

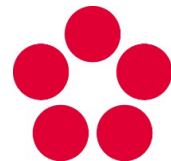


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ČESKÉ REPUBLIKY



CRAYFISH IN EUROPE: ALIENS VS. NATIVES

Pavel Vlach

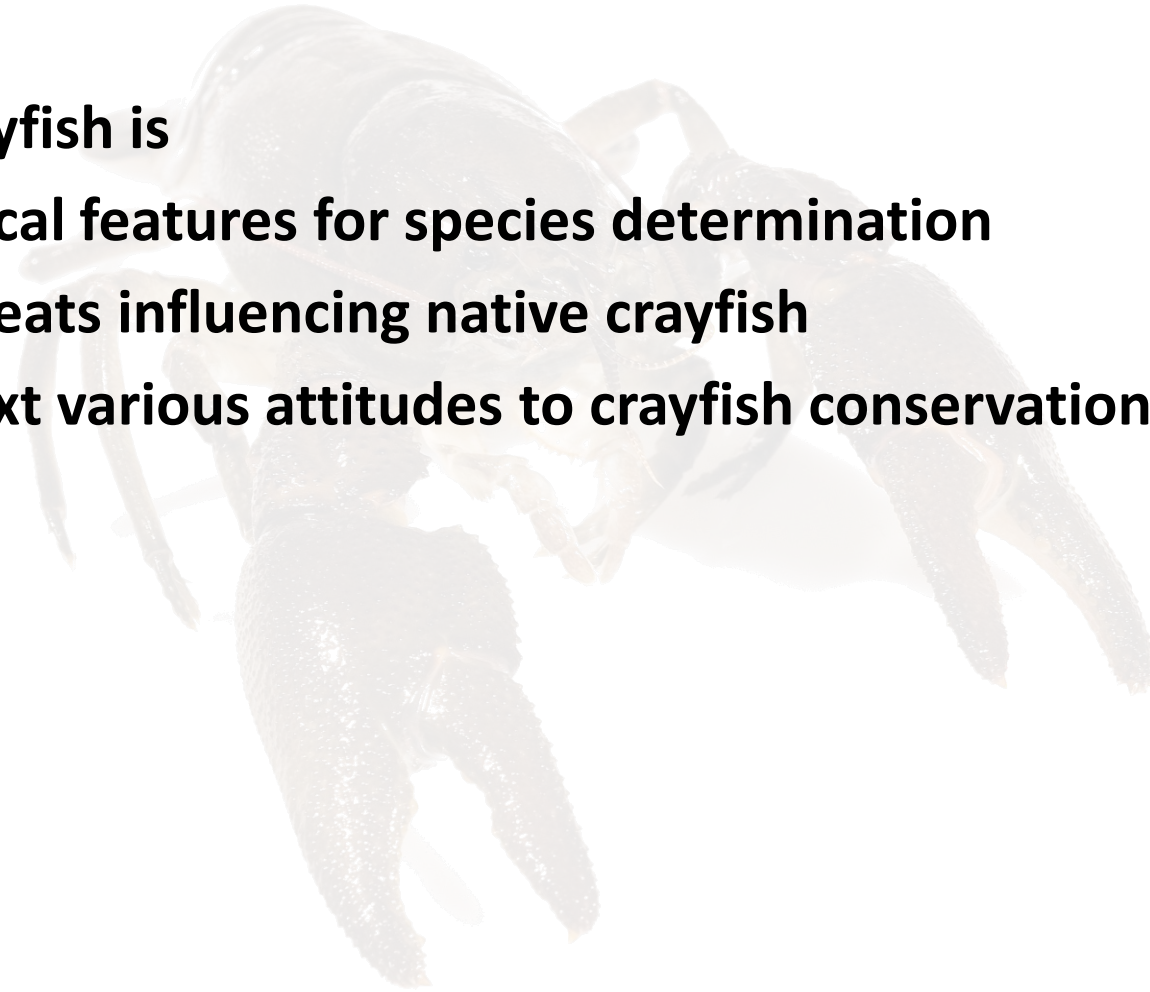


Jihočeská univerzita
v Českých Budějovicích
University of South Bohemia
in České Budějovice



What should I be able to do after the lesson?

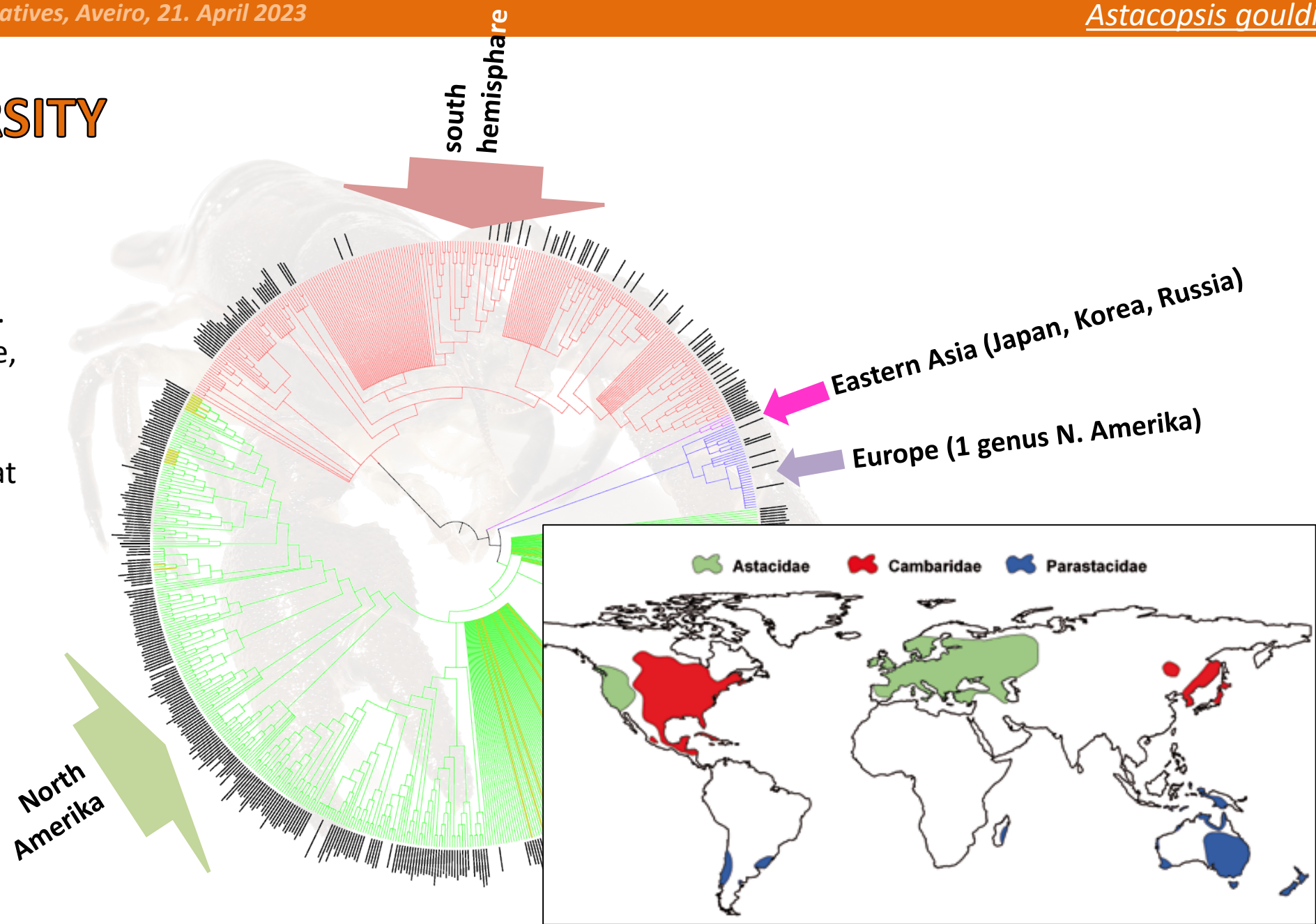
- to define what crayfish is
- to use morphological features for species determination
- to name major threats influencing native crayfish
- to discuss in context various attitudes to crayfish conservation





CRAYFISH DIVERSITY IN THE WORLD

Freshwater crayfish system
 diagram by Stern et al. (2017).
 Color code: **green** Cambaridae,
blue Astacidae, **purple**
 Cambaroididae, **red**
 Parastacidae. The black lines at
 the perimeter represent the
 log10 value of geographic
 spread in km².



CRAYFISH IN EUROPE

- **ICS**
 - Noble crayfish (*Astacus astacus*)
 - Narrow clawed crayfish (*Pontastacus leptodactylus*)
 - Stone crayfish (*Austropotamobius torrentium*)
 - White clawed crayfish (*Austropotamobius pallipes*)
 - *Austropotamobius bihariensis*
 - *Pontastacus pachypus*
 - *Austropotamobius italicus??*
- **OLD NICS**
 - Spiny cheek crayfish (*Faxonius limosus*)
 - Signal crayfish (*Pacifastacus leniusculus*)
 - Red swamp crayfish (*Procambarus clarkii*)
- **NEW NICS**
 - Marbled crayfish (*Procambarus virginalis*)
 - Common Yabi (*Cherax destructor*)
 - Red clawed Australian crayfish (*Cherax quadricarinatus*)
 - *Faxonius (syn. Orconetes) immunis*
 - *Faxonius (syn. Orconetes) juvenilis*
 - *Faxonius (syn. Orconetes) virilis*
 - *Procambarus alleni*



