



**An update on short-term forecasting for larvae and adult mosquito abundances and epidemiological risk in wide – area mosquito control programs.**

**22<sup>nd</sup> E-SOVE conference  
Sofia, Bulgaria, 11-14/10/2022**

**Nikos Perros, Ecodevelopment SA**



# Our products

Product? Service?

“Service as a product – SaaSP”

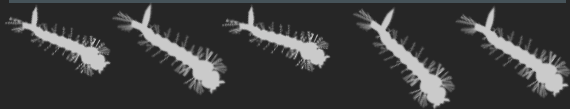
B2G, B2B, B2C

**BoL      BAR      BAd**

# Our forecast products

## **BoL** (Big data technologies model of Larvae)

- ✓ Weekly forecast of mosquito presence – absence (Culex, Aedes) at breeding site lvl
- ✓ Binary model, probabilistic
- ✓ ML, Random Forest algorithm
- ✓ **Training: RCM, 2018 to 2022**
- ✓ >280.000 on site larvae samplings from >20.000 delineated breeding sites



## **BAR** (Big data technologies' model for the Assessment of Risk)

- ✓ Weekly forecast of WNV at settlement lvl
- ✓ Binary model, probabilistic
- ✓ ML, Neural network
- ✓ **Training: RCM 2018 to 2022**
- ✓ 319 WNV human cases



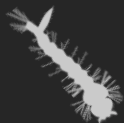
## **BAd** (Big data technologies' model for Adult mosquitoes)

- ✓ Daily forecast of mosquito abundances at settlement level
- ✓ Regression model
- ✓ ML, CatBoost algorithm
- ✓ **Training: RCM, 2011 to 2020**
- ✓ > 11.500 adult samplings





# Our forecast products



## BoL (Big data technologies model of Larvae)

- ✓ 26/285 input parameters
- ✓ Validation accuracy - training VS test on 20% random selection

Robustness:	BoL V1.0
Recall	0.83
F1 score	0.77

### Top 5/24 variables

1. Dry site over time
2. Date
3. Coast distance
4. DEM
5. Flow accumulation



## BAR (Big data technologies' model for the Assessment of Risk)

- ✓ 16/65 input parameters
- ✓ Validation accuracy - training VS test on 20% random selection

Robustness:	BAR V1.0	BAR V2.0
Recall	0.52	0.66
F1 score	0.58	0.62

### Top 8/16 variables

1. Date
2. LST Night
3. Sentinels
4. Surface water
5. Weekly precip.
6. MIR
7. BoL - Culex
8. Flooded areas



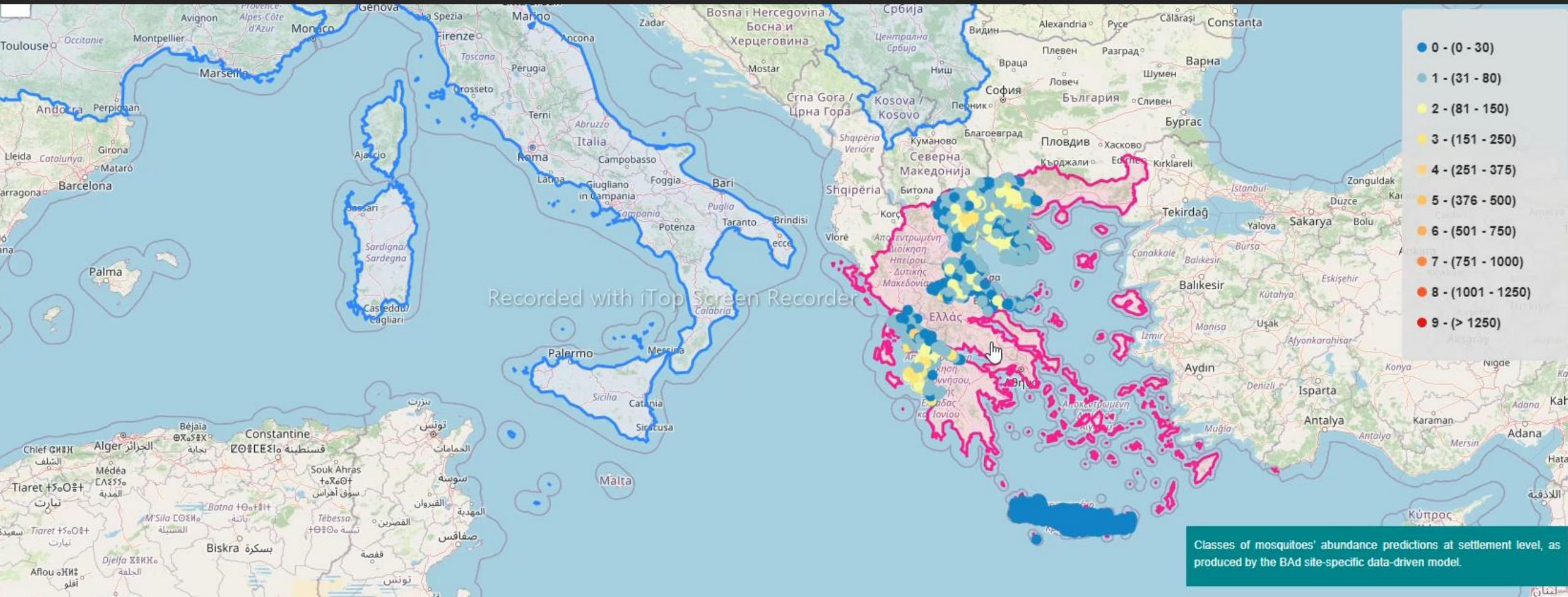
## BAd (Big data technologies' model for Adult mosquitoes)

