

Jernej Polajnar, Odd. za raziskave organizmov in ekosistemov, Nacionalni inštitut za biologijo

Uporaba vibracijskih signalov za nadzor žuželčjih škodljivcev

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Uporaba vibracijskih signalov

Review



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Manipulating behaviour with substrate-borne vibrations – potential for insect pest control

Jernej Polajnar,^a Anna Eriksson,^a Andrea Lucchi,^b Gianfranco Anfora,^a Meta Virant-Doberlet^c and Valerio Mazzoni^{a*}

Abstract

This review presents an overview of the potential use of substrate-borne vibrations for the purpose of achieving insect pest control in the context of integrated pest management. Although the importance of mechanical vibrations in the life of insects has been fairly well established, the effect of substrate-borne vibrations has historically been understudied, in contrast to sound *sensu stricto*. Consequently, the idea of using substrate-borne vibrations for pest control is still in its infancy. This review therefore focuses on the theoretical background, using it to highlight potential applications in a field environment, and lists the few preliminary studies that have been or are being performed. Conceptual similarities to the use of sound, as well as limitations inherent in this approach, are also noted.

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Keywords: bioacoustics; vibrational Communication; disruptive signals; IPM

1 INTRODUCTION

Since the groundbreaking public exposure of the risk to the environment and public health posed by chemical methods of pest control,¹ there has been an ongoing effort to reduce harmful

be successful even with imperfect knowledge of underlying mechanisms,⁶ although likely with diminished efficiency.

Insects sense their environment using various modalities, of which the most studied at long range are chemoreception

Osnovna zamisel:

Vplivanje na vedenje žuželk z vzbujanjem mehanskih vibracij podlage na način, ki koristi človeku.



NATIONAL INSTITUTE OF BIOLOGY



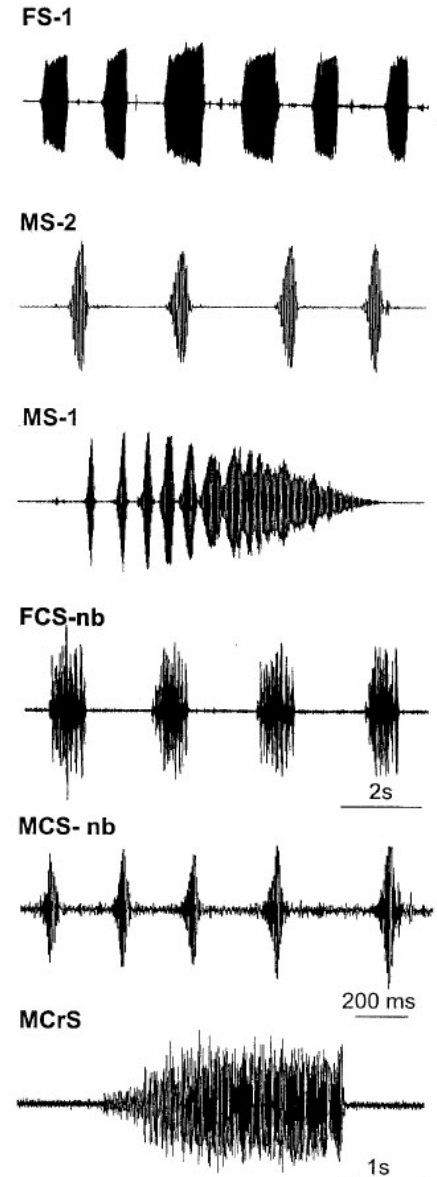
FONDAZIONE
EDMUND
MACH



Uporaba vibracijskih signalov

Žuželke vibrirajo!