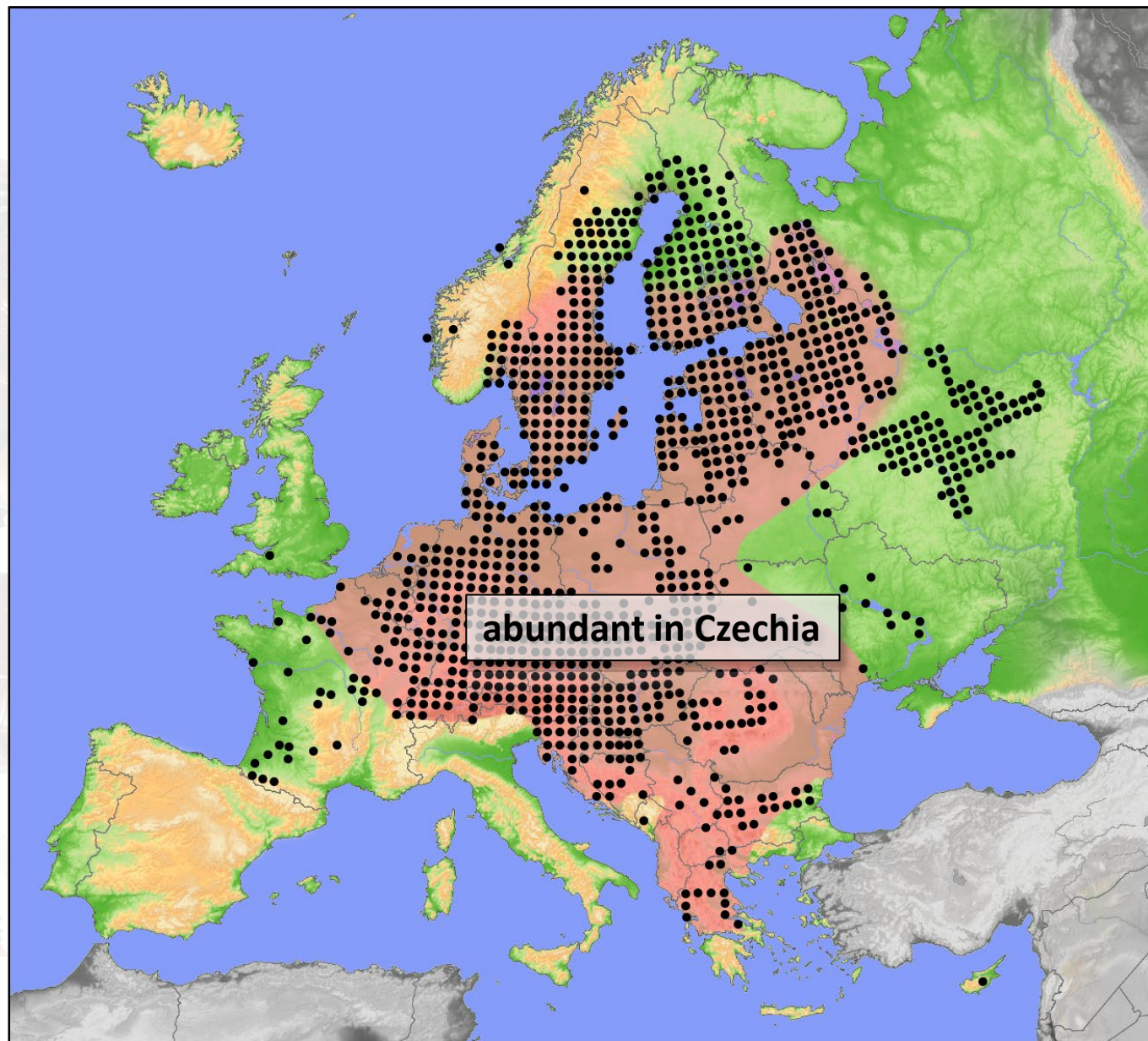
NOBLE CRAYFISH

ASTACUS ASTACUS

✓ ICS, VU



- two pairs of postorbital ridges
 - claws strong, with bumps, red - orange on lower side; orange patch on upper side
 - smooth carapace, but spines are present between head and thorax
- part of carapace



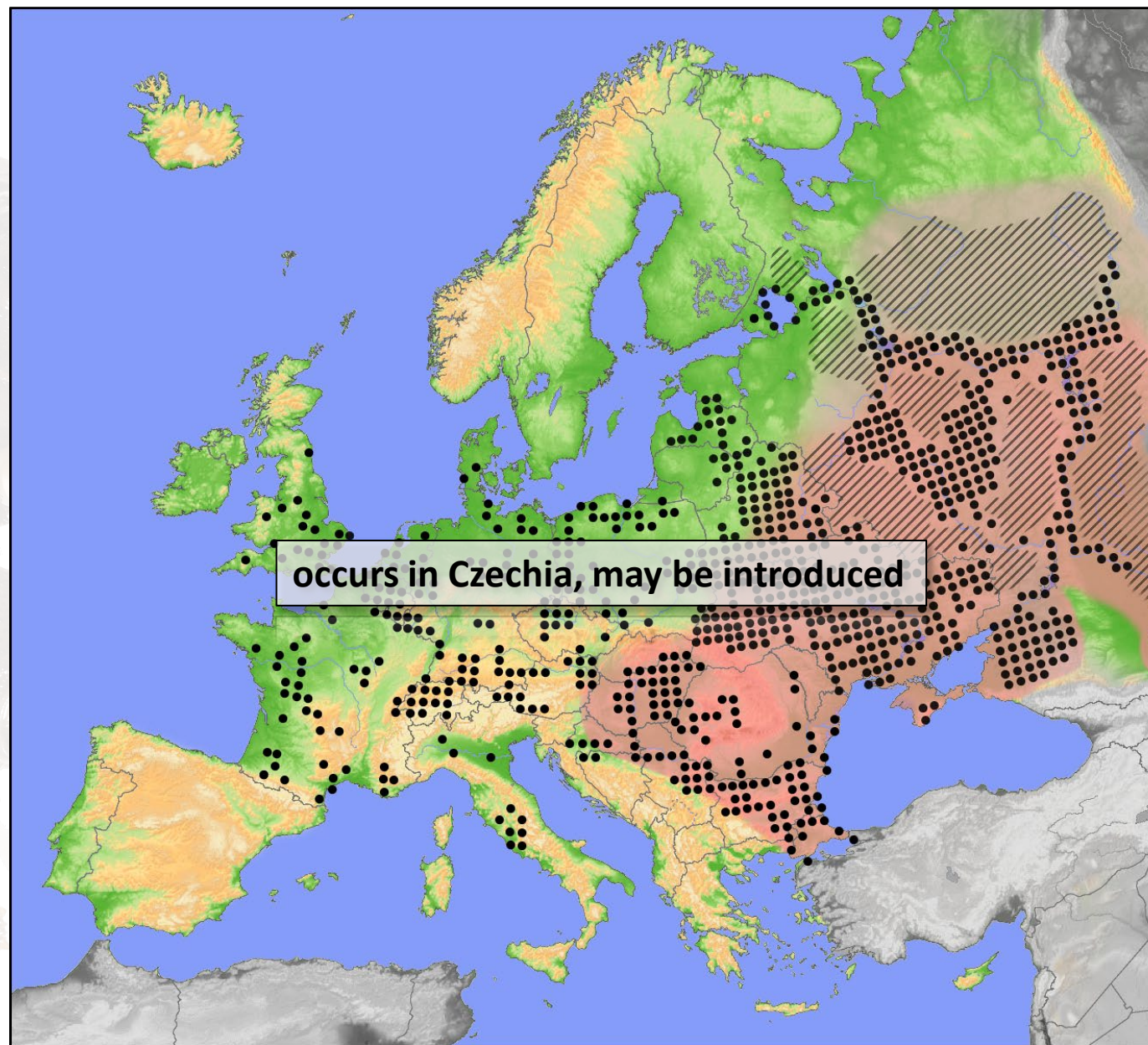
NARROW CLAWED CRAYFISH

PONTASTACUS LEPTODACTYLUS

✓ ICS, LC, POSSIBLE CP VECTOR!



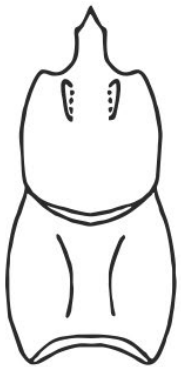
- two pairs of postorbital ridges
- claws narrow, long, light-coloured on upper side, orange patch on upper side; inner parts smooth
- carapace with spines and bumps



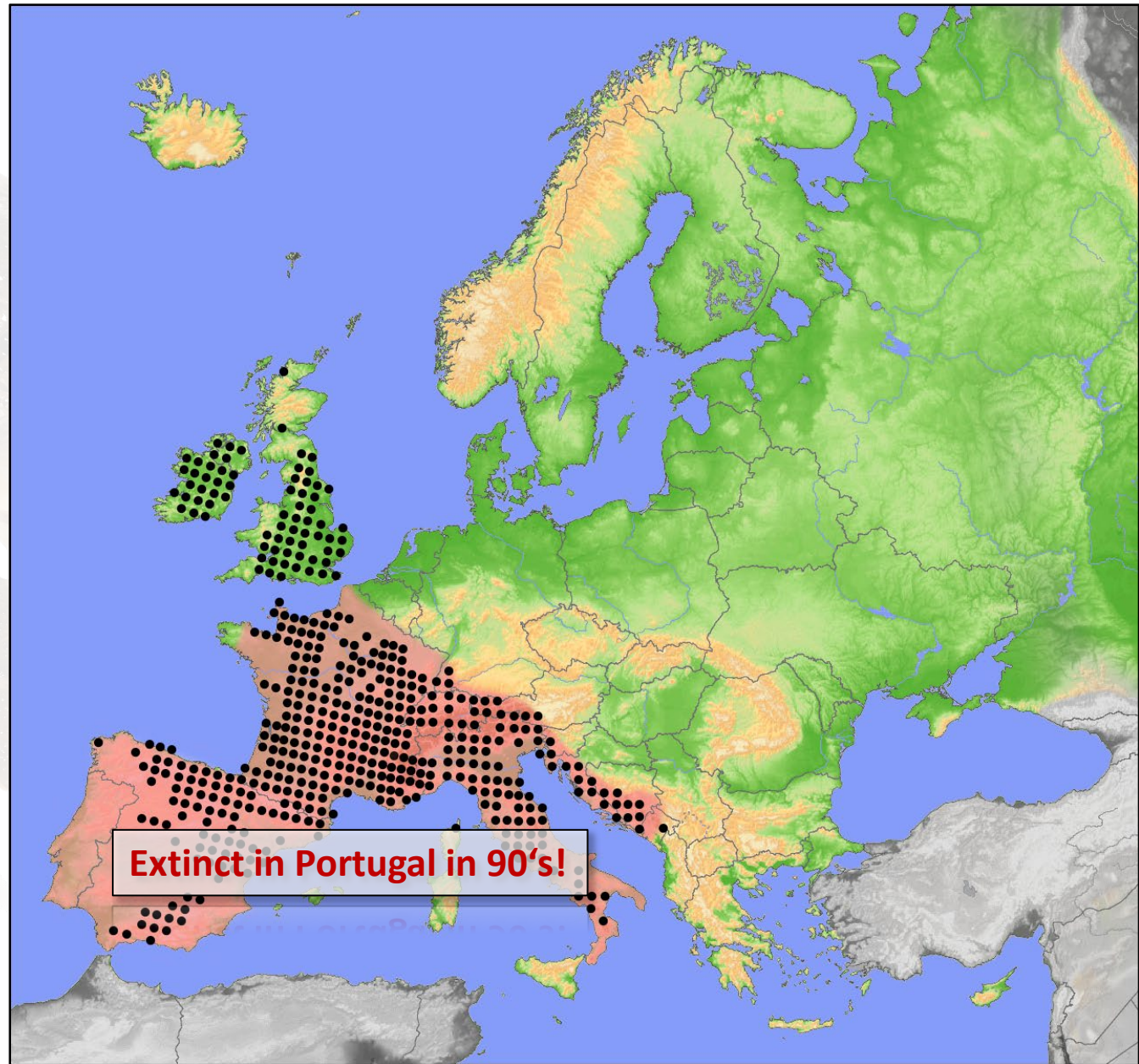
WHITE CLAWED CRAYFISH

AUSTROPOTAMOBIVS PALLIPES

✓ ICS, EN



- ⇒ one pair of postorbital ridges
- ⇒ light-coloured on upper side, orange patch on upper side
- ⇒ carapace smooth, with mild bumps, without spines
- ⇒ claws with bumps, grey or light orange on lower side
- ⇒ white or light coloured base joints of legs