- ✓ 29 out of 285 parameters
- ✓ Test accuracy (80/20): MAE (Mean Absolute Error)
- ✓  $\pm 1,31$  out of 10 equally likelihood mosquito abundance classes

### Top 5/29 variables

1. Date
2. LST day week
3. Breeding sites surface
4. BoL - Culex
5. precipitation 21 days

# Product visualization – BAd







# Mosquito vision application (based on BAd model)



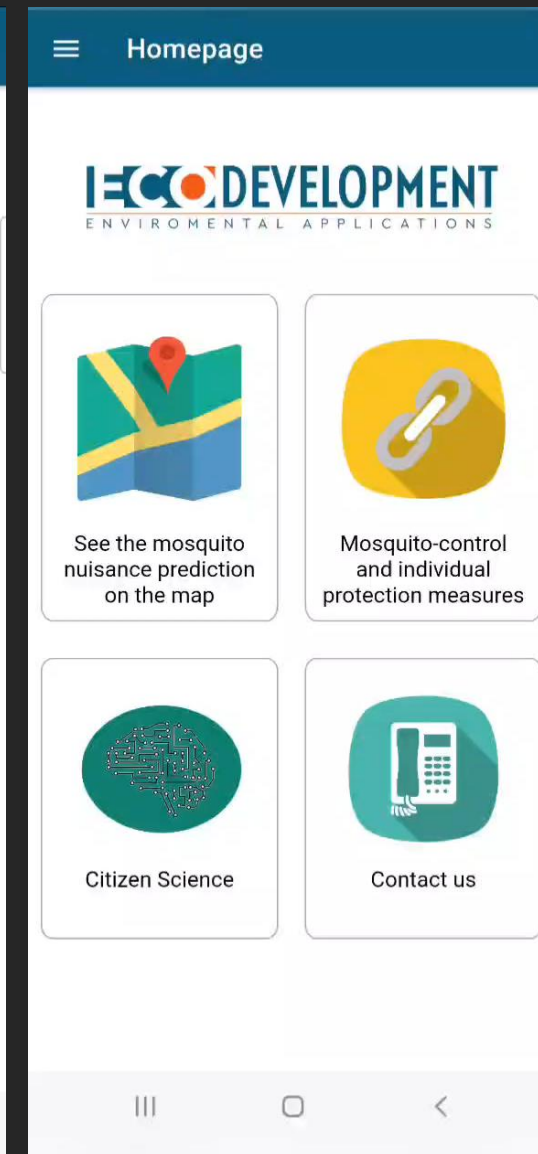
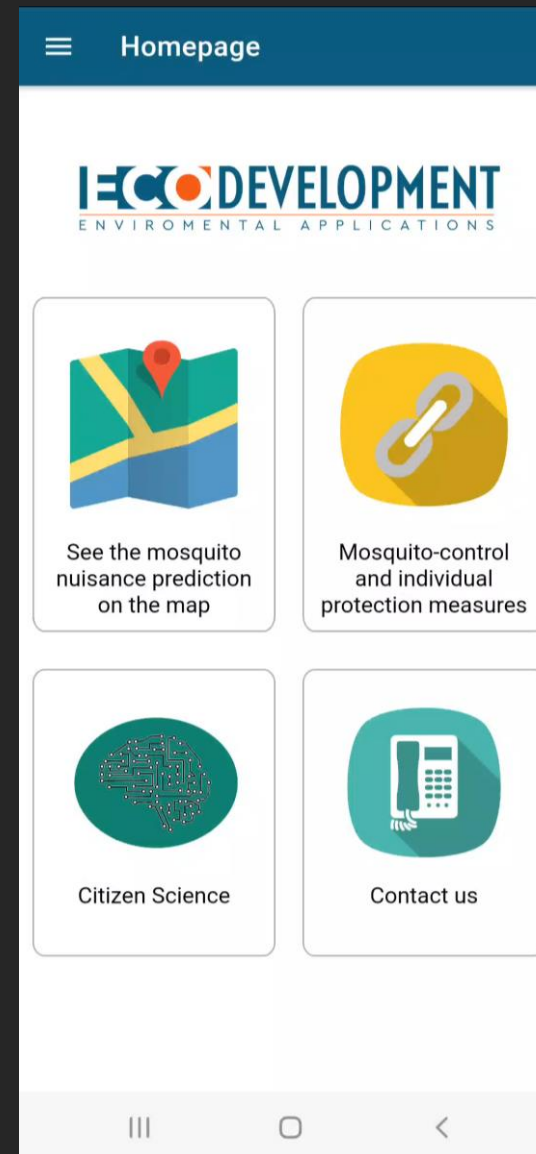
## Mosquito Vision – mobile application

