

Is recruitment of naive foragers important?



Efficient food exploitation by stingless bees (*Melipona seminigra*)
Is the recruitment of naive foragers really important?

Michael Hrncir & Dirk Louis P. Schorkopf

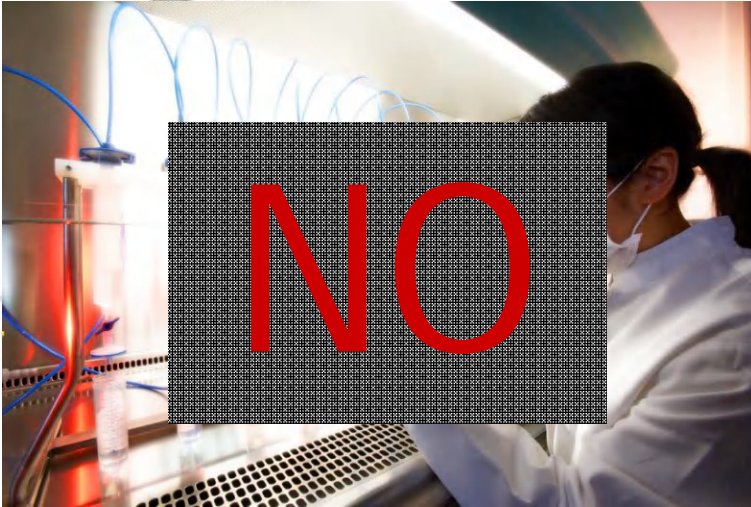
Apimondia 2011 – Buenos Aires
Social Organization of Behaviour



Is recruitment of naive foragers important?



Who are the Stingless Bees?



Stingless bees do **NOT** derive from funny or freaky genetic experiments



Stingless bees are **NOT** honey bees after sting removal

Is recruitment of naive foragers important?



Who are the Stingless Bees?



Stingless bees
are the largest group of
eusocial bees

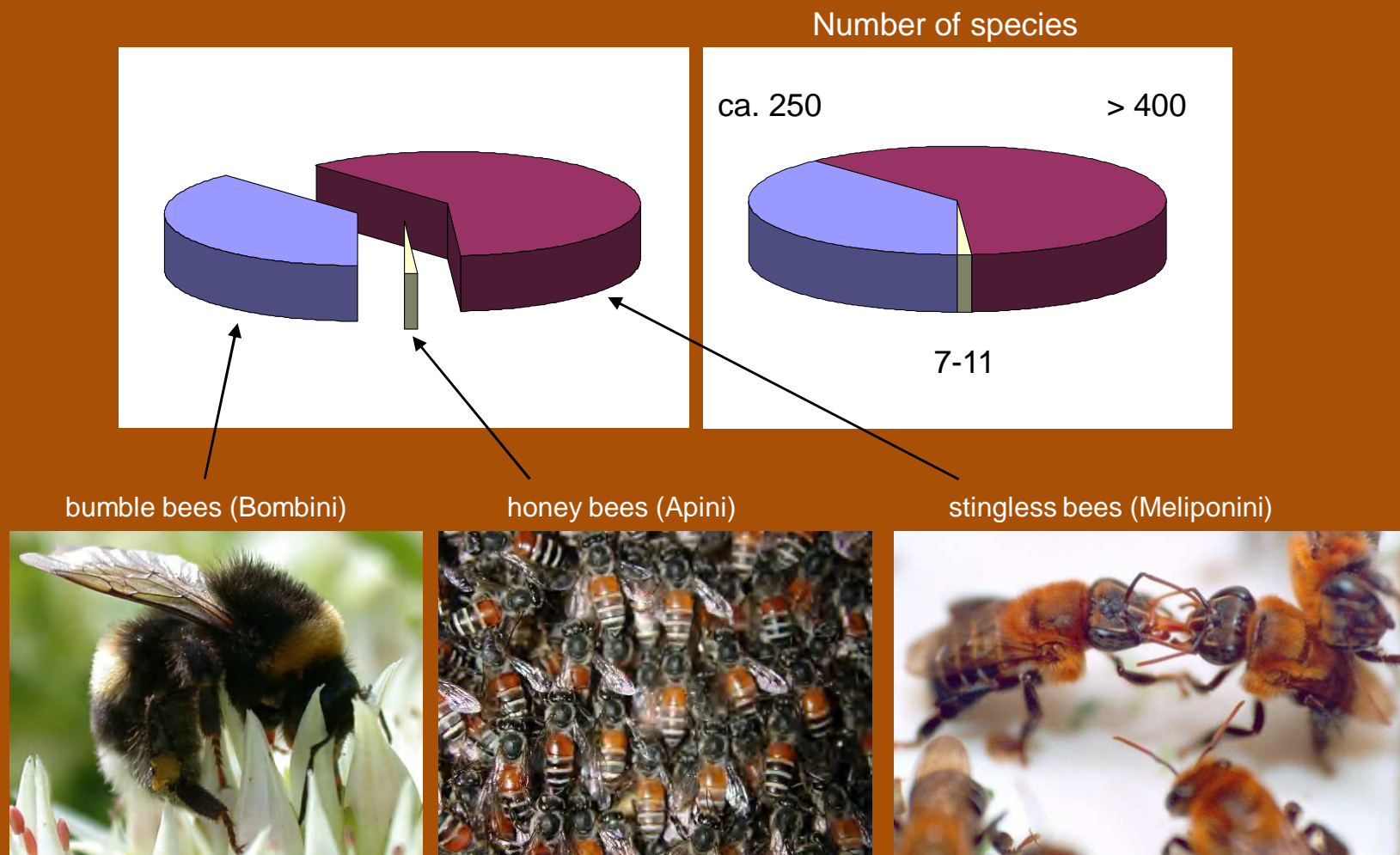


Is recruitment of naive foragers important?



Who are the Stingless Bees?

The eusocial bees



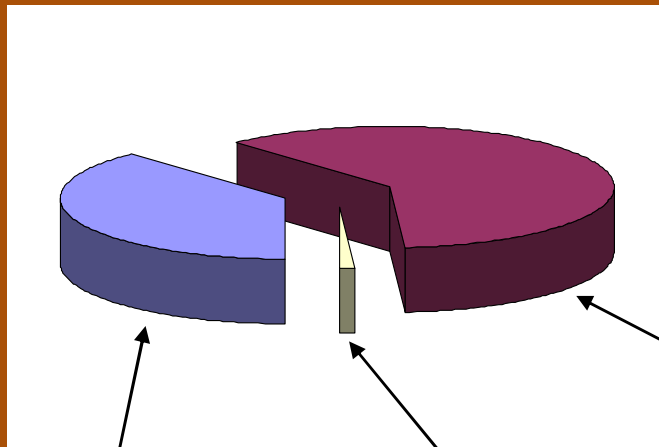
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Who are the Stingless Bees?

The eusocial bees

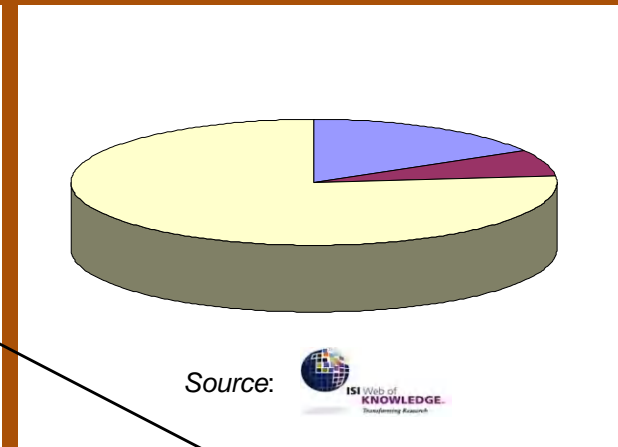
Articles since 1998



bumble bees (Bombini)



honey bees (Apini)



stingless bees (Meliponini)



Source:



Is recruitment of naive foragers important?



Organization of Foraging Processes



Is recruitment of naive foragers important?



Organization of Foraging Processes



Is recruitment of naive foragers important?



Organization of Foraging Processes



Is recruitment of naive foragers important?



Organization of Foraging Processes



Is recruitment of naive foragers important?



Organization of Foraging Processes



Recruitment is any form of communication that brings additional individuals to a place where work is required (Wilson, 1971)

Is recruitment of naive foragers important?



Organization of Foraging Processes



Problem for bees
Competition over
food sources



Is recruitment of naive foragers important?



Organization of Foraging Processes



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Is recruitment of naive foragers important?



Organization of Foraging Processes



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Is recruitment of naive foragers important?



Organization of Foraging Processes



Problem for bees
Competition over food sources

Possible solution
Quick mobilization of available foragers

Is recruitment of naive foragers important?



Organization of Foraging Processes



Recruitment to food sources
 \neq
Recruitment to food sources

Recruitment is any form of communication that brings additional individuals to a place where work is required (Wilson, 1971)

Is recruitment of naive foragers important?