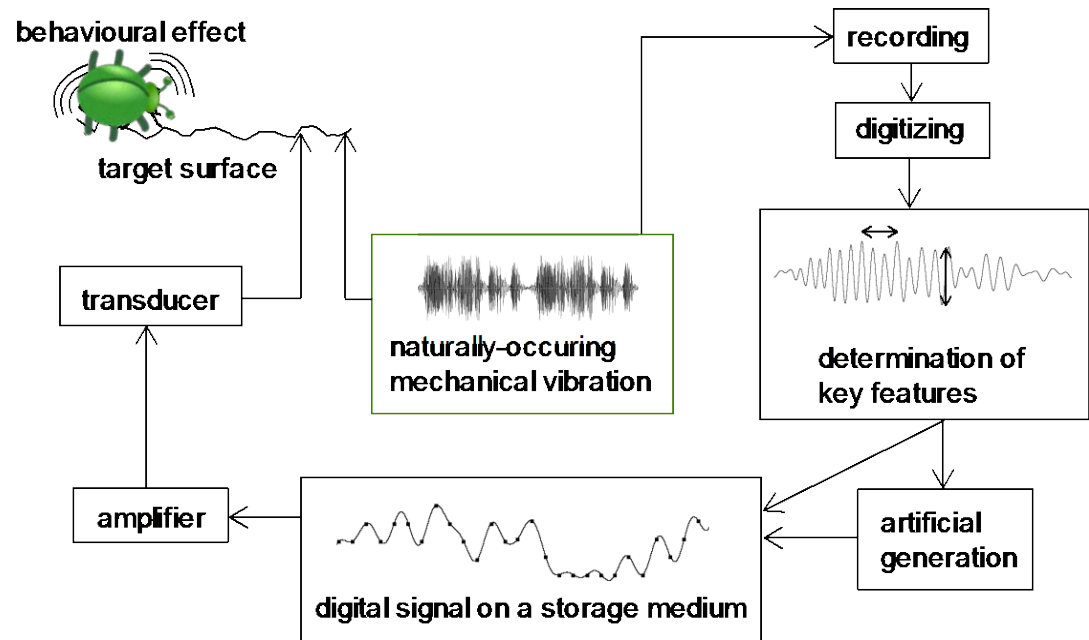
- ❖ žuželke so slab vir zvoka
- ❖ namesto tega signali, ki se prevajajo po podlagi
- ❖ produkcija in zaznavanje signalov s specializiranimi organi oz. krčenjem mišic
- ❖ komunikacija: prepoznava in lokalizacija partnerja
- ❖ vrstno in spolno specifični repertoarji



Uporaba vibracijskih signalov

Manipulacija

- ❖ uporaba naravnih signalov – neposredno ali modificiranih
- ❖ detekcija:
 - ❖ piezoelektrični pretvorniki
 - ❖ laserski vibrometri
- ❖ računalniško predvajanje:
 - ❖ kontaktni predvajalniki
 - ❖ zvočniki predvajajo zvok, ki vzbuja podlago