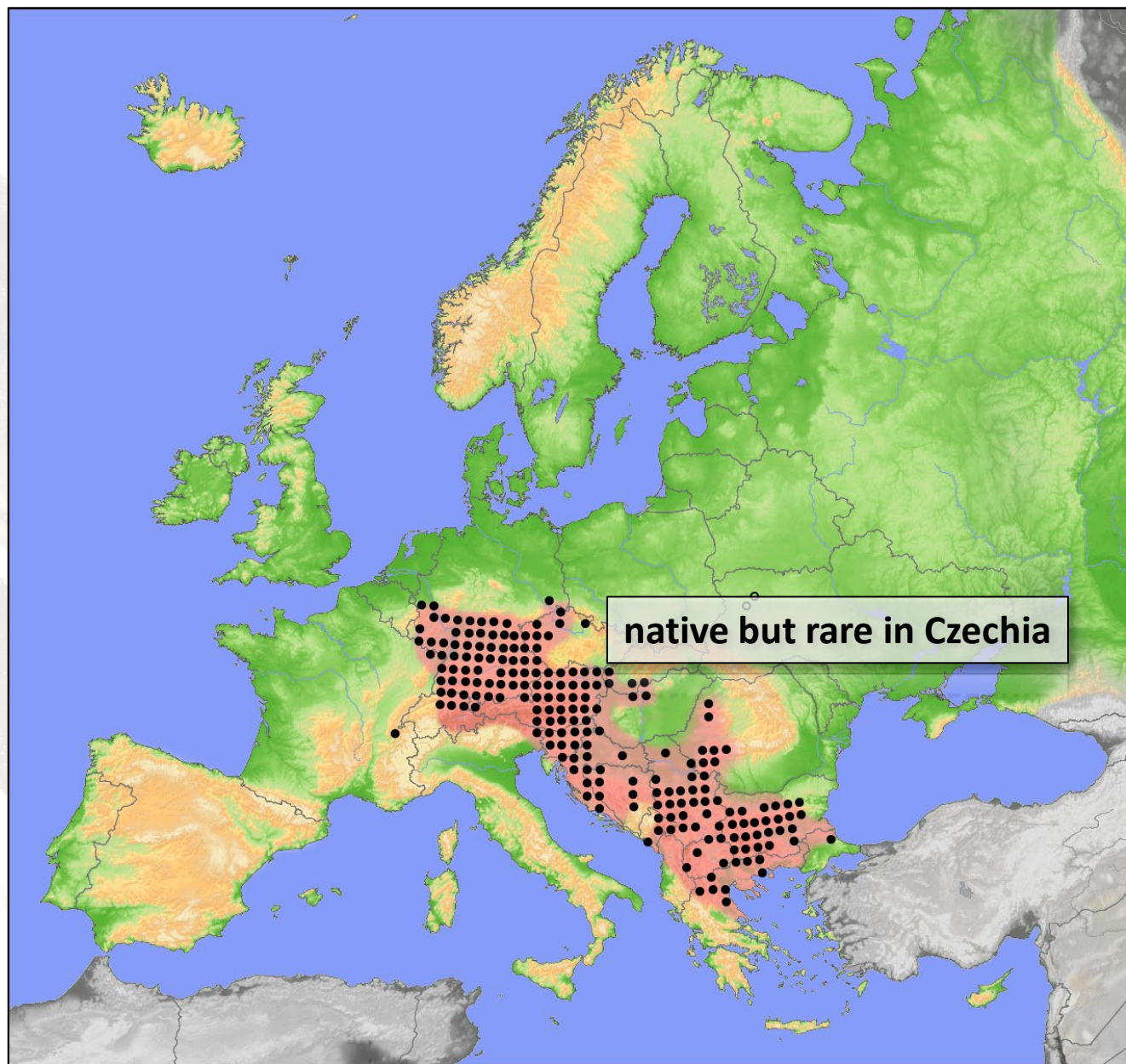
STONE CRAYFISH

AUSTROPOTAMOBIOUS TORRENTIUM

✓ ICS, DD



- ⇒ one pair of postorbital ridges
- ⇒ light-coloured on upper side, orange patch on upper side
- ⇒ carapace smooth, with mild bumps, without spines
- ⇒ claws with bumps, grey or light orange on lower side



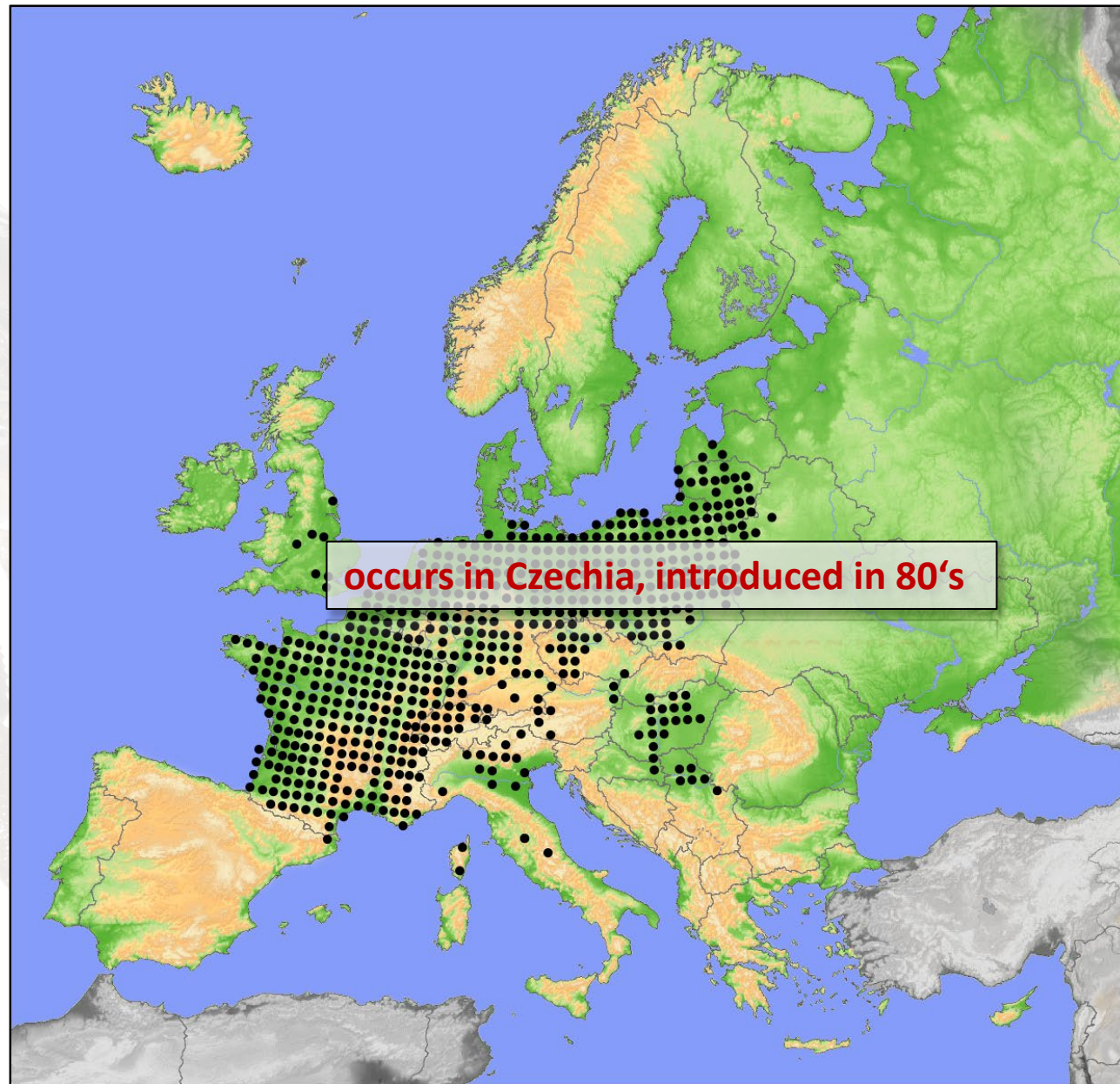
SPINY CHEEK CRAYFISH

FAXONIUS LIMOSUS

× NICS, CP VECTOR



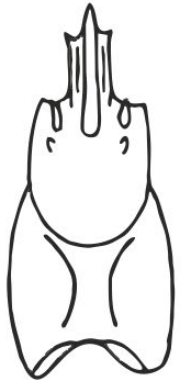
- ⇒ one pair of long postorbital ridges terminated by sharp spines
- ⇒ dark brown to olive-green, with distinct red to brown-red transversal bands
- ⇒ tips of claws orange