Recruitment \neq Recruitment



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



Situation 1
New food source
No food source-experienced foragers



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



naive



naive



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



naive



naive



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



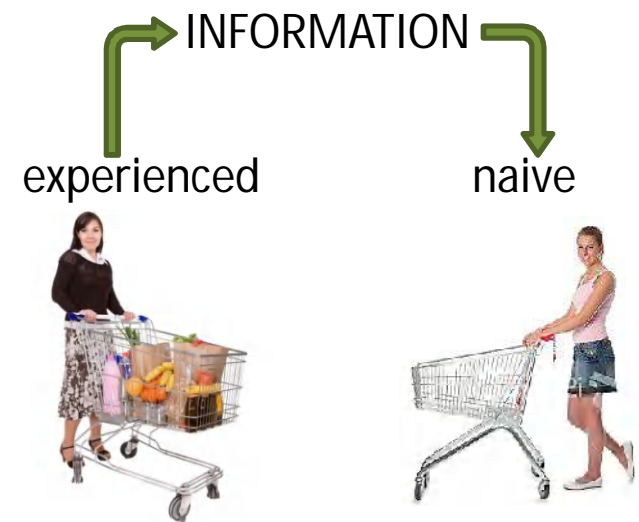
naive



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



Situation 1

Scouts return as experienced foragers
Information transfer
Activation of food source-naive bees

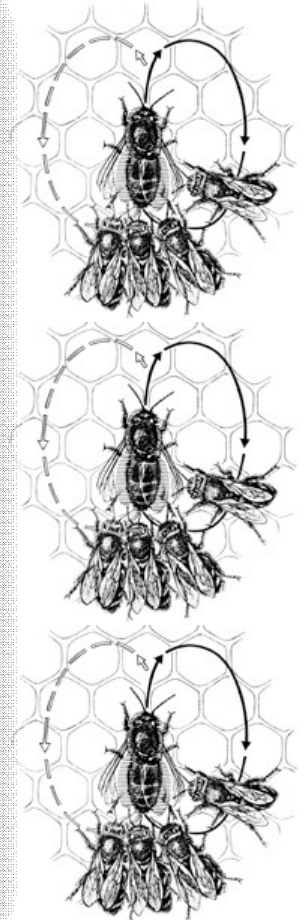
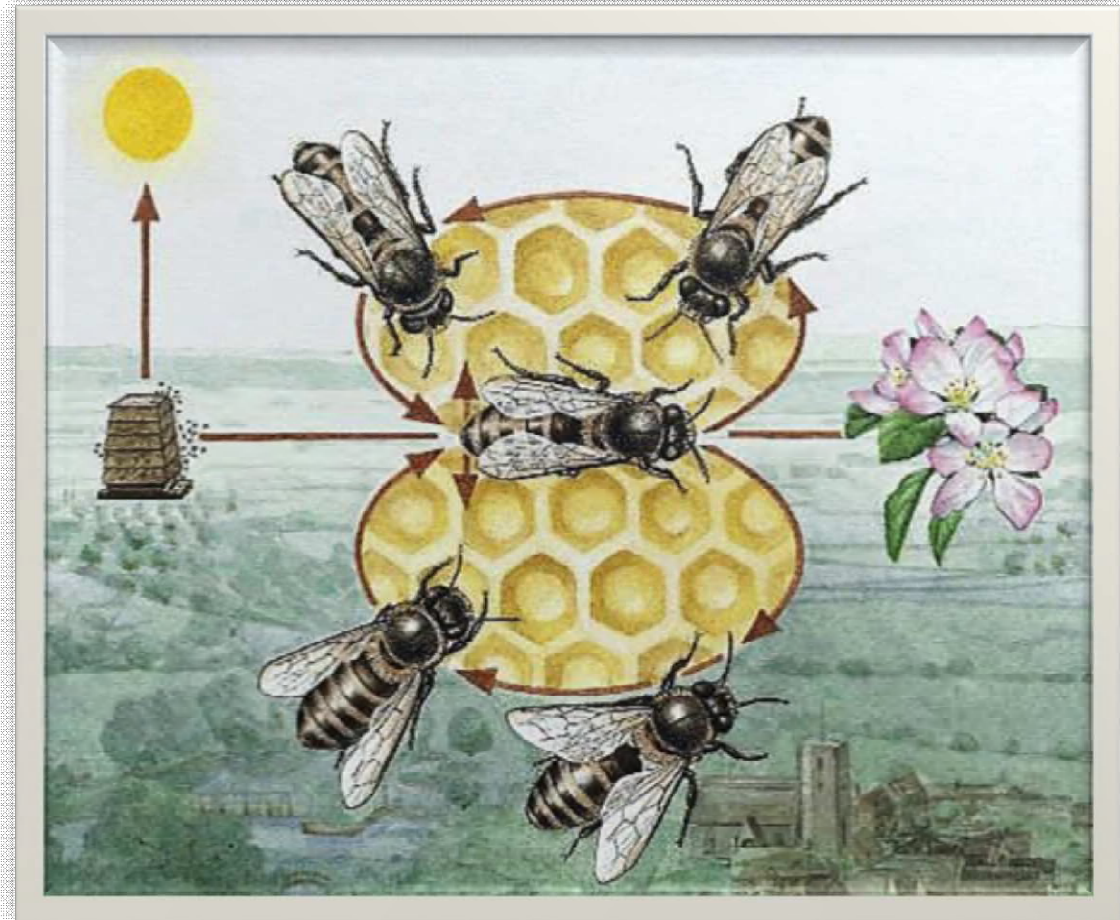


Is recruitment of naive foragers important?



Organization of Foraging Processes

The famous waggle dance of the honey bee



Information about **DIRECTION** and **DISTANCE** of a food source

Is recruitment of naive foragers important?



Organization of Foraging Processes

What about stingless bees?



Stingless bees do not dance!

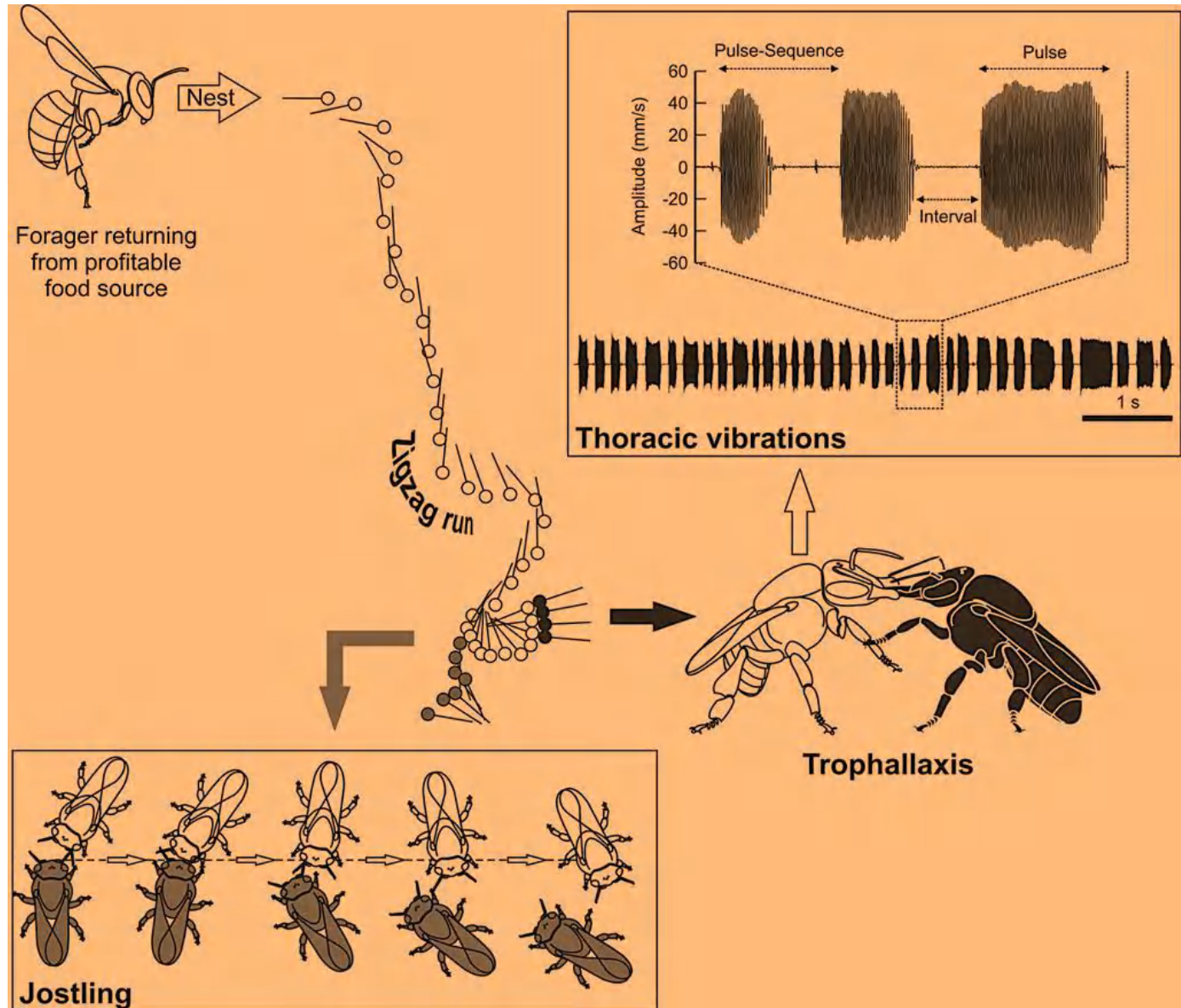
Is recruitment of naive foragers important?