- Daily nuisance prediction,
- **open to the public**
- In 4/13 regions of Greece: Central Macedonia, Western Greece, Crete, Thessaly (2.415 settlements, 2020 – 2021)
- Based on the BAd model & 5-day **weather forecast**
- **5 nuisance categories:**



None Minor Moderate Increased Intense

- Evening (*Aedes caspius*) & night time (*Culex pipiens*)
- 288 reviews (weekly rated by 47 peers)
- Mean deviation between predicted and estimated nuisance: evening - 0.7 night level - 0.1 level
- 2 **Citizen Science** functions were added in 2021 (evaluation of nuisance, reporting of breeding sites)



<https://play.google.com/store/apps/details?id=gr.ecodev.mosquitovision>

# R & D dept and data analytics team



**Dr. Spiros Mourelatos, Biologist, PhD in Hydrobiology**

**28 years**

Founder and President of ECODEVELOPMENT SA  
Project management, translational science



**Sandra Gewehr, Biologist, MSc in Botany, Msc in Public Health / Health Policy**

**25 years**

Director of R&D Department  
Field entomology, GIS applications, databases management, UAV applications



**Dr. Christos Karydas, Agronomist, PhD in Geomatics**

**7 years**

Director of Department of Geomatics  
GIS applications, Image analysis expert, Geomatics Soil Resources Management, Production of algorithms



**Dr. Miltos Iatrou, Agronomist, PhD in Soil Science**

**8 years**

Project Manager in Machine Learning  
Modeling and biometrics, Spectral data analysis, production of algorithms, machine learning expert



**Stella Kalaitzopoulou, Biologist**

**27 years**

Director of Department of Mosquito Control  
Field entomology, GIS applications, data analysis and databases management, WebGIS, quality management



**Dr. Xanthi Tseni, Geologist, MSc in Geomatics, PhD in Geology**

**7 years**

Manager of GIS applications  
GIS applications, Image analysis, modelling, WebGIS



**Ioannis Pegiadis, Data analyst**

**1 year**

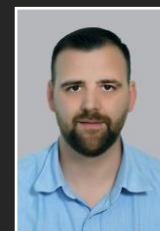
Assistant Project Manager  
Data analysis, Data Visualization, Data Management and Machine learning



**Nikos Perros, Agronomist, MSc in Geomatics, MSc in Quality Assurance**

**12 years**

Regional Director / Southern Greece  
Field entomology, GIS applications, project management



**Alexandros Lambridis, Programmer**

**1 year**

Assistant Project Manager  
Programming, Data analysis, Data Visualization, Data Management