

Monitoring rodents in Cotonou seaport, Benin: implication for zoonotic risk and rodent management

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Direction

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Supervision

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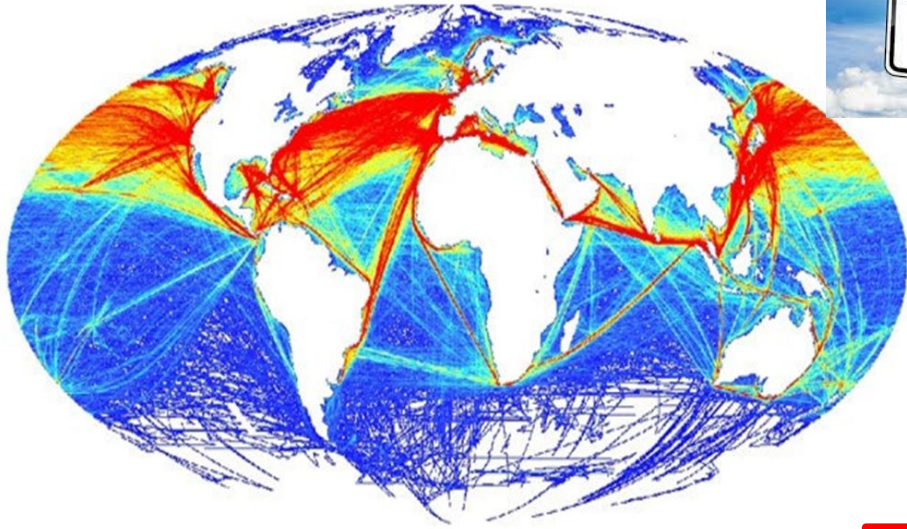
Dr (MC) Carine **BROUAT**

Encadrement

Dr (MC) Gualbert **HOUEMENOU**

Dr (MC) Karmadine **HIMA**

ObsMICE days , Niamey 29/11 – 01/12/2022



MARITIME WORLD TRADE



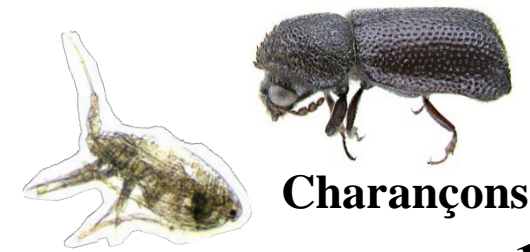
Eichhornia crassipes



Aedes aegypti



Aedes albopictus



Planctons

Charançons

Why the Autonomous Port of Cotonou ?