Is recruitment of naive foragers important?



Organization of Foraging Processes

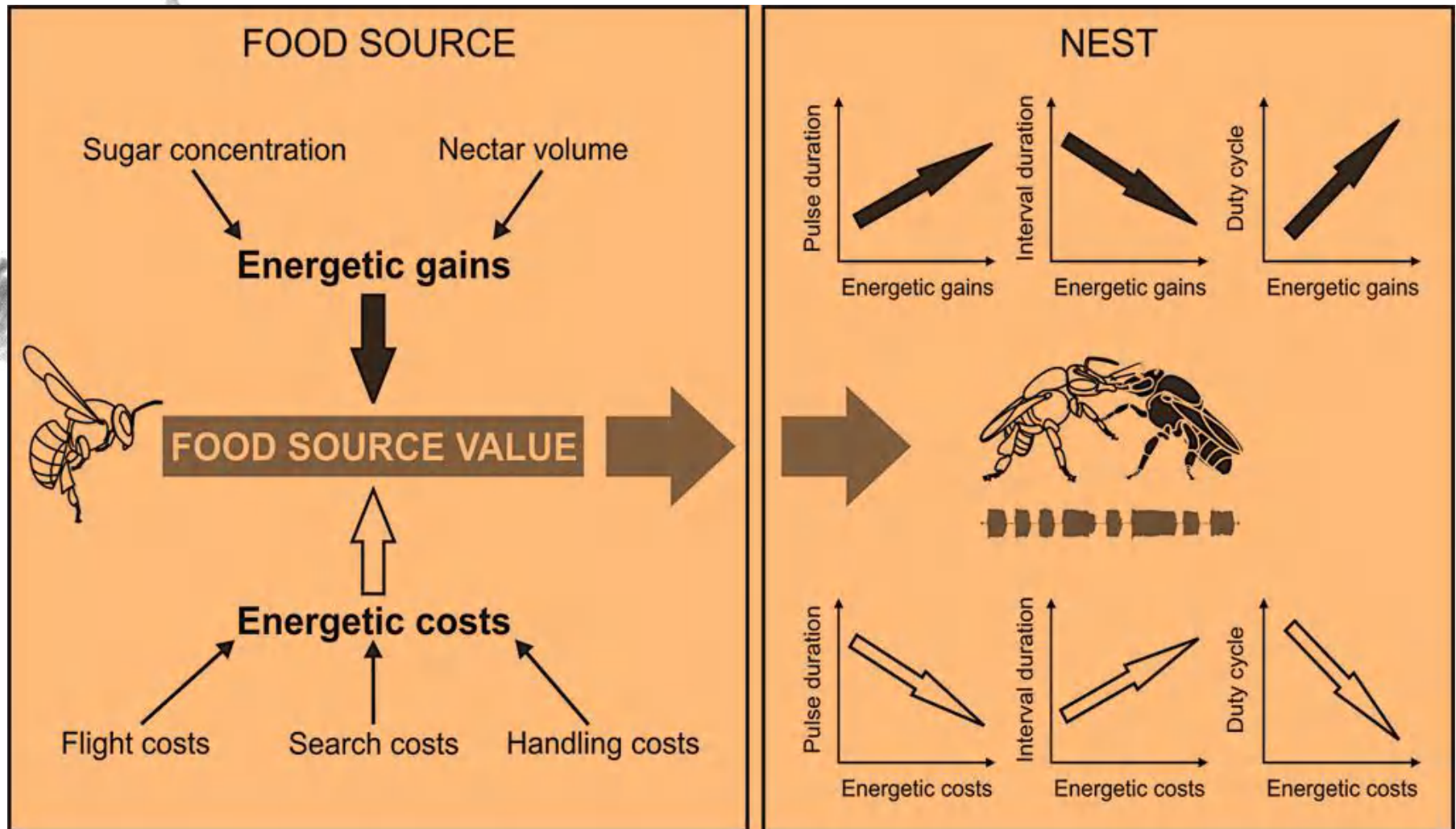


from: Hrnčir, 2009, CRC-Press

Is recruitment of naive foragers important?



Organization of Foraging Processes



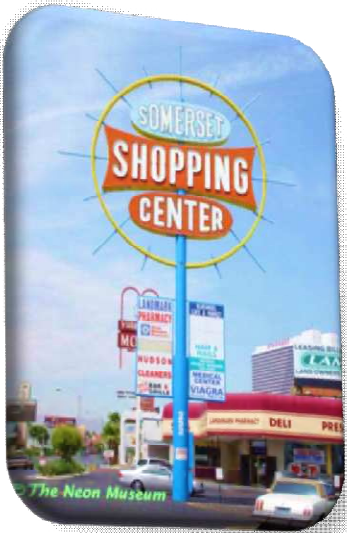
from: Hrncir, 2009, CRC-Press

NO Information about **DIRECTION** and **DISTANCE** of a food source

Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



experienced



naive



SLOW ACTIVATION

Situation 1

Scouts return as experienced foragers
Information transfer
Activation of food source-naive bees



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



experienced

experienced

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experienced



experienced



SLOW ACTIVATION

Situation 1

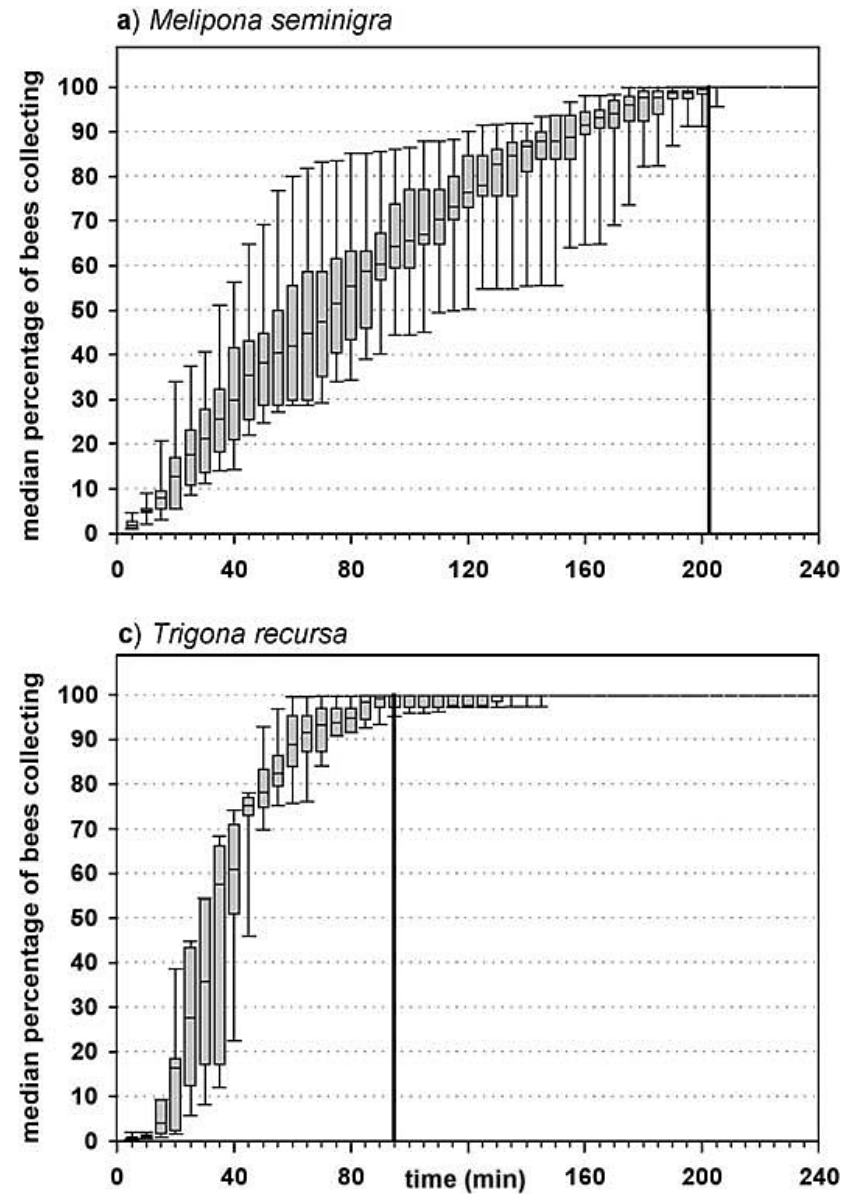
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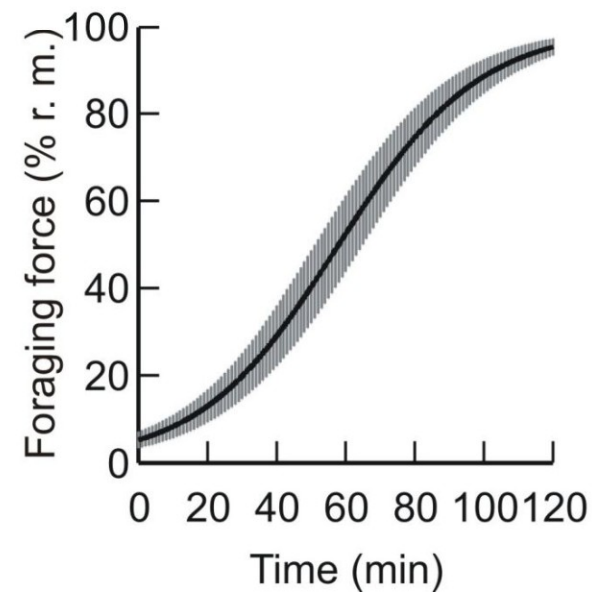
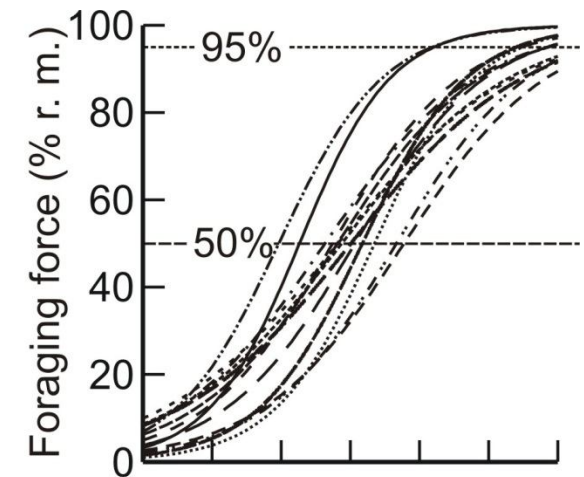
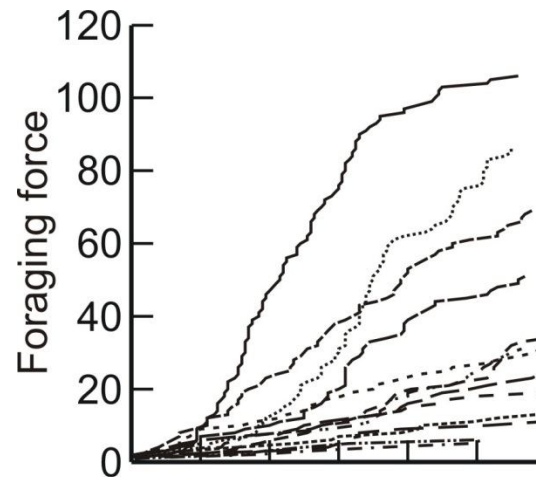
Recruitment \neq Recruitment – Situation 1: New food source