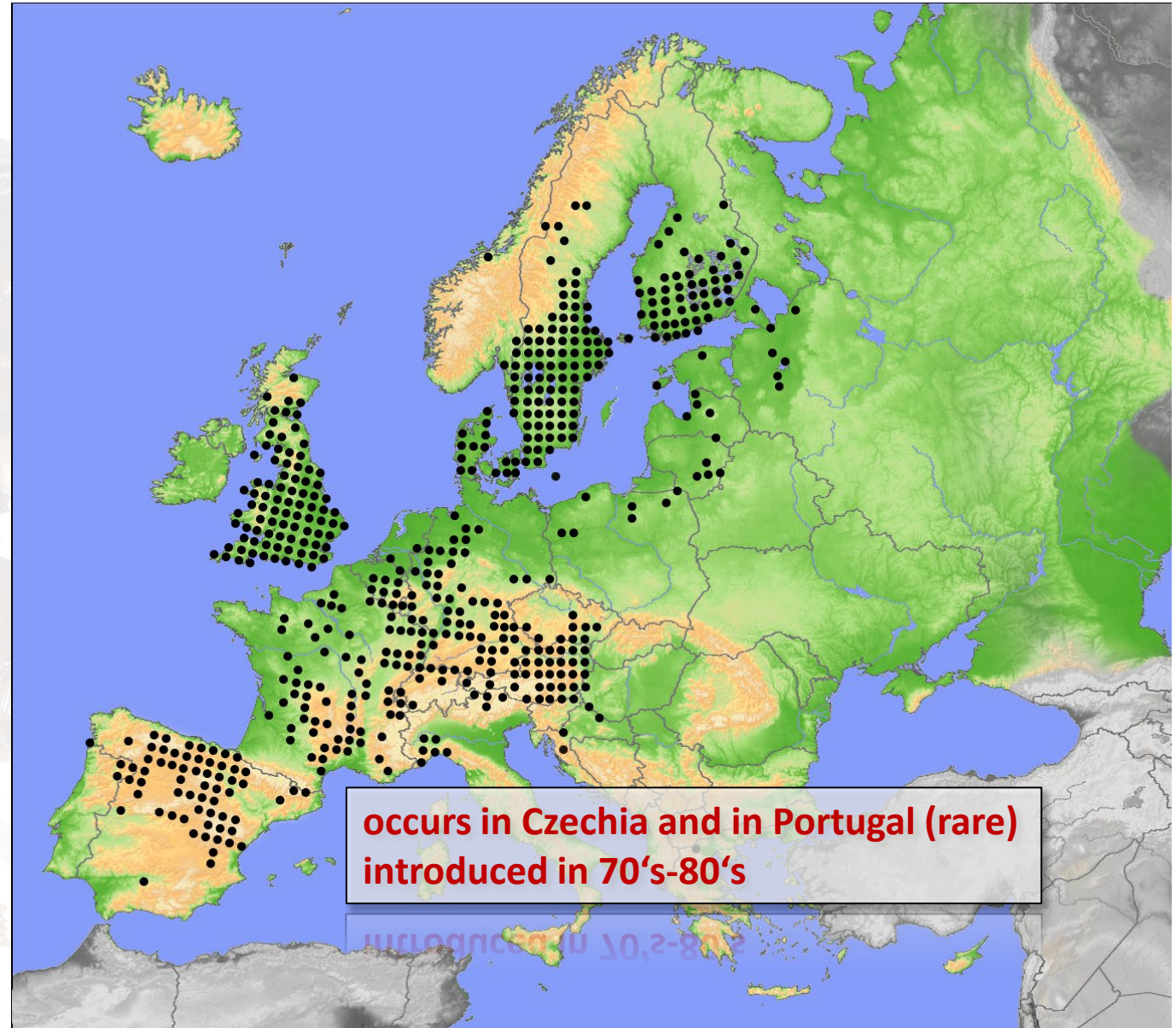
SIGNAL CRAYFISH

PACIFASTACUS LENIUSCULUS

× NICS, CP VECTOR



- two pairs of postorbital ridges
- claws big, smooth, red on lower side; white-turquoise patch on upper side
- smooth carapace



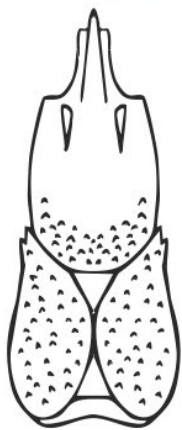
RED SWAMP CRAYFISH

PROCAMBARUS CLARKII

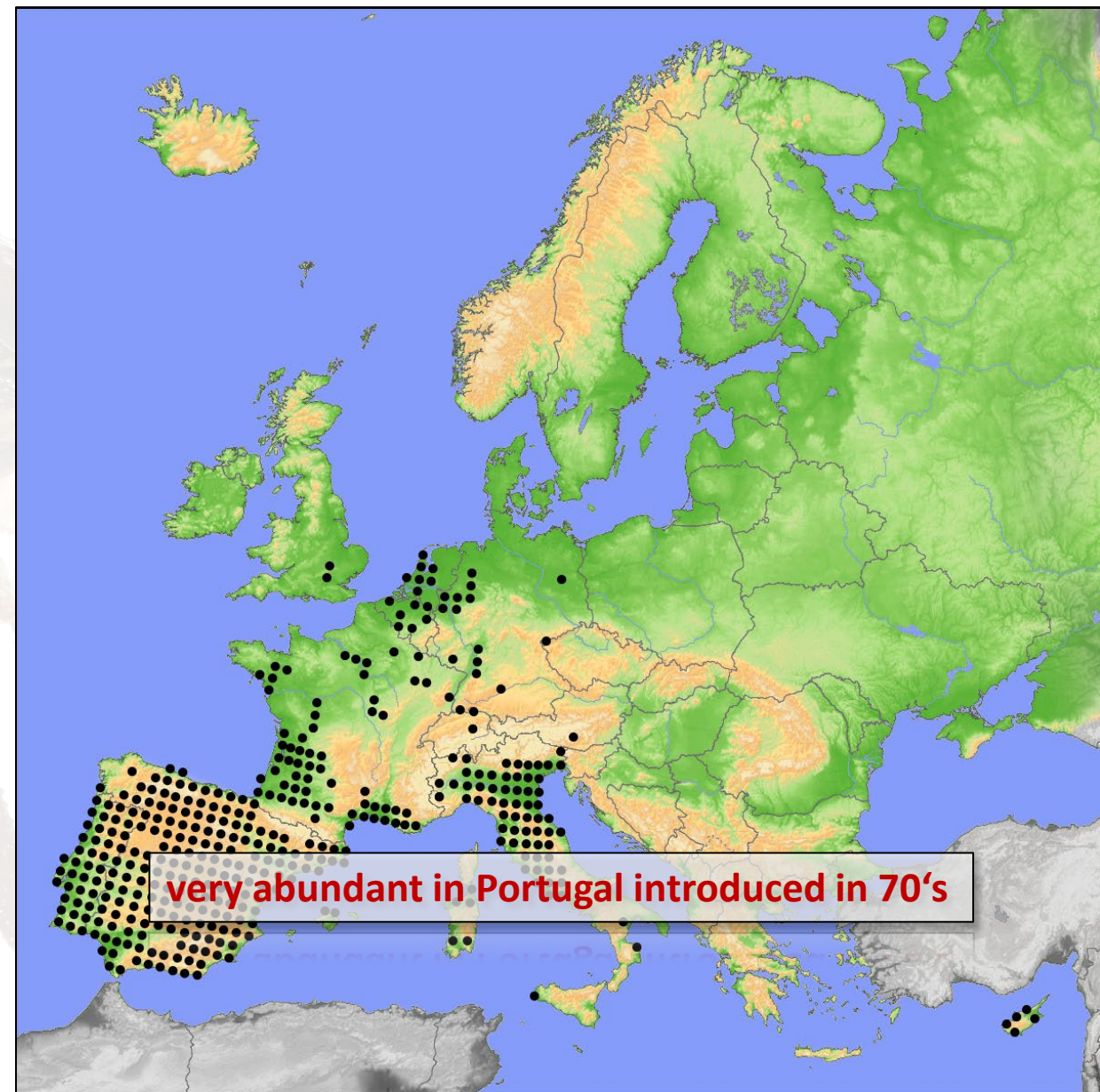
× NICS, CP VECTOR



photo: M. Petryl



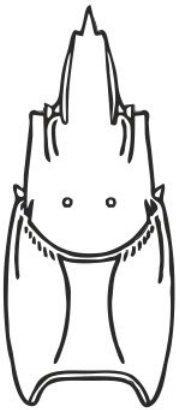
- one pair of postorbital ridges
- claws narrow, upper side with numerous bumps and spines
- convergent (even connected) gill-cardiac grooves



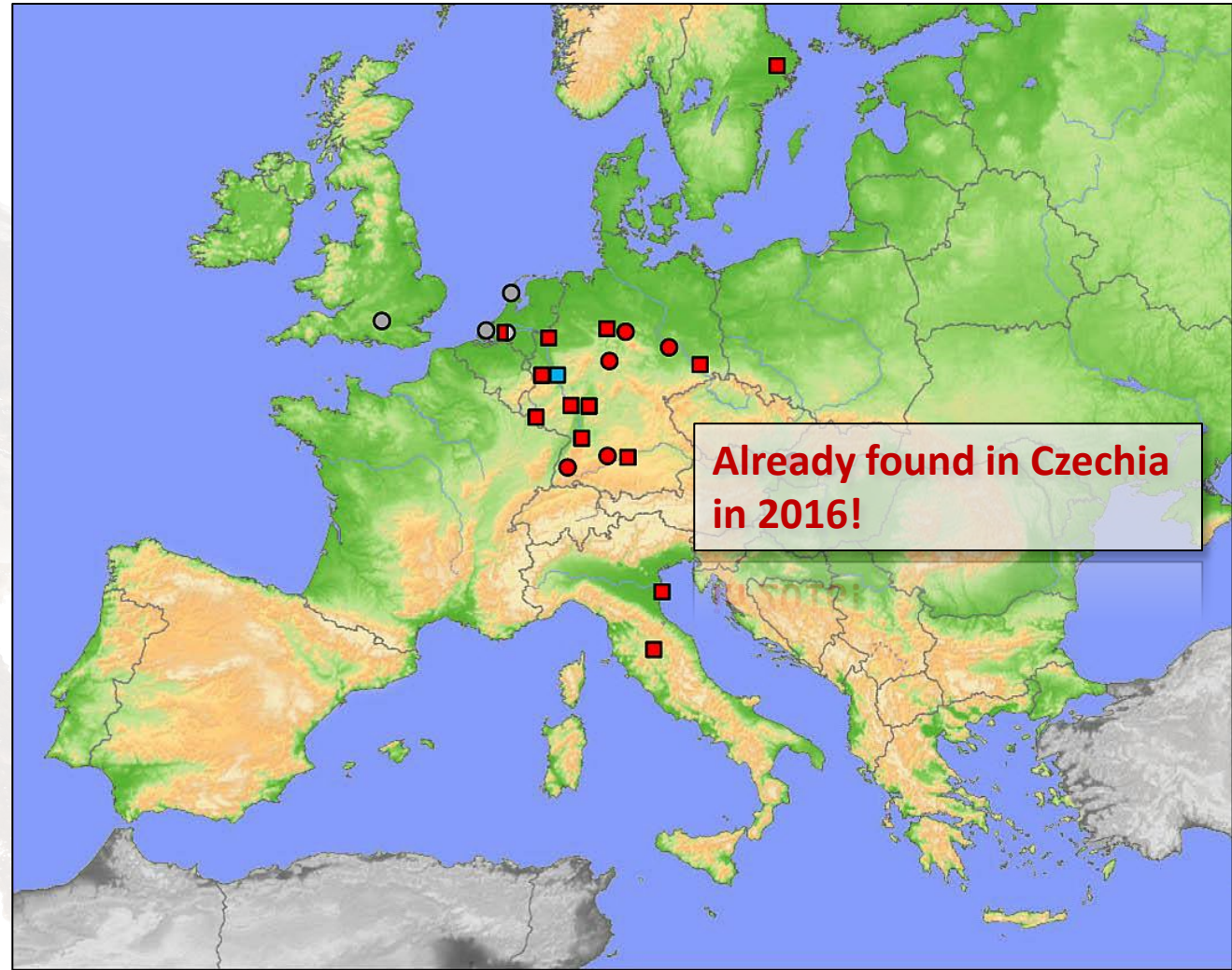
MARBLED CRAYFISH

PROCAMBARUS VIRGINALIS

× NICS, CP VECTOR



- ⇒ one pair of postorbital ridges
- ⇒ claws short, lower side is orange, žová, beige or blueish
- ⇒ marble-coloured carapace