BENIN

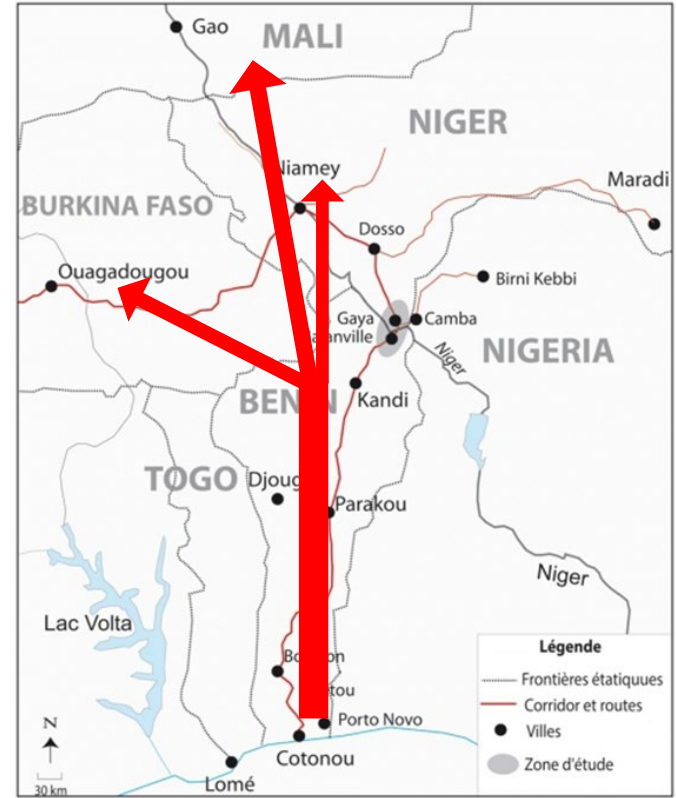
70 % of Benin GDP



Introduction to the Cotonou seaport by maritime traffic



Dissemination by trucks

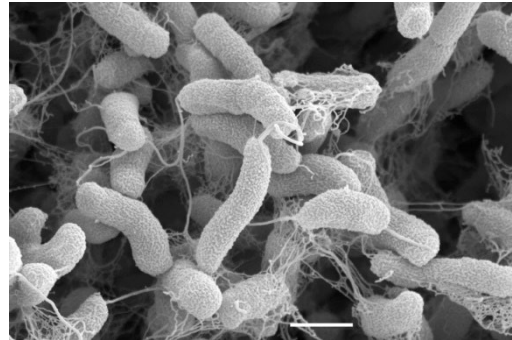


Introduction in the hinterland

WIDE SCALE DISSEMINATION OF RODENT-BORNE PATHOGENS

INTERNATIONAL HEALTH REGULATIONS

