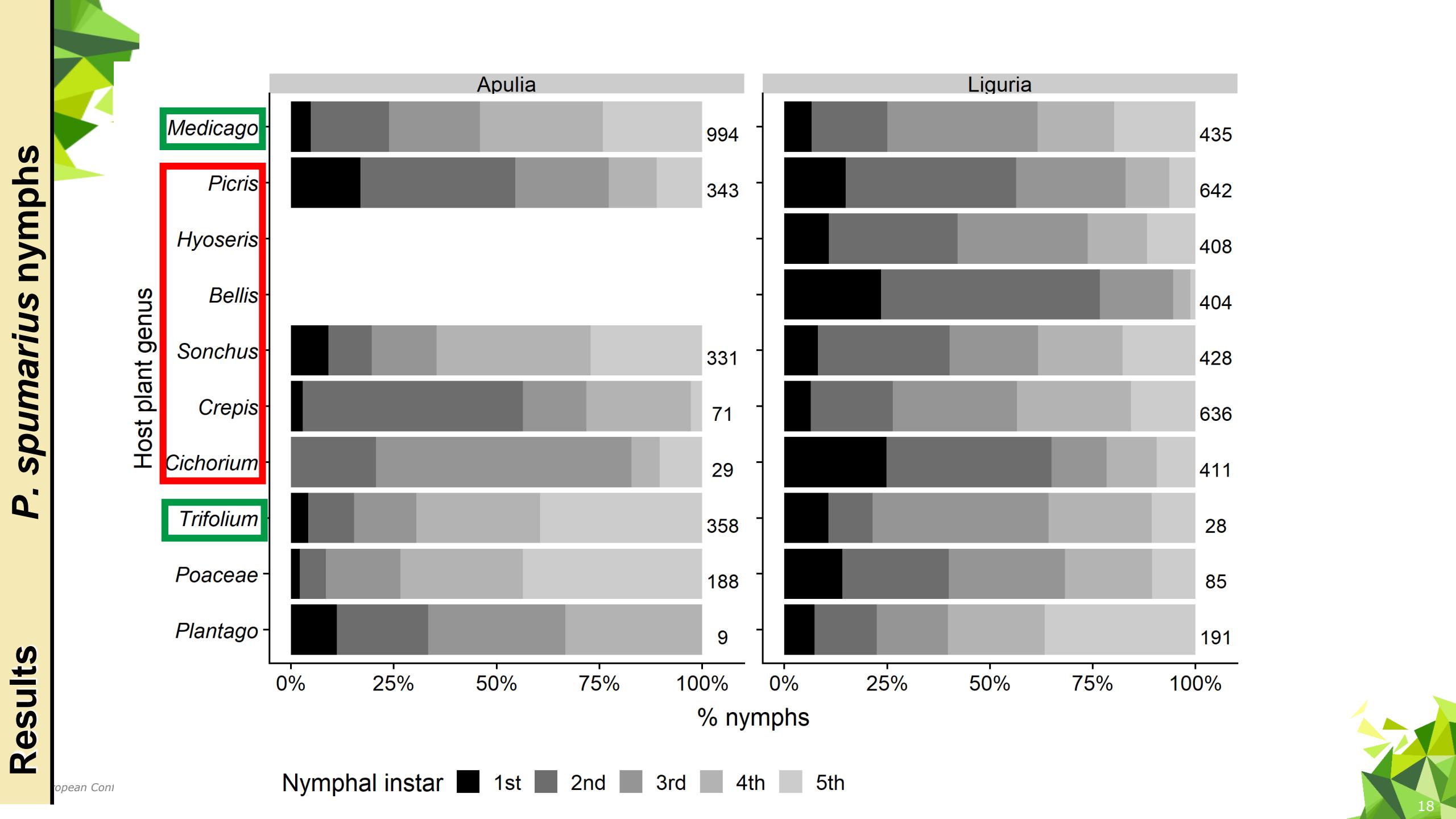
Results

Abundance of spittlebug adults on olive trees over the season in Apulia and Liguria olive groves, compared with phenological stages of olive tree



(ie = inflorescence emergence; fl = flowering; fd = fruit development; mt = maturity of fruits; sn = senescence)