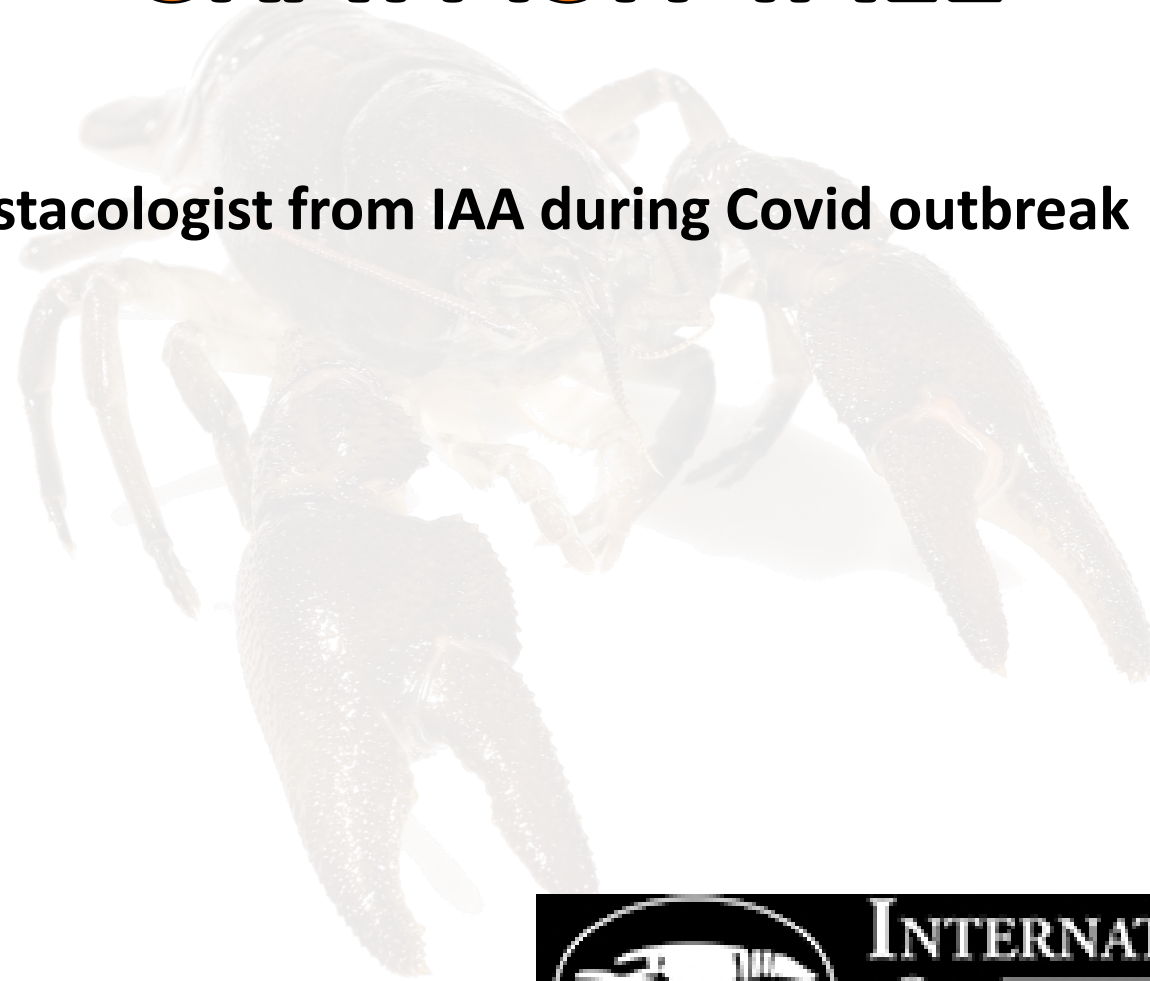


HOW TO DETERMINE THEM?



CRAYFISH TALE

- Video
- product of many astacologist from IAA during Covid outbreak



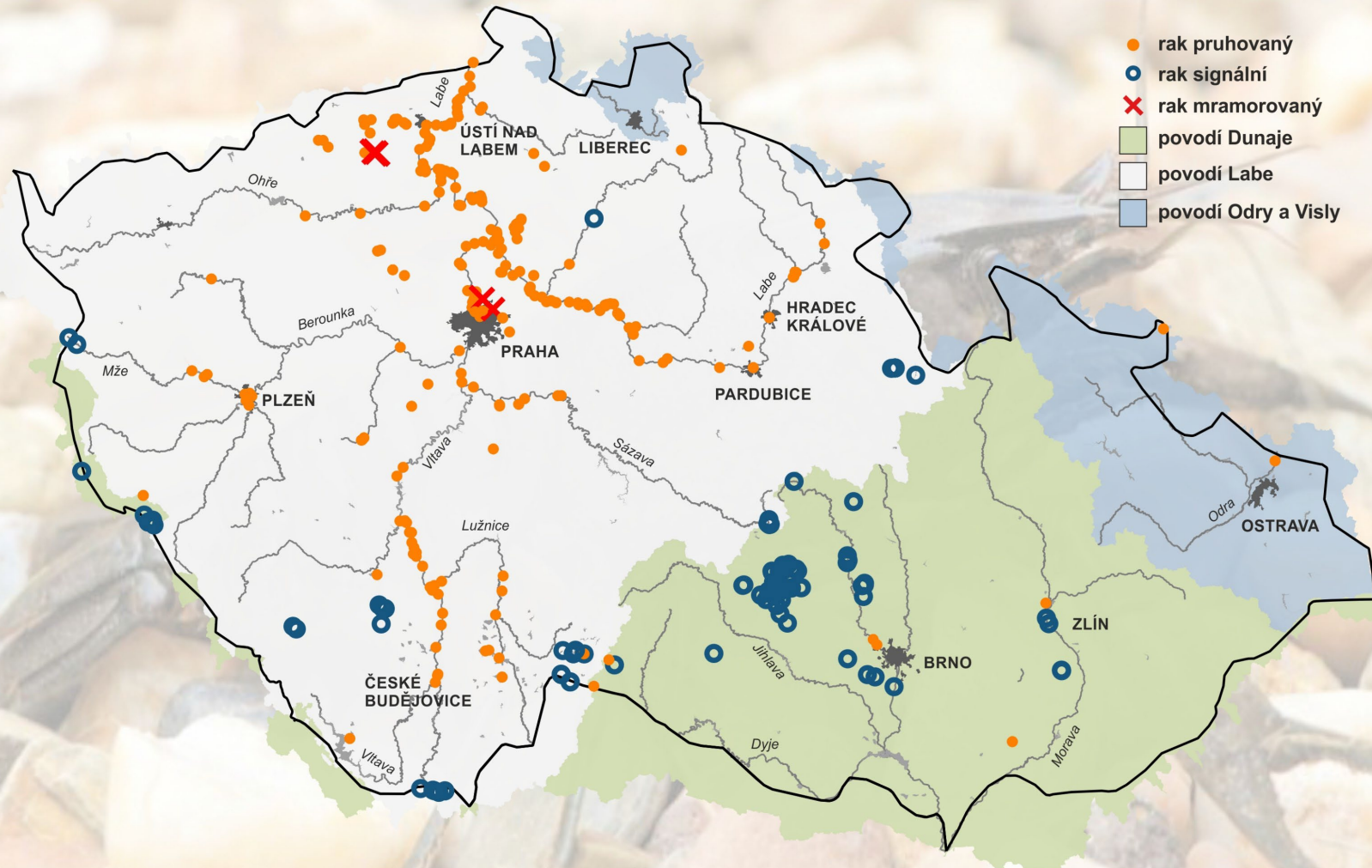
INTERNATIONAL ASSOCIATION
OF **ASTACOLOGY**

CRAYFISH IN CZECHIA

- 6 crayfish species
- 2 native spec.
 - *Astacus astacus*
 - *Austropotamobius torrentium*
- 1 non-native but European spec.
 - *P. leptodactylus*
- 2 old NICS
 - *Pacifastacus leniusculus*,
 - *Faxonius limosus*
- 1 new bad guy
 - *Procambarus virginalis*