Rodents



Yersinia pestis

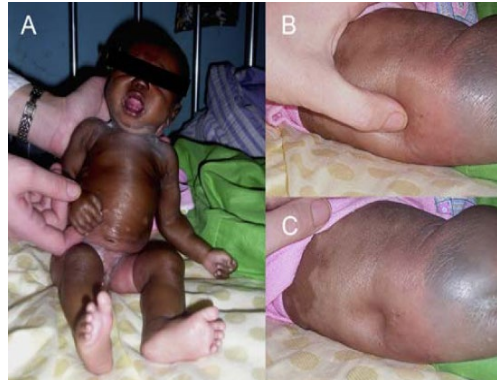
Vibrio cholerae



Fleas



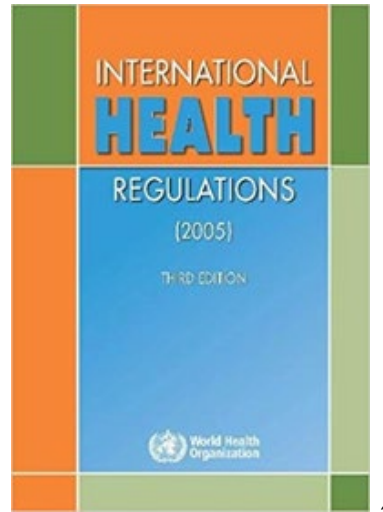
Plague



Trypanosomiasis

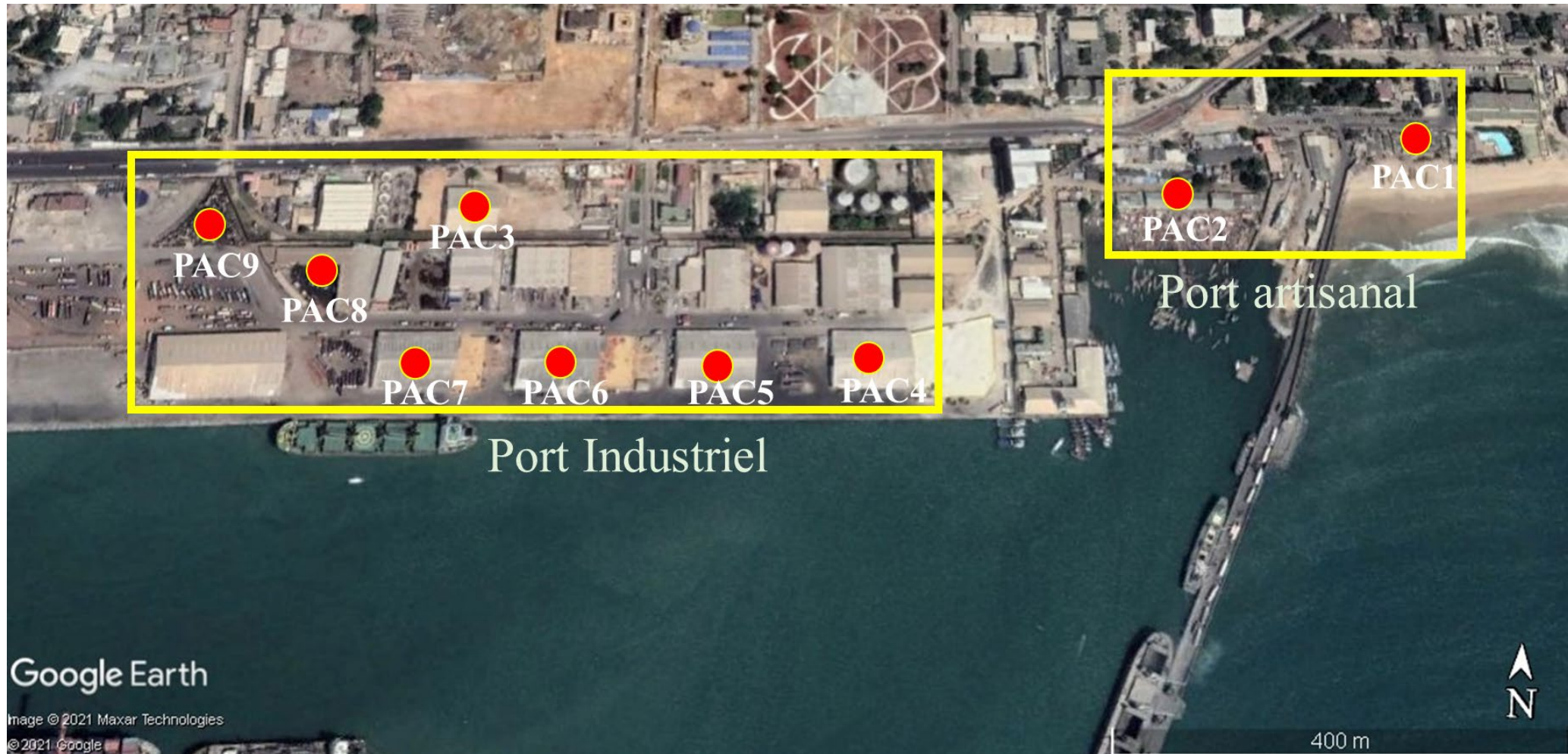


Cholera

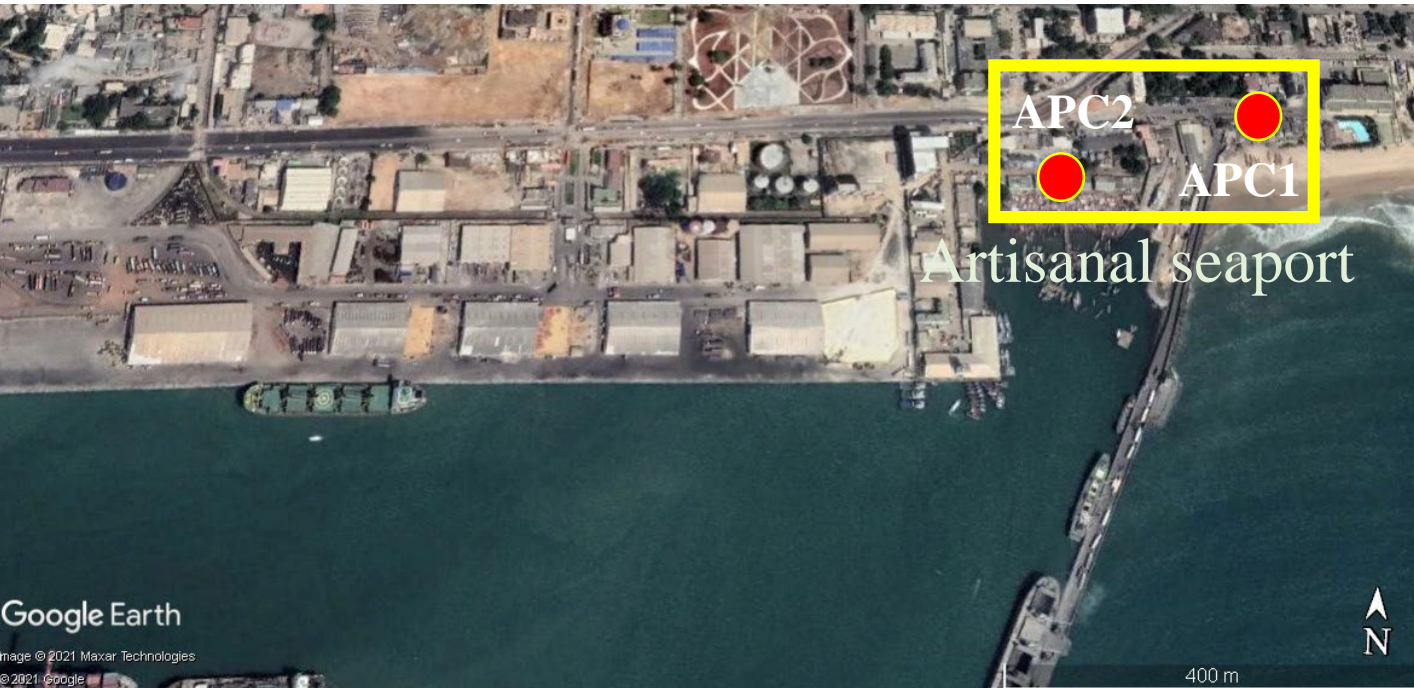


What are the sample sites ?