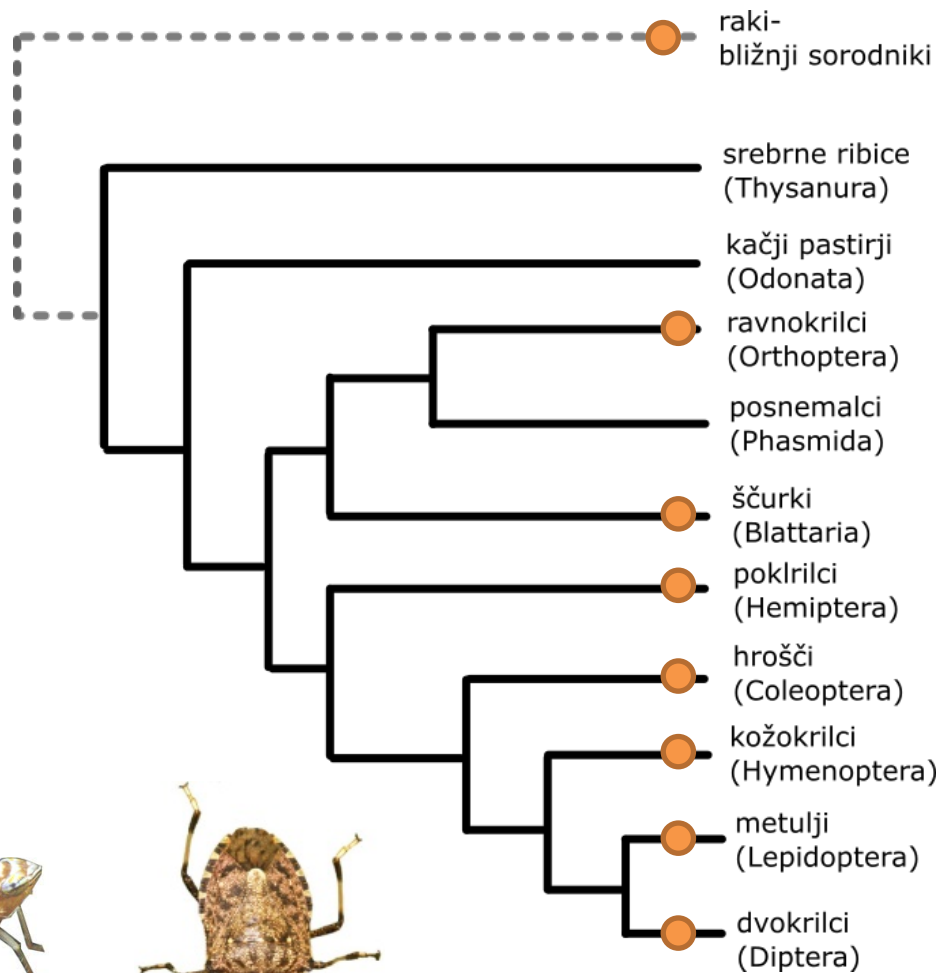
PRISTOPI



Uporaba vibracijskih signalov

Raziskanost

- ❖ Raziskovano širom razreda žuželk ...
- ❖ ... a pri zelo malo vrstah.
- ❖ Dve konkretniji študiji:
 - ❖ lubadarji
 - ❖ škržatki
- ❖ ... in še ena naša v teku.



vrst	raz.
370	/
5k	/
20k	1
2,5k	/
7,5k	1
80k	5
400k	8
150k	0
180k	3
125k	0



Uporaba vibracijskih signalov

Ameriški škržatek



- ❖ uvožen iz Severne Amerike
- ❖ prenašalec zlate trsne rumenice
- ❖ karantenski škodljivec



Uporaba vibracijskih signalov

Ameriški škržatek



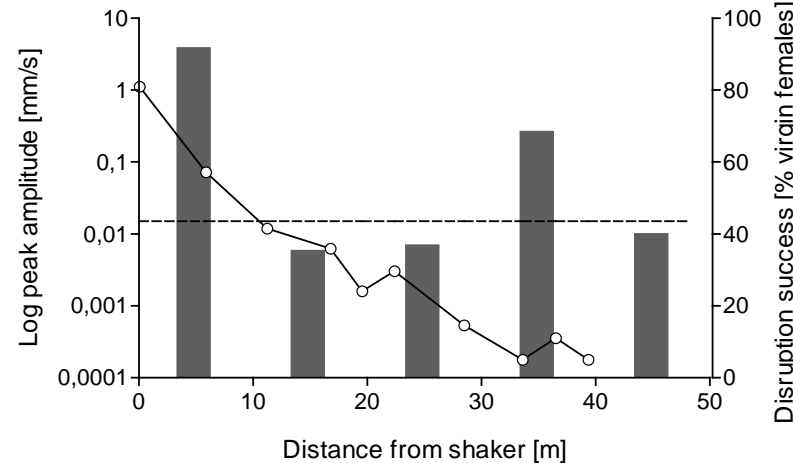
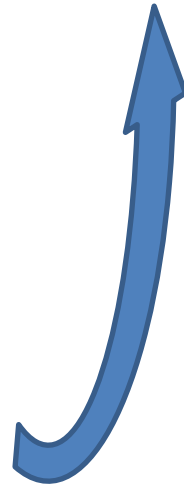
❖ bazična biologija:

- ❖ omejen na trto
- ❖ počasno razmnoževanje
- ❖ uporablja izključno vibracije za spolno komunikacijo
- ❖ motilni rivalni signali samcev



❖ aplikativne raziskave

- ❖ laboratorij: potrditev koncepta
- ❖ terenski poskusi



Uporaba vibracijskih signalov

Sporočilo za domov



- ❖ Cilj: zdravju in okolju prijaznejša pridelava hrane.
- ❖ Vibracije imajo še ogromno potenciala za inovativne rešitve.
- ❖ **Ampak!** Brez bazične znanosti dolgoročno ne bo šlo.
- ❖ Pomembno je sodelovati.