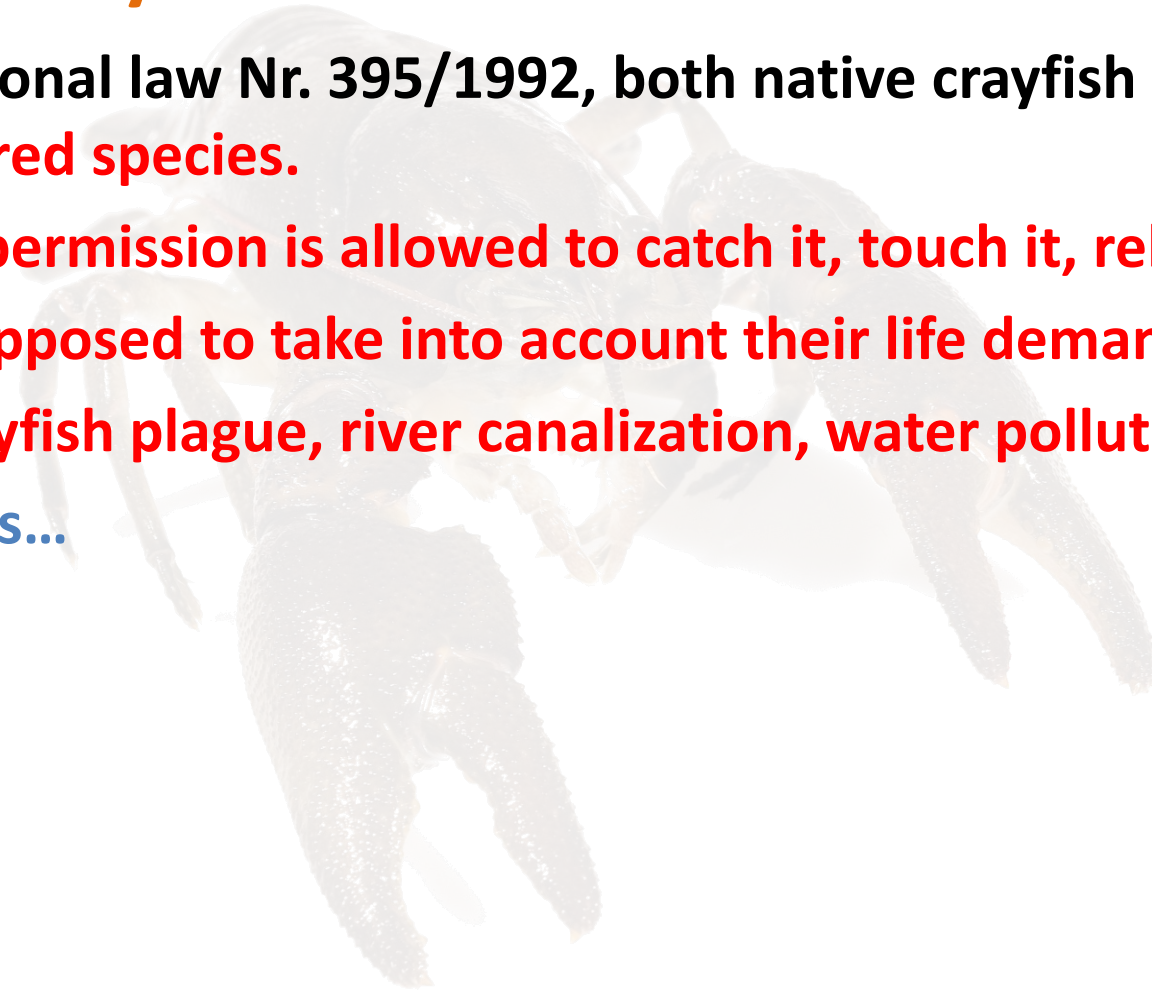
Výskyt invazních druhů raků v České republice



Mapa výskytu invazních druhů raků v ČR, © Pavel Vlach, 2023. Podklady: Profily sledování a výskyt raků: AOPK ČR, VÚV TGM, v. v. i. a data poskytnutá studenty vysokých škol.

Crayfish conservation in Czechia

- according to the national law Nr. 395/1992, both native crayfish species are considered as **critically endangered species**.
 - nobody without permission is allowed to catch it, touch it, release it, ...
 - everybody are supposed to take into account their life demands...
- **3 typical threats: crayfish plague, river canalization, water pollution**
- **Let's tell a few stories...**



CRAYFISH TALE

- Based on the video, identify the most important threats for native crayfish species.

- *Work in group of four*
- *5 minutes*



WATER POLLUTION



RIVER CANALISATION

- **Přešínský brook (in past)**



RIVER CANALISATION

- Chýlava brook (2022)



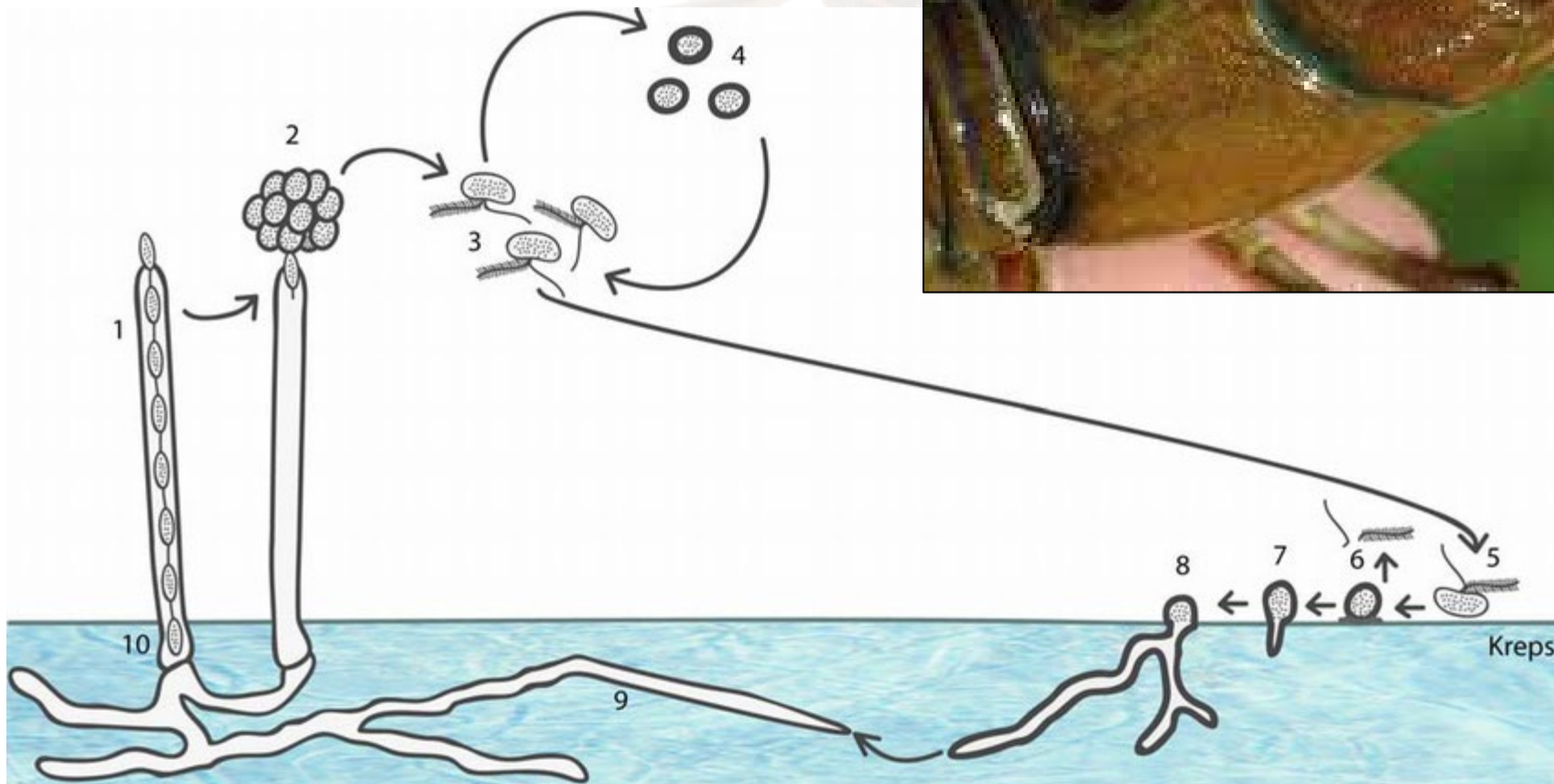


WHY ARE INVASIVE CRAYFISH SPECIES SO DANGEROUS?

INVASIVE CRAYFISH => CRAYFISH PLAGUE



APHANOMYCES ASTACI CRAYFISH PLAGUE

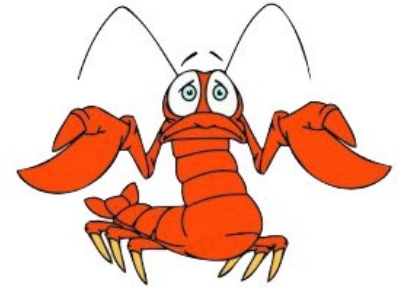


WHY INVASIVE CRAYFISH SPECIES ARE SO DANGEROUS?

- **NICS are less sensitive to lower water quality**
 - They migrate very often
 - ICS can walk for tens of meters per a night, NICS kilometers even for landscape per a night
- **They have much higher reproductive potential**
 - ICS from tens to lower hundreds eggs (250) per a clutch; NICS higher hundreds (800)
 - Marbled crayfish are partenogenetic!
- **They are very aggressive and more active**
 - Much aggressive, actively defending and attacking

ISC ARE NOT ABLE TO SURVIVE WITHOUT
HUMAN CARE.

BUT REMEMBER!



ONLY HUMANS ARE RESPONSIBLE FOR THE
SITUATION AND THE NEED TO KILL INNOCENT
NICS.



HOW WE DEFEND ICS AGAINST NICS?