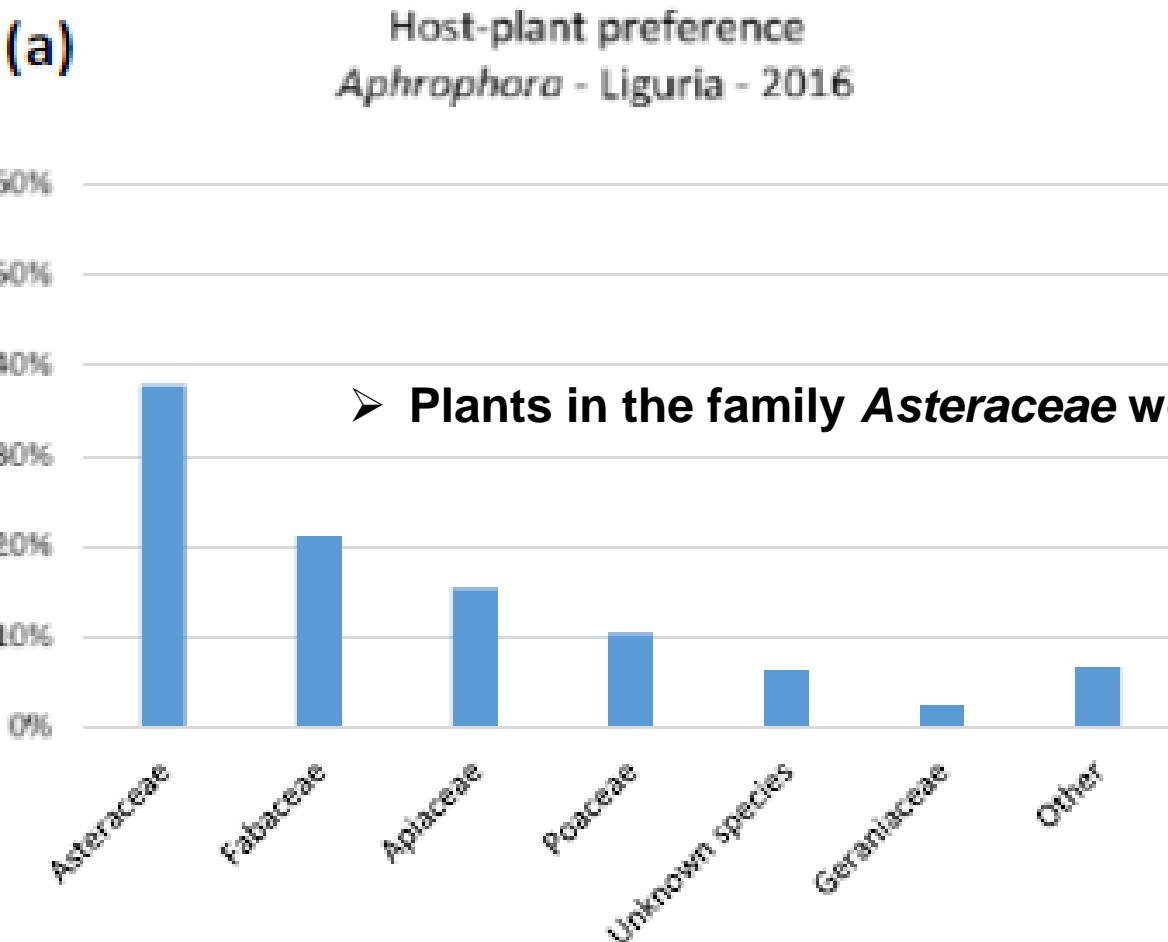
Results



Results

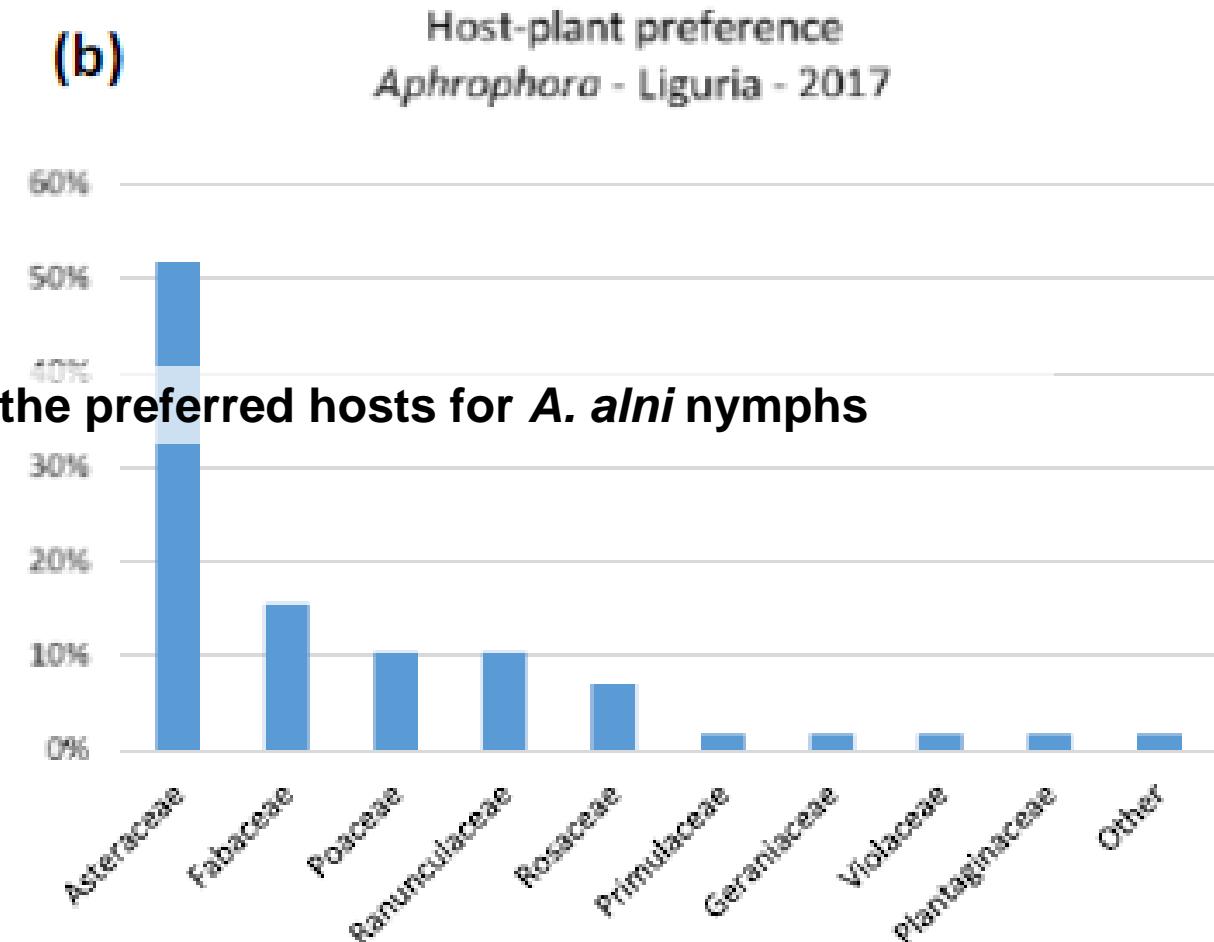
A. alni nymphs

(a)