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



Situation 1

New food source

No food source-experienced foragers

Food source naive foragers are important
(no surprise there)

Slow build-up of foraging force



Is recruitment of naive foragers important?



Recruitment \neq Recruitment



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



Situation 2
Known food source
Known food patch
(position known to experienced foragers)



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



experienced



experienced



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



experienced



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



Situation 2

Inspectors find food still available
Information transfer
Activation of experienced foragers



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



experienced



experienced



RAPID ACTIVATION

Situation 2

Inspectors find food still available
Information transfer
Activation of experienced foragers



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



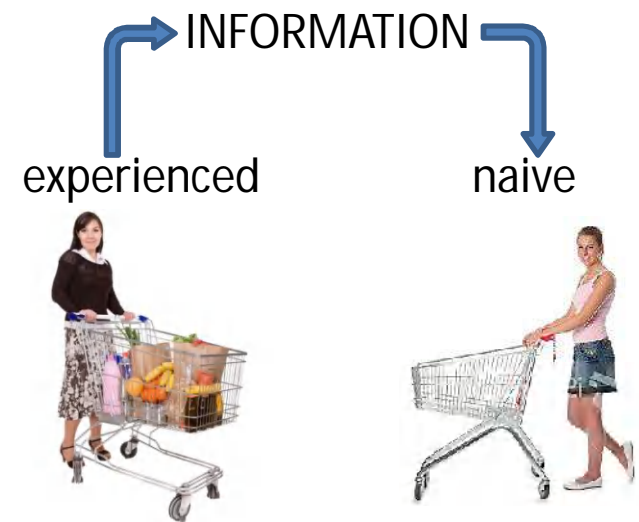
naive



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



Situation 2

Inspectors find food still available
Information transfer
Activation of naive foragers



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



experienced



naive



SLOW ACTIVATION

Situation 2

Inspectors find food still available
Information transfer
Activation of naive foragers



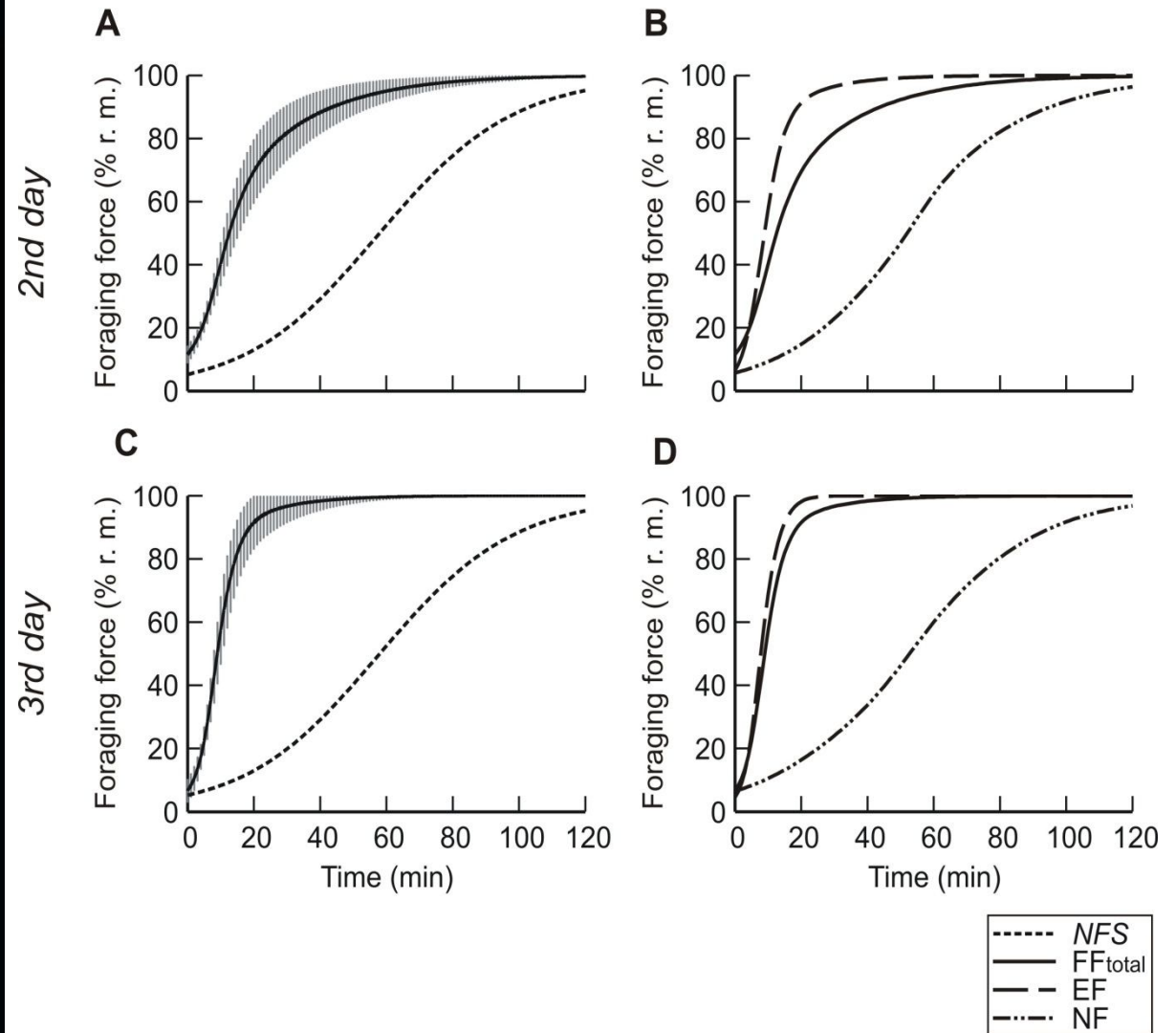
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Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