- **Decrease numbers in particular populations**
 - **Manual searching**
 - **Trapping**
- **Poisoning populations**
- **Male sterilisation**
- **Fish predation**
 - **Eel, catfish, chub, pikeperch, burbout**
- **NICS population isolation**
 - **to limit their migration**

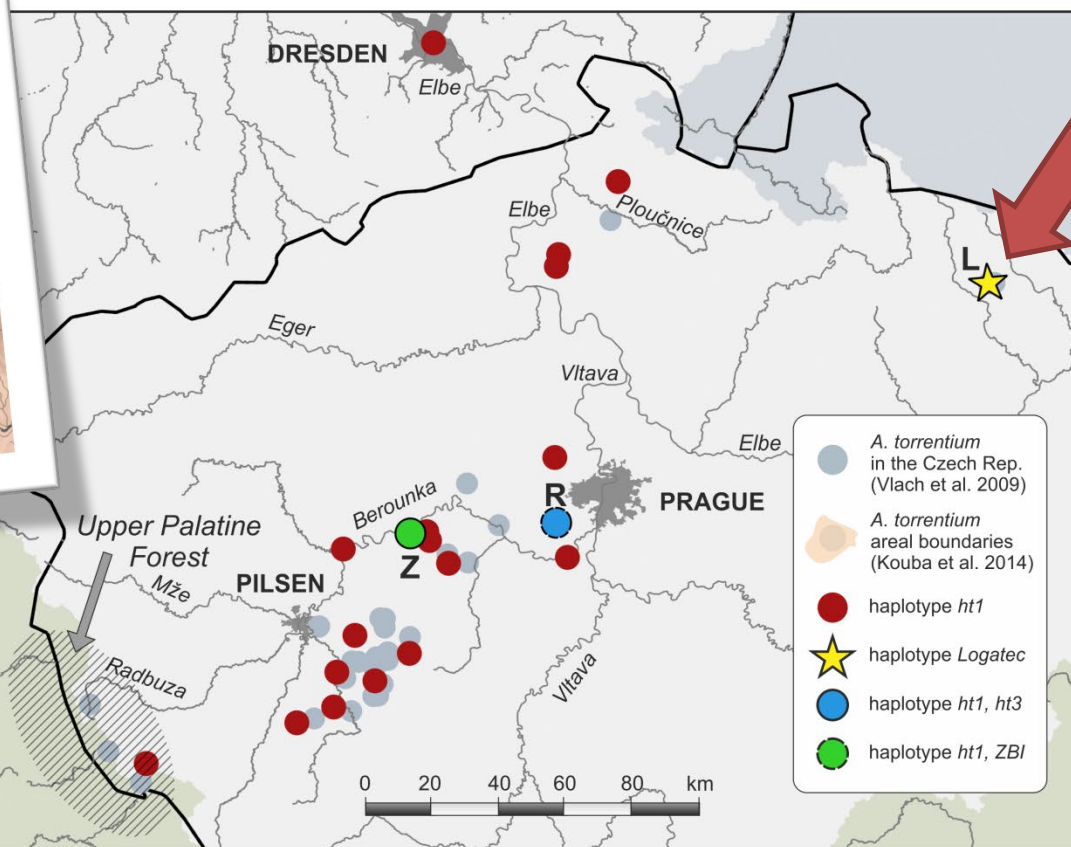
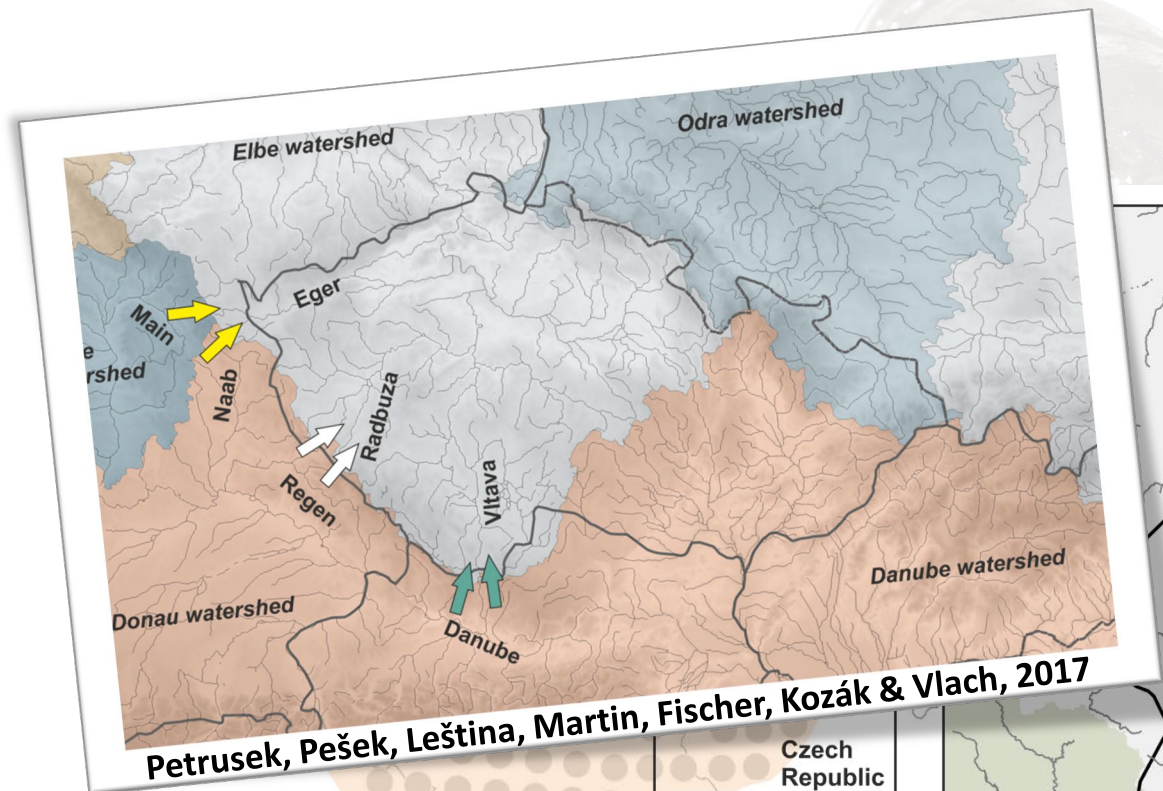


A. TORRENTIUM IN CZECHIA: A HALF-BLOOD PRINCE

Machino & Füreder 2005

Machino & Holdich 2006

Martin (2008)

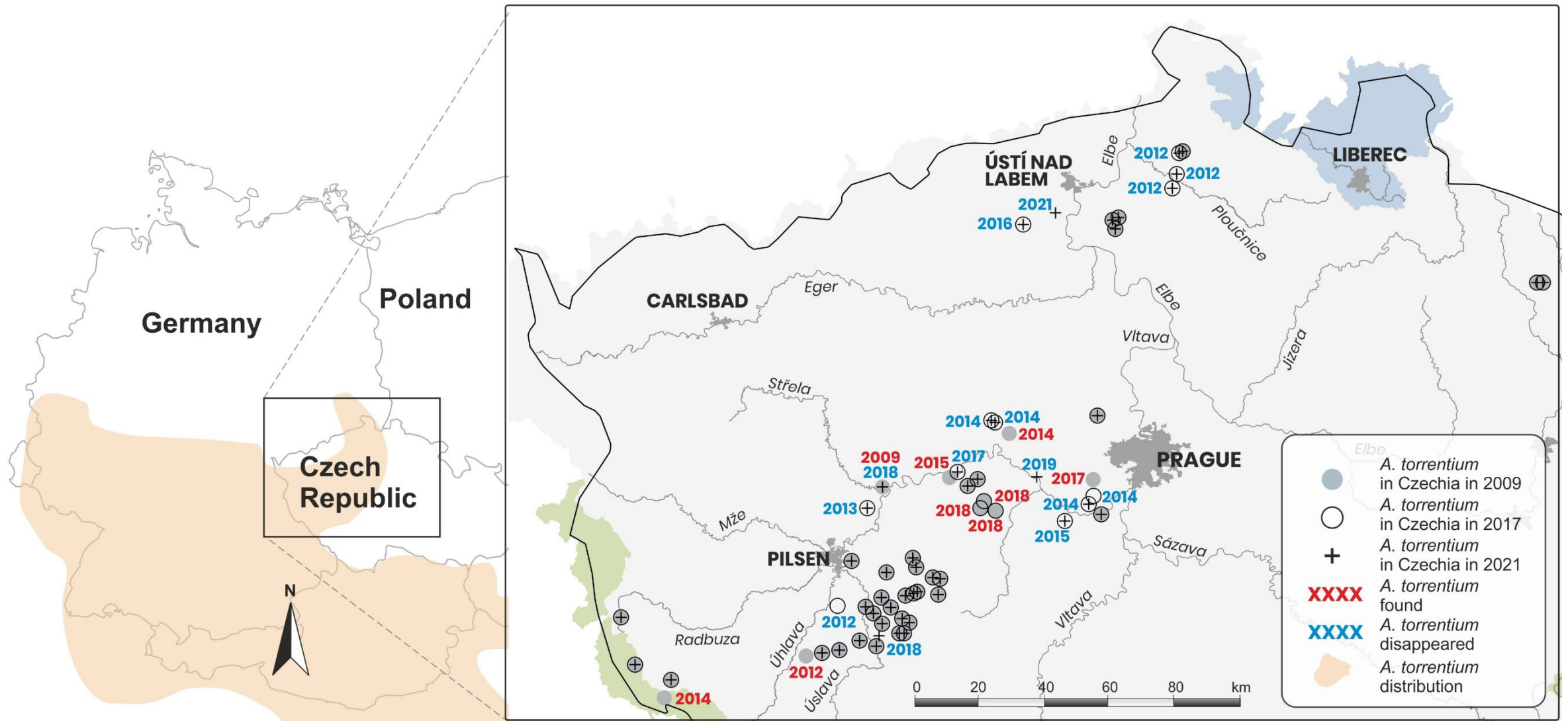


Czech Republic

Austria



PRESENT STATUS OF STONE CRAYFISH IN CZECHIA





RESEARCH ACTIVITIES

FECUNDITY, OVERWINTER MORTALITY, HATCHABILITY



METHODOLOGY

- 6 cages (6 streams)
- We did it as natural as possible!