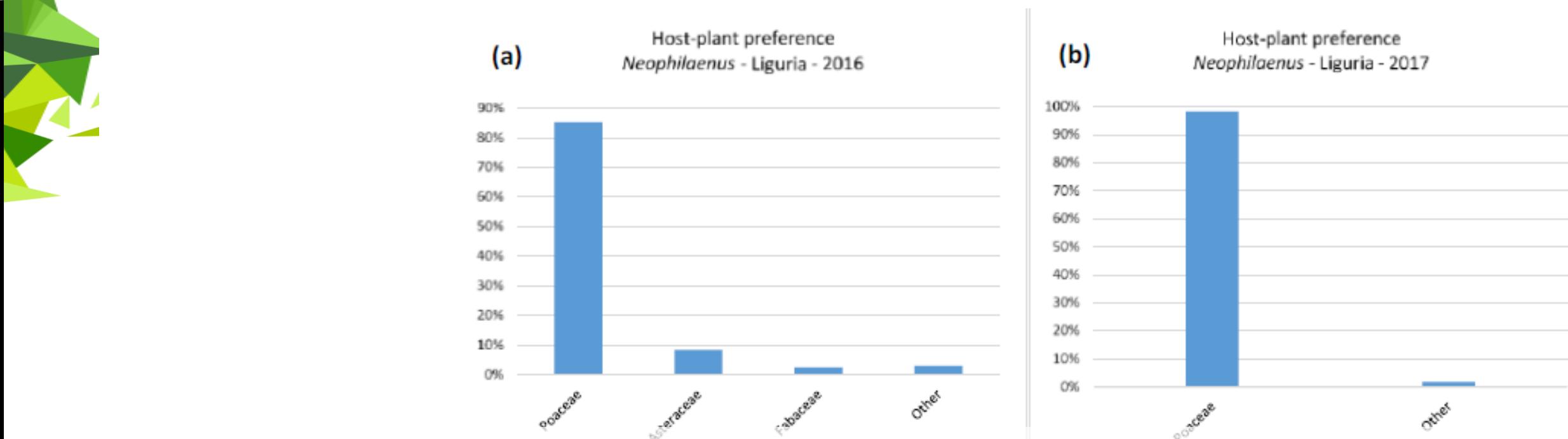


➤ Plants in the family Asteraceae were the preferred hosts for *A. alni* nymphs

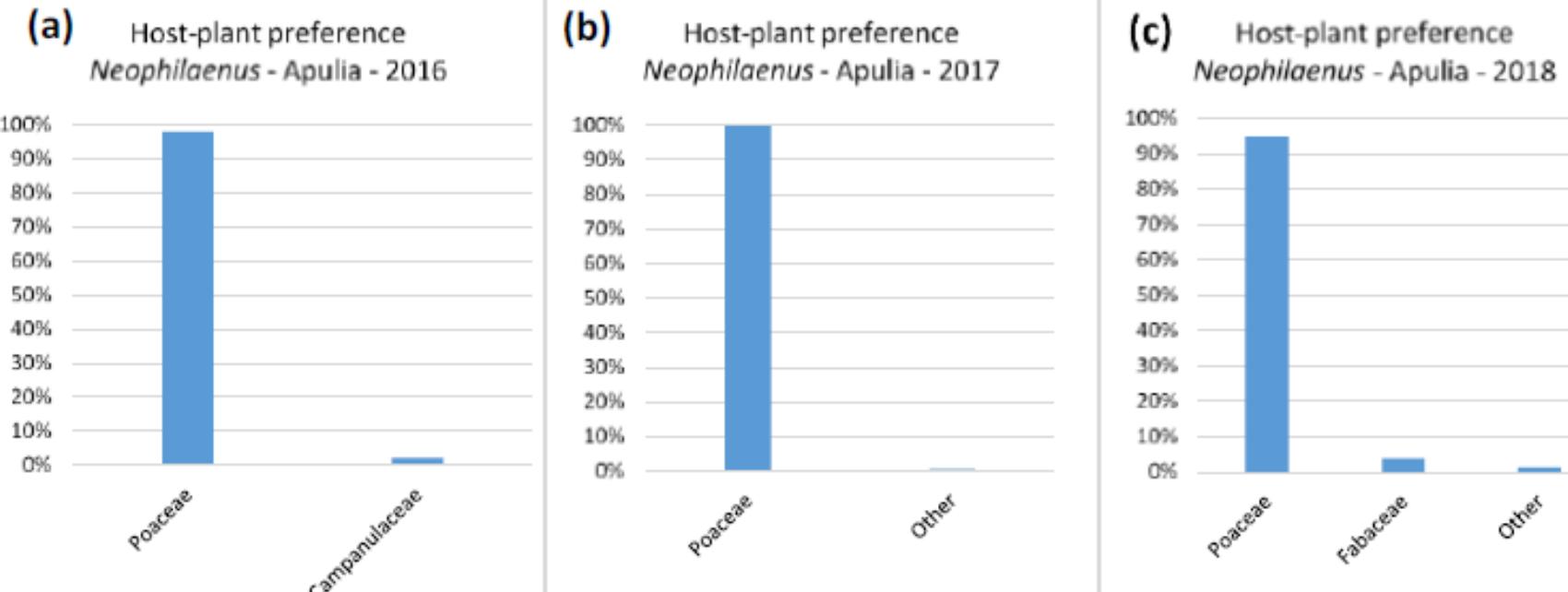
(b)



Results *N. campestris* nymphs



➤ *N. campestris* nymphs were strongly associated with plants in the family **Poaceae**



Plant Selection and Population Trend of Spittlebug Immatures (Hemiptera: Aphrophoridae) in Olive Groves of the Apulia Region of Italy

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Domenico Bosco^{3,5,6,○}

Nymphs of *P. spumarius* were sampled on 72 plant genera, and among the most common 25 genera, ***Sonchus*, *Knautia*, *Glebionis*, *Urospermum* (Asteraceae), *Medicago*, *Vicia*, *Melilotus*** (Fabaceae), and ***Daucus*** (Apiaceae) were the ones selected preferentially, according to Manly's index results

Phenology and abundance

- The phenological pattern in the two regions is similar if referred to chronological time. In fact, nymphs developed in Liguria between early March and end of May and in Apulia between the end of February and mid-May
- Phenological data based on physiological time (DD) are different in Liguria and Apulia. This difference among locations could be explained by a non-linear component in the temperature-dependent development rate function of *P. spumarius*
- The average nymph population density of *P. spumarius* varied from 13 to 30 individuals/m² in Liguria according to the olive grove and the year, and from 5 to 19 individuals/m² in Apulia



Host-plants of nymphs

- Nymphs of *P. spumarius* were polyphagous, they showed a strong host-preference for herbaceous plants of the Asteraceae and Fabaceae families both in Liguria and in Apulia regions of Italy: 72-88% of the total nymphs were indeed associated with these plant families
- Nymphs of *Aphrophora alni* showed a similar host-preference, while those of *Neophilaenus campestris* were strongly associated with Poaceae (85-100% of the nymphs were found on gramineous plants)

Vegetation compartments of the olive agroecosystem

- Depending on the region, the highest presence of *P. spumarius* adults on olive trees was recorded in May-June (Apulia) or for an extended period in May-August (Liguria)
- On the herbaceous cover two peaks of adults could be identified, in May and in September-October
- Alternative woody host-plants are important reservoir of the vector over the summer months





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EXTERNAL SCIENTIFIC REPORT



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Collection of data and information on biology and control of vectors of *Xylella fastidiosa*

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Thanks for your attention