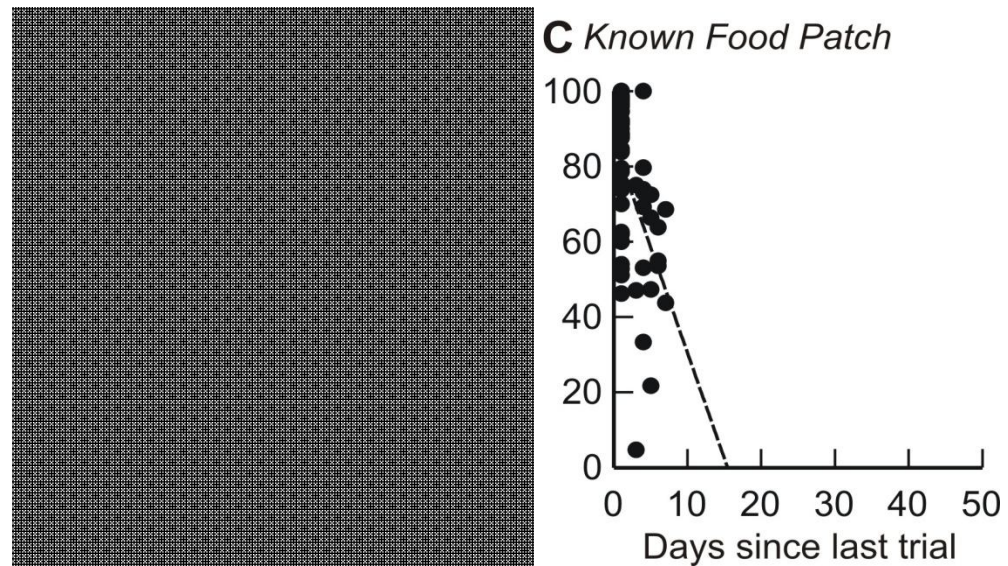
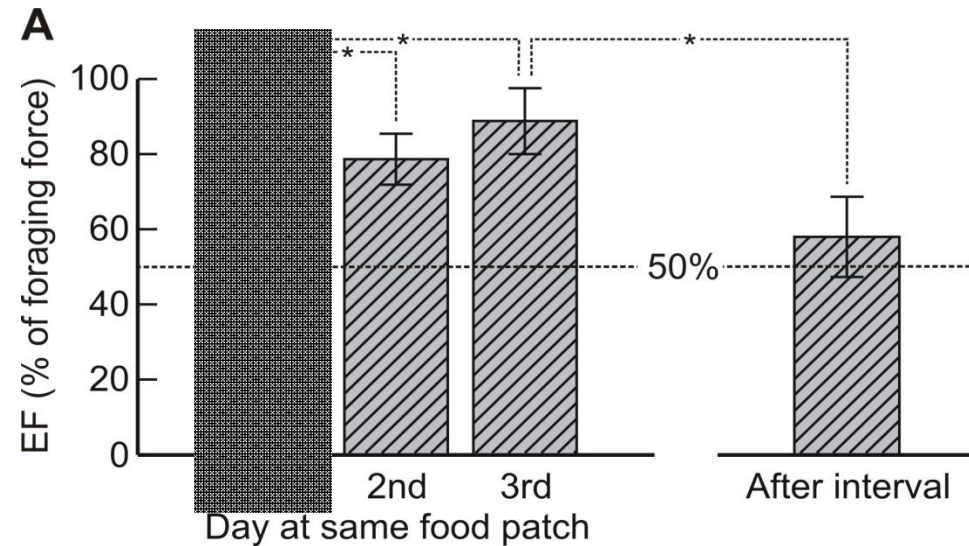
Known Food Patch



Is recruitment of naive foragers important?



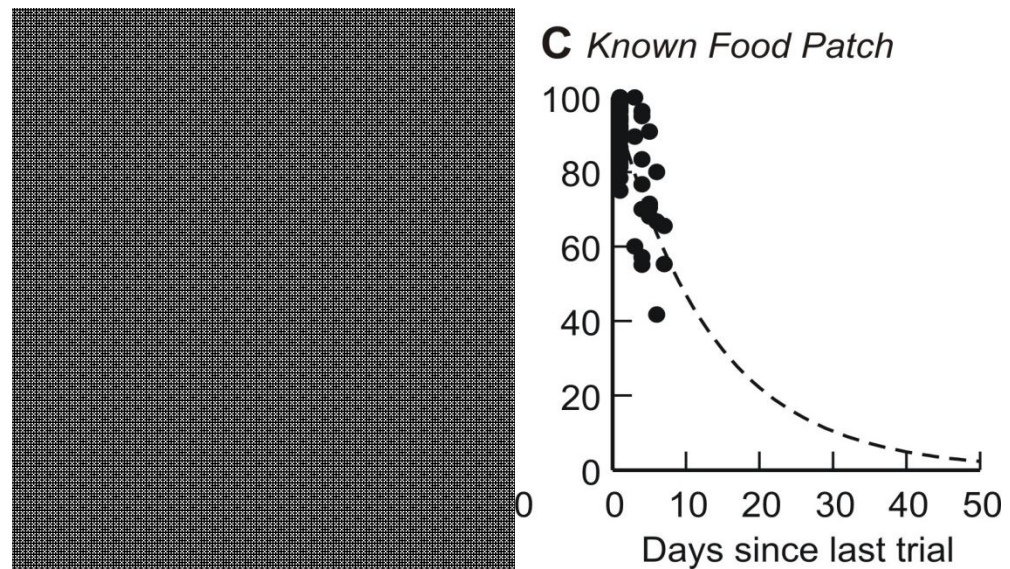
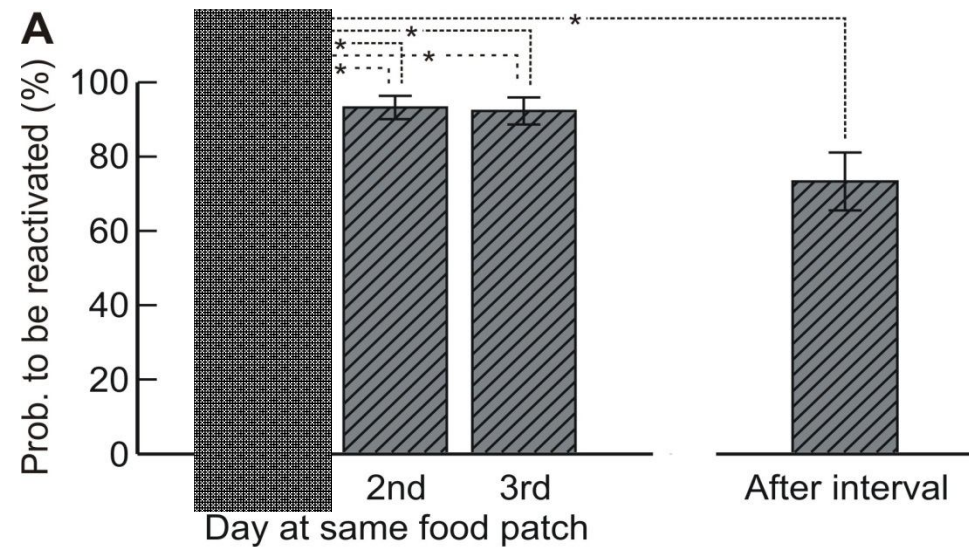
Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



Is recruitment of naive foragers important?