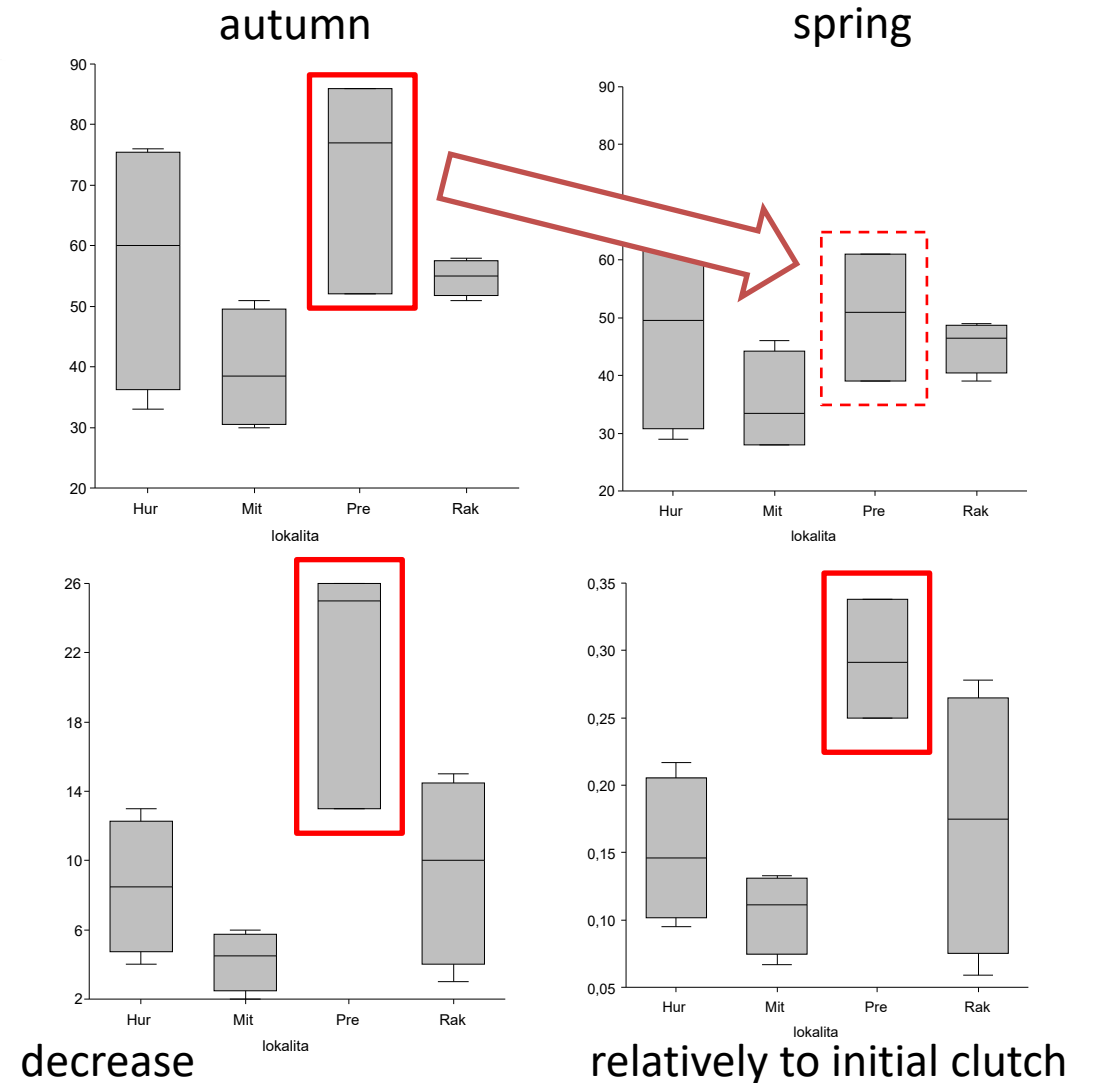
EGGS LOSS AFTER WINTER (AND SPRING)

Autumn:

- The average number of eggs (= average population fertility) ranged from 36 to 64.

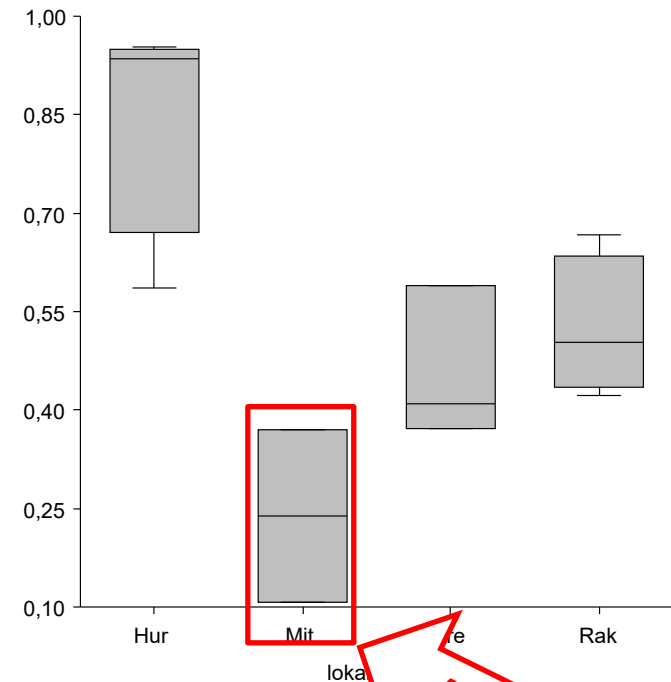
Spring:

- The number of eggs leveled out so much that the differences in abundances in individual streams were no longer significantly different ($H = 3.61$, $P = 0.31$).
- The loss of eggs during the winter was 2–26 eggs, which represented 6–34% of the original clutch size.
- *Small or incomplete clutches and smaller females lost less frequently eggs during winter than in case of bigger clutches or bigger females.*



HATCHABILITY

- The share of hatched juveniles varied between 37-95%, which can be considered as an extreme hatchability. Differences between localities were found ($H = 8.76$, $P = 0.03$).



NIGHT MIGRATION PATTERN OF STONE CRAYFISH



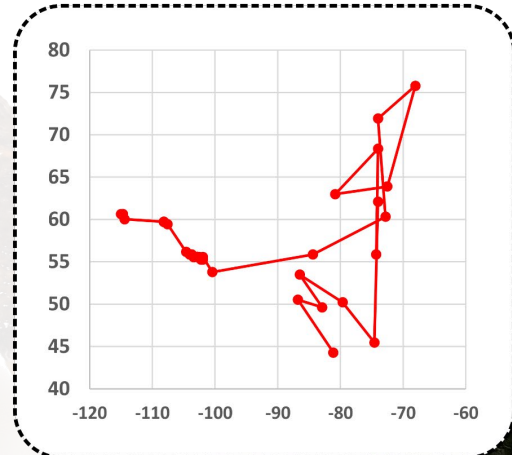
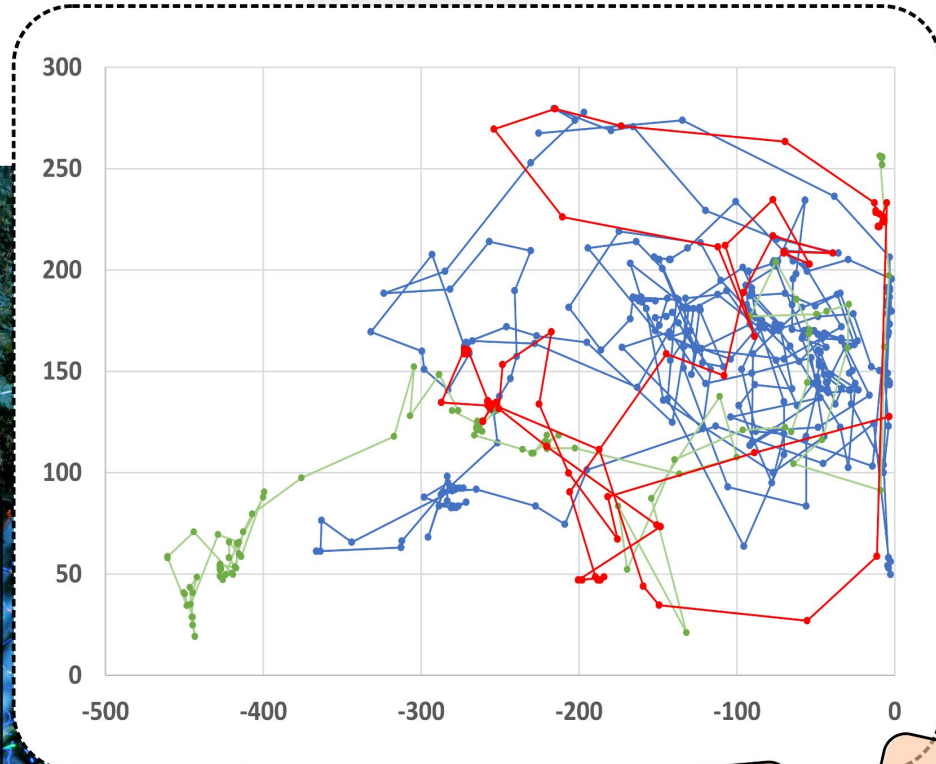
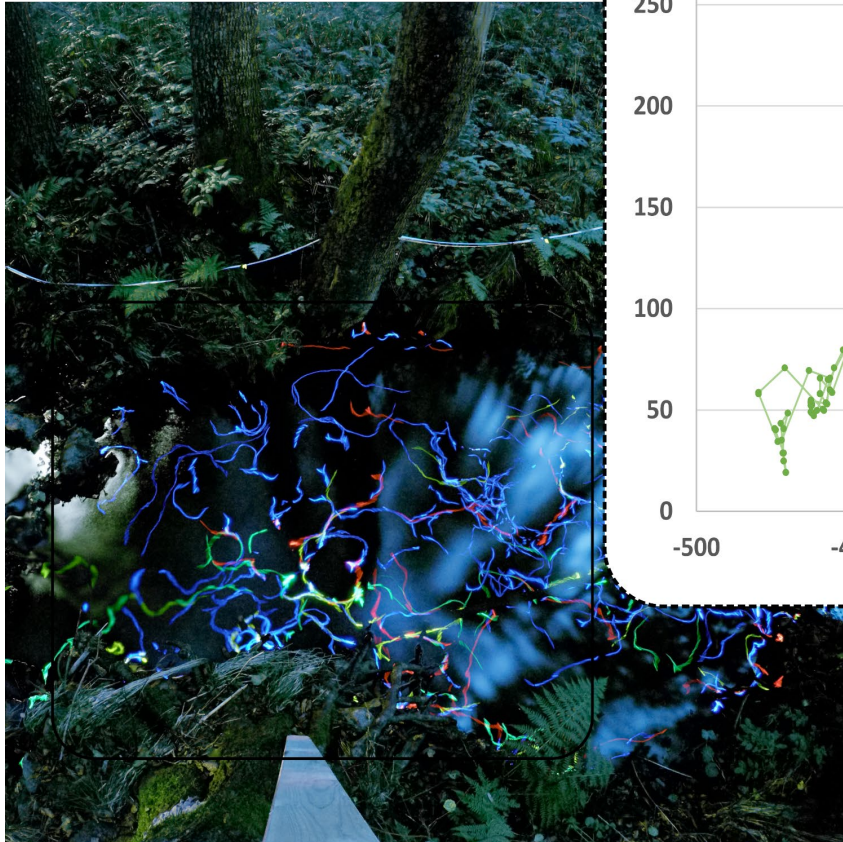
Study design:
four GoPro cameras were
placed in 5m distance on
each stream



Marking:
each specimen was marked with
Lightstick MINI 4 (glued on a carapax)



NIGHT MIGRATION PATTERN OF STONE CRAYFISH



Přešínský brook
overall movements (picture and single plot) of three curious active walkers

Kornatický brook
overall movement (picture and plot) of one „lazy” homing guy





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Thank you for your attention!

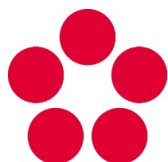
- [email: vlach@gasos-ro.cz](mailto:vlach@gasos-ro.cz)
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AOPK ČR



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