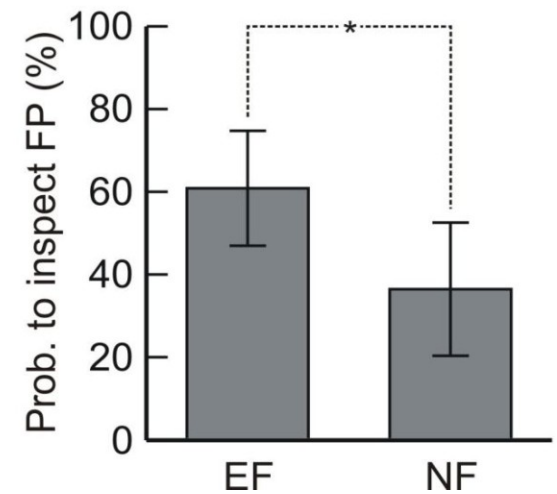
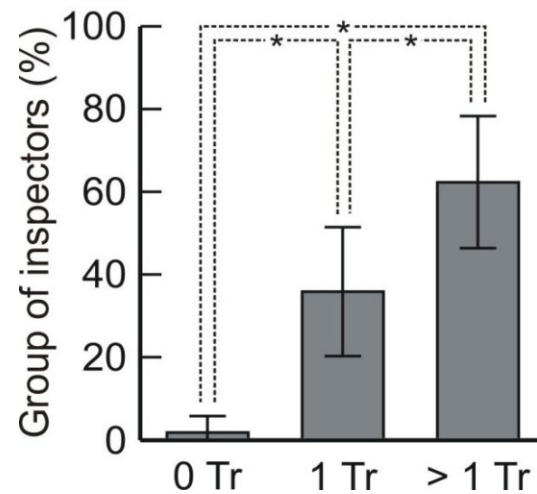
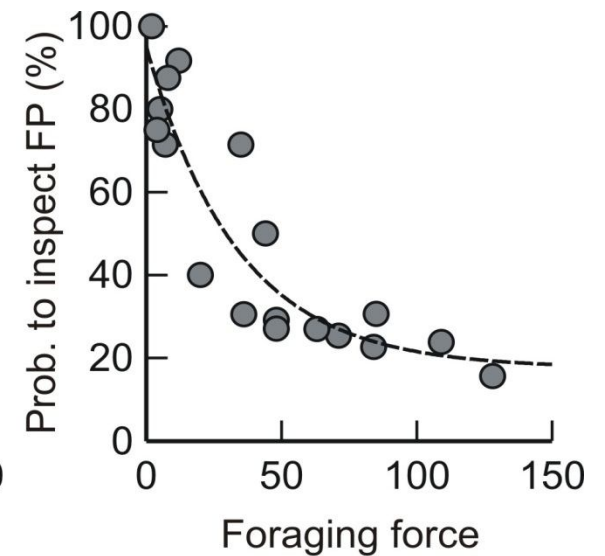
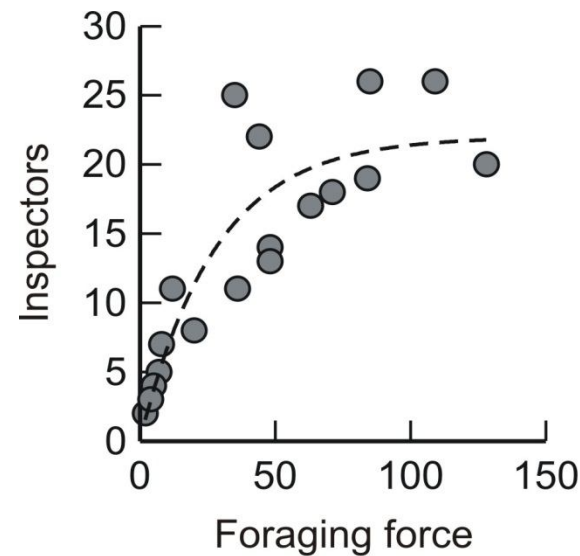
Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 2: Known food source at familiar position



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 1: New food source



Situation 2

Known food source
Known food patch

- More experienced foragers inspect more often
- Experienced foragers are quickly activated
- Almost all experienced foragers are activated

Fast build-up of foraging force
Naive foragers are not very important



Is recruitment of naive foragers important?



Recruitment \neq Recruitment



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



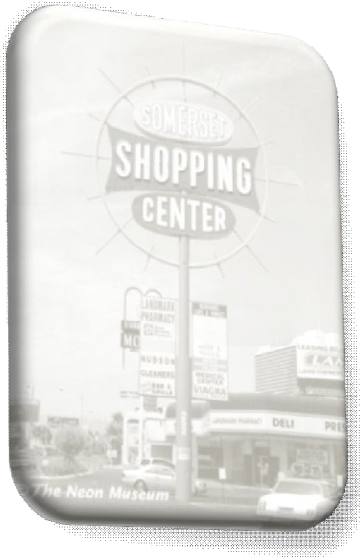
Situation 3
Known food source
New food patch
(position not known to experienced foragers)



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



experienced



experienced



own food source at position unknown to colony



experienced

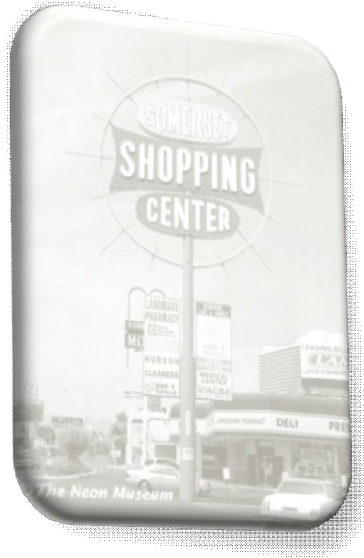


Organization of Behaviour, 23/09/2011

Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



Situation 3

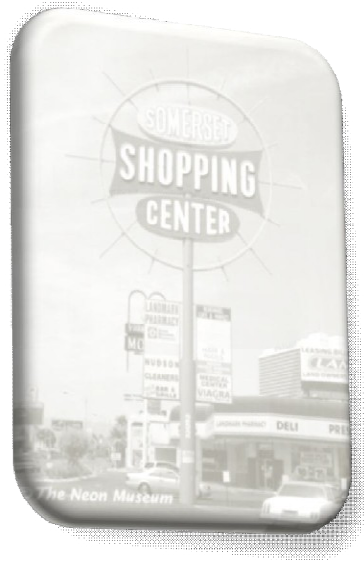
Experienced foragers search for new patch
Information transfer
Activation of experienced foragers



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



experienced



experienced



Situation 3

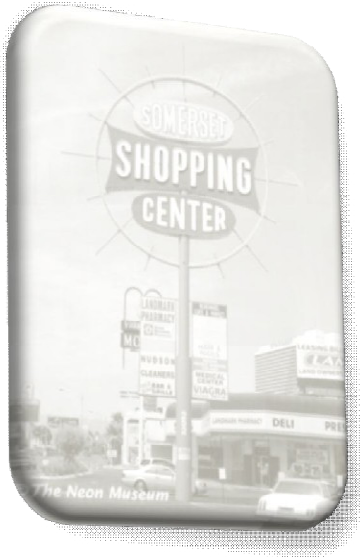
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experienced



experienced



SLOW ACTIVATION

Situation 3

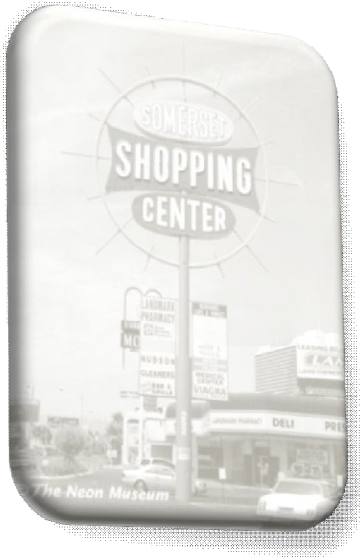
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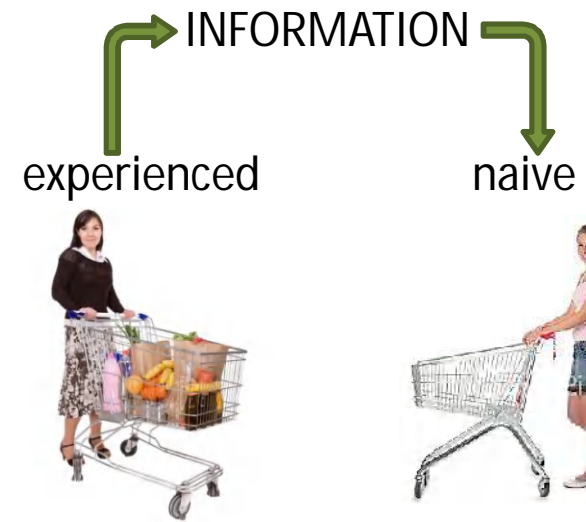
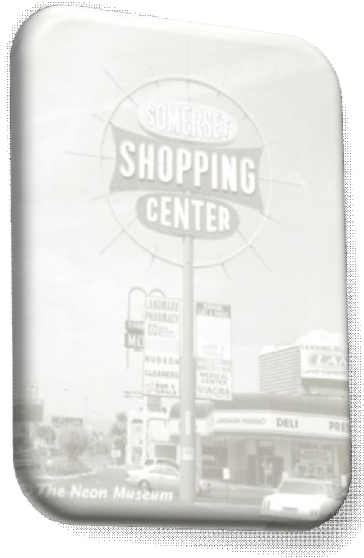
naive



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



Situation 3

Experienced foragers search for new patch
Information transfer
Activation of naive foragers



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



experienced



naive



SLOW ACTIVATION

Situation 3

Experienced foragers search for new patch
Information transfer
Activation of naive foragers



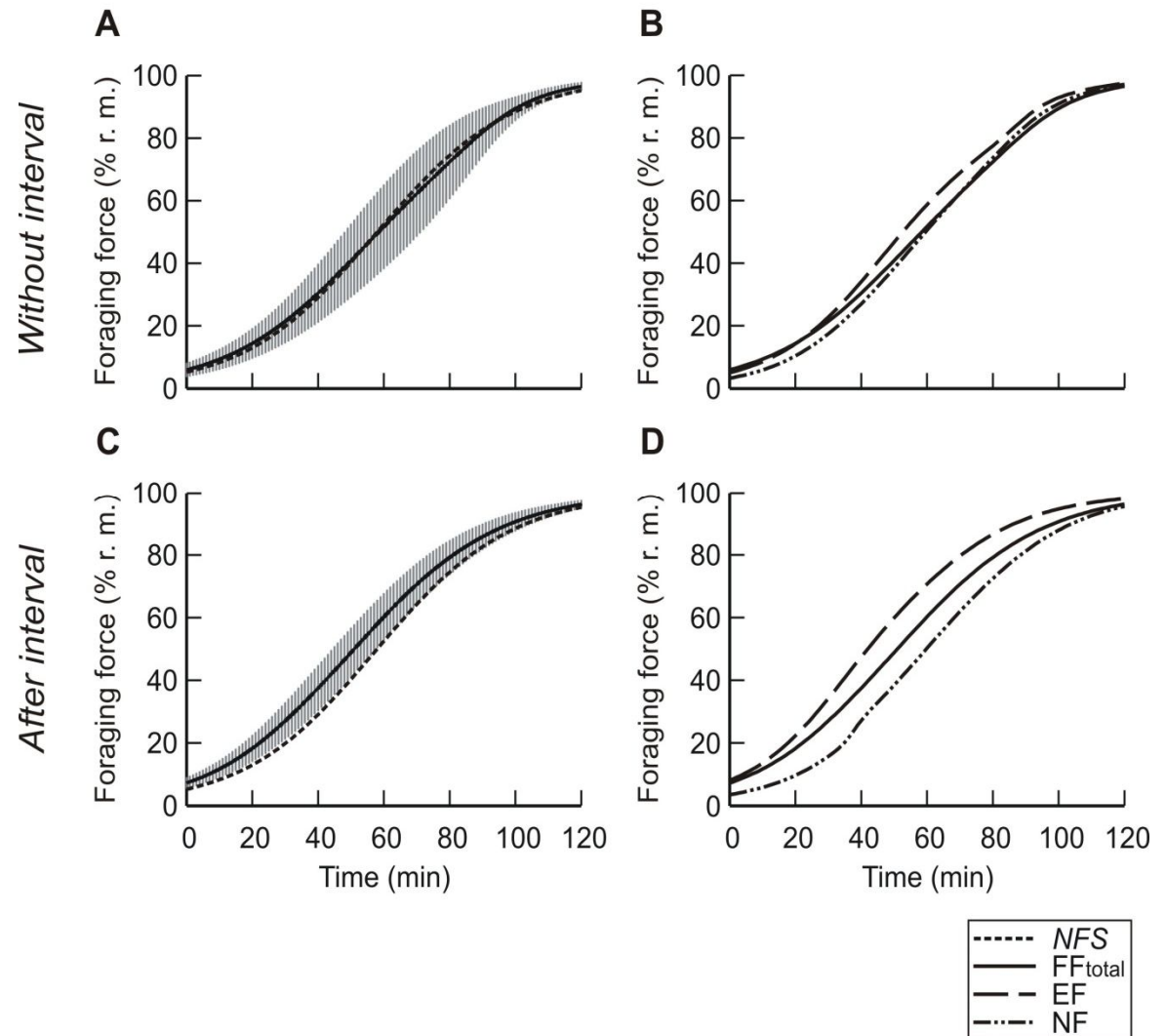
Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



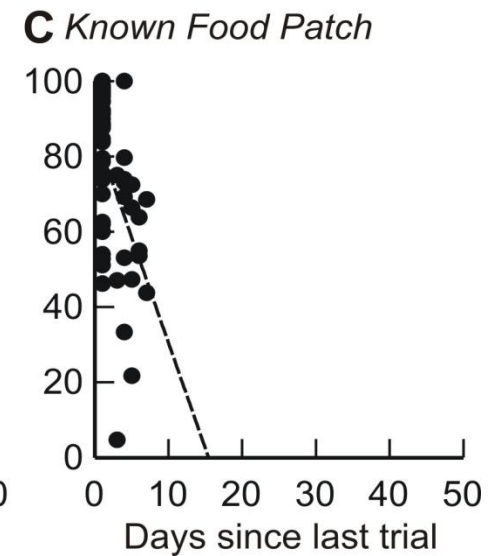
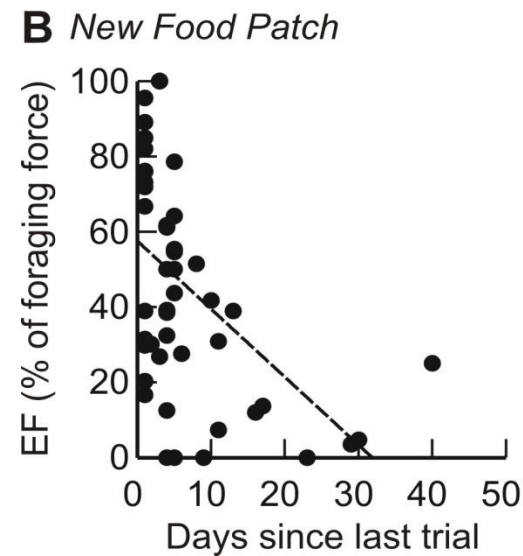
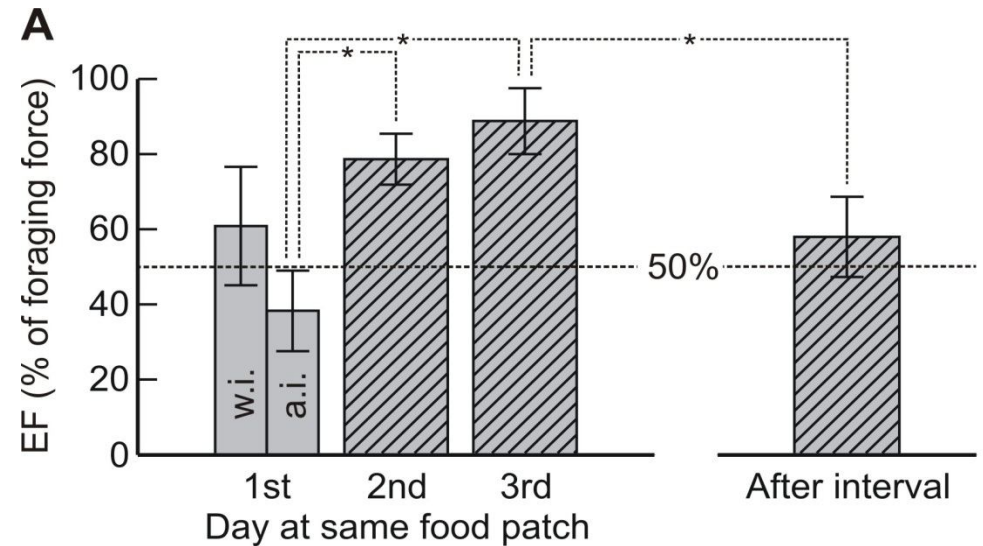
New Food Patch



Is recruitment of naive foragers important?



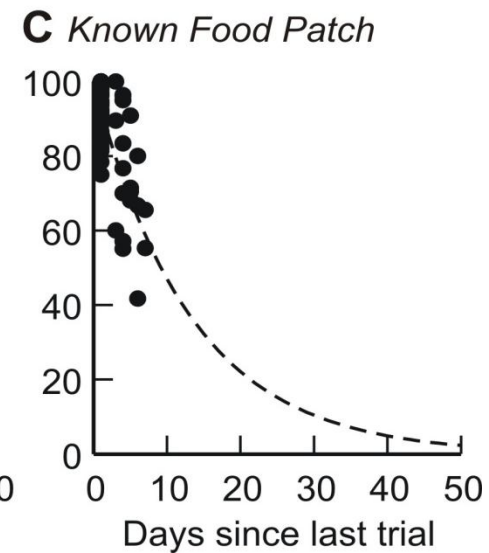
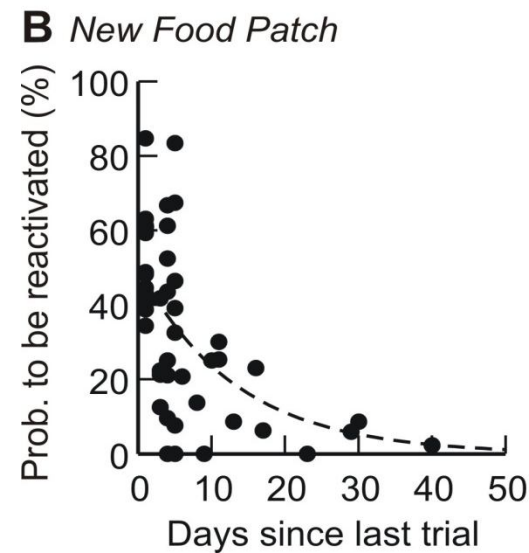
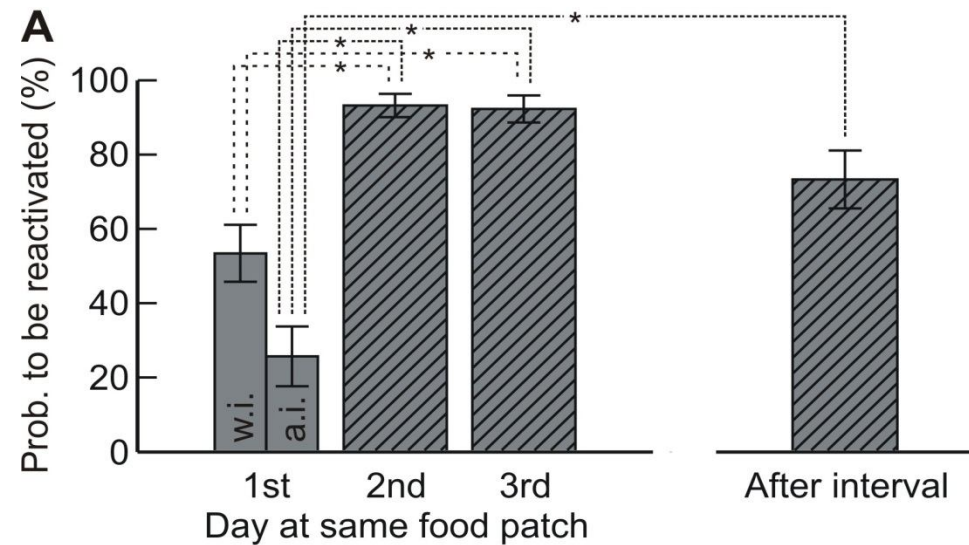
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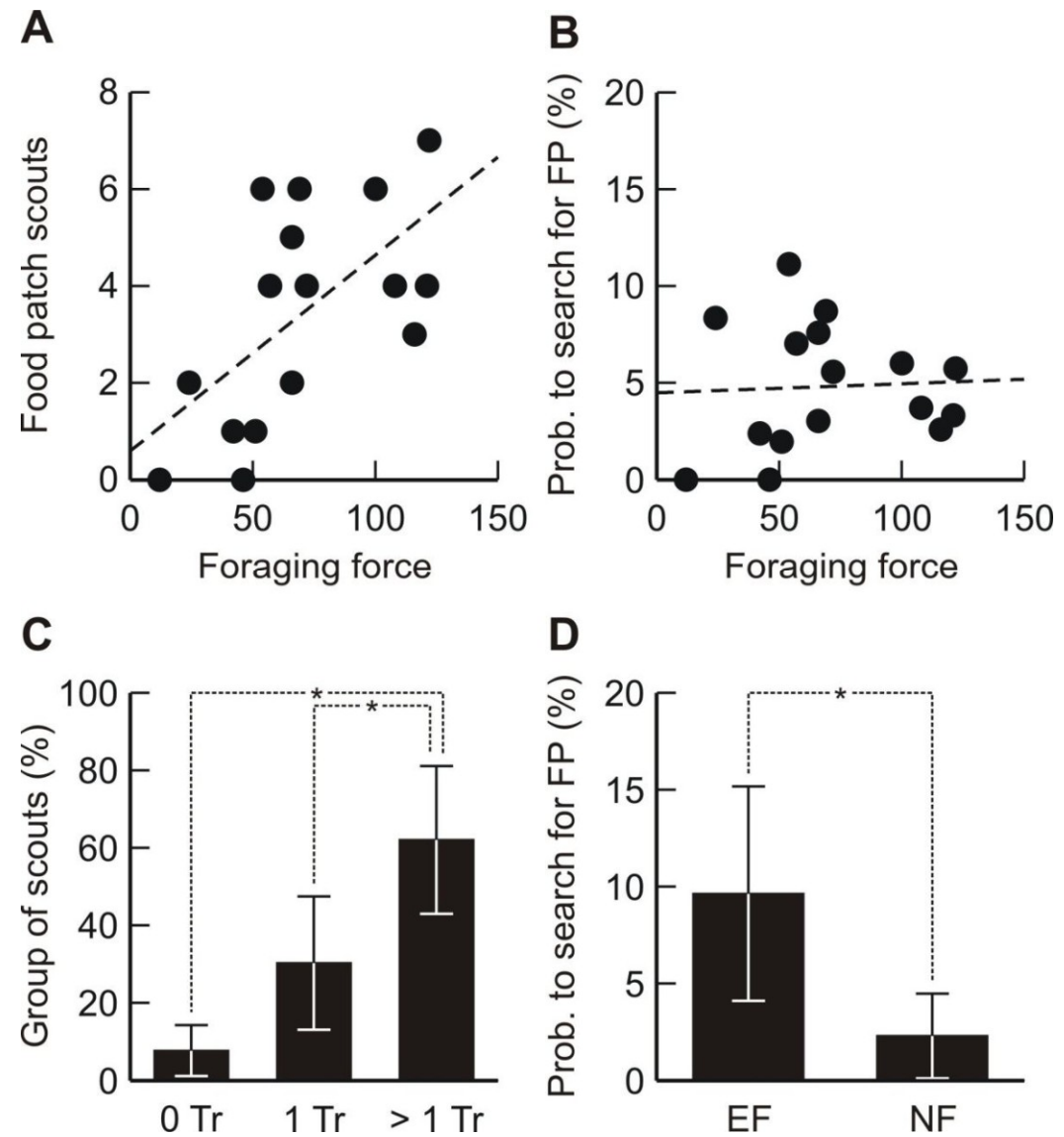
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Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



Is recruitment of naive foragers important?



Recruitment \neq Recruitment – Situation 3: Known food source at position unknown to colony



Situation 3

Known food source
New food patch

- Few experienced foragers search for a new patch
- More experienced foragers search more often
- Experienced and naive foragers arrive at the patch at similar rates
- Less than 50% of the experienced foragers are activated

Slow build-up of foraging force
Naive foragers are important



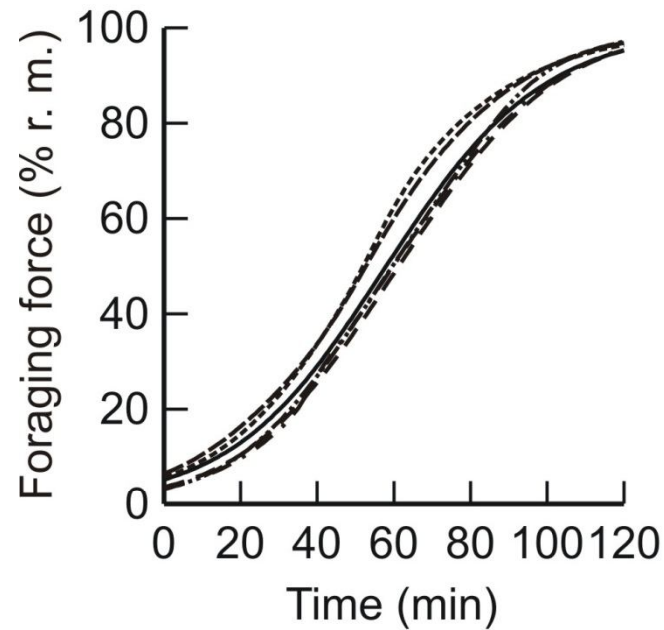
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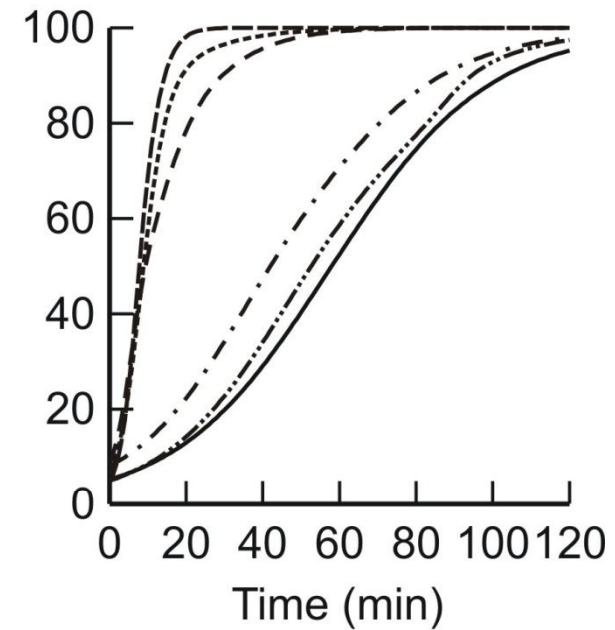
Organization of Foraging Processes



A Food source-naive foragers



B Experienced foragers



- *New Food Source*
- · - · - *New Food Patch - without interval*
- · · · *New Food Patch - after interval*
- · · · *Known Food Patch - 2nd day*
- - - - *Known Food Patch - 3rd day*
- - - - *Known Food Patch - after interval*

Is recruitment of naive foragers important?



Organization of Foraging Processes



Conclusion

The recruitment of naive foragers can indeed increase the efficiency of food exploitation processes when *Melipona seminigra* colonies exploit ephemeral resources that provide food simultaneously at various patches

(mass flowering plants that contribute to 90% of the annual food input into stingless bee colonies)

 **FAPESP**

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