Autonomous Port of Cotonou (APC)



What are the sample sites ?



Artisanal fishing seaport



What are the sample sites ?



Industriel seaport

What are the sample sites ?



Industrial seaport

Sampling protocol ?

➤ Diachronic monitoring



Rodents Cotonou seaport ?

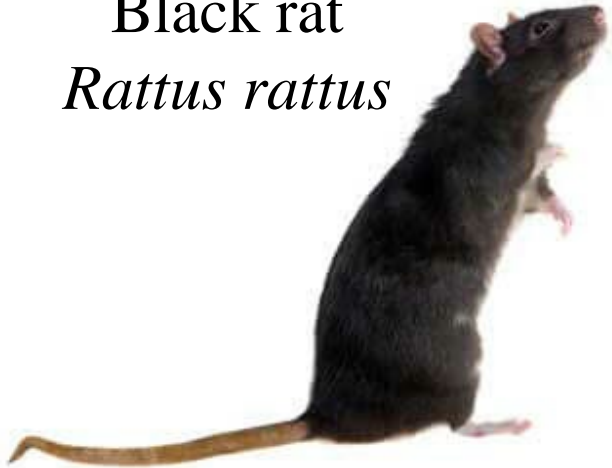
☐ Rodents : Rats et mice

☐ Insectivorous

(De Visser et al., 2001)

Multiples mammal rat
Mastomys natalensis

Black rat
Rattus rattus



Brown rat
Rattus norvegicus



domestic mouse
Mus musculus

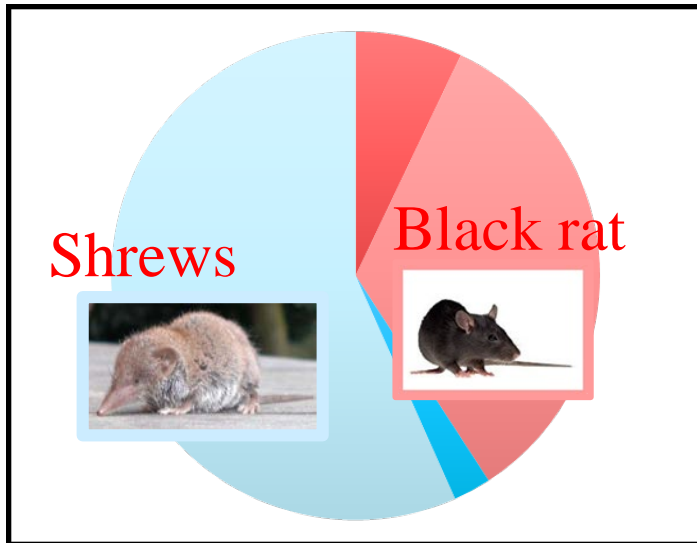


Shrew
Crocidura olivieri



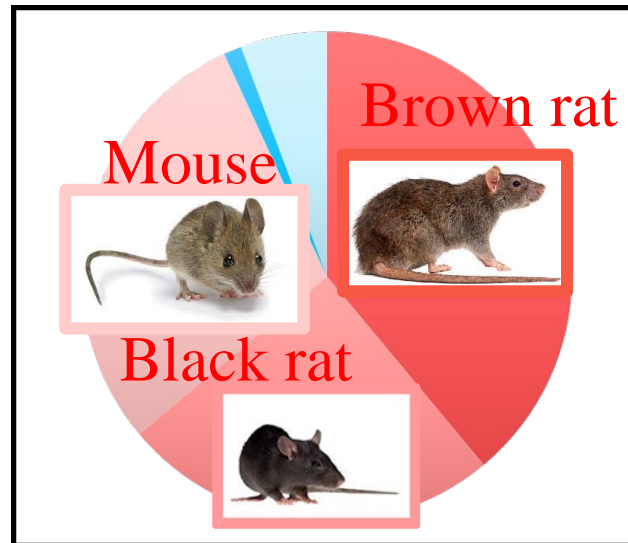
Ecology of communities ?

Np : 1659 ; Nm : 327



Artisanal seaport

Np : 4910 ; Nm : 633



Industrial seaport



Natives species



Invasives alien species

- ❖ **6569 traps set**
- ❖ **960 small mammal captured**
- ❖ **805 (83.8%) invasifs** (369 black rats, 189 brown rats et 247 domestic mice)
- ✓ **155 (16.12%) natifs** (141 shrews and 14 multiples mammals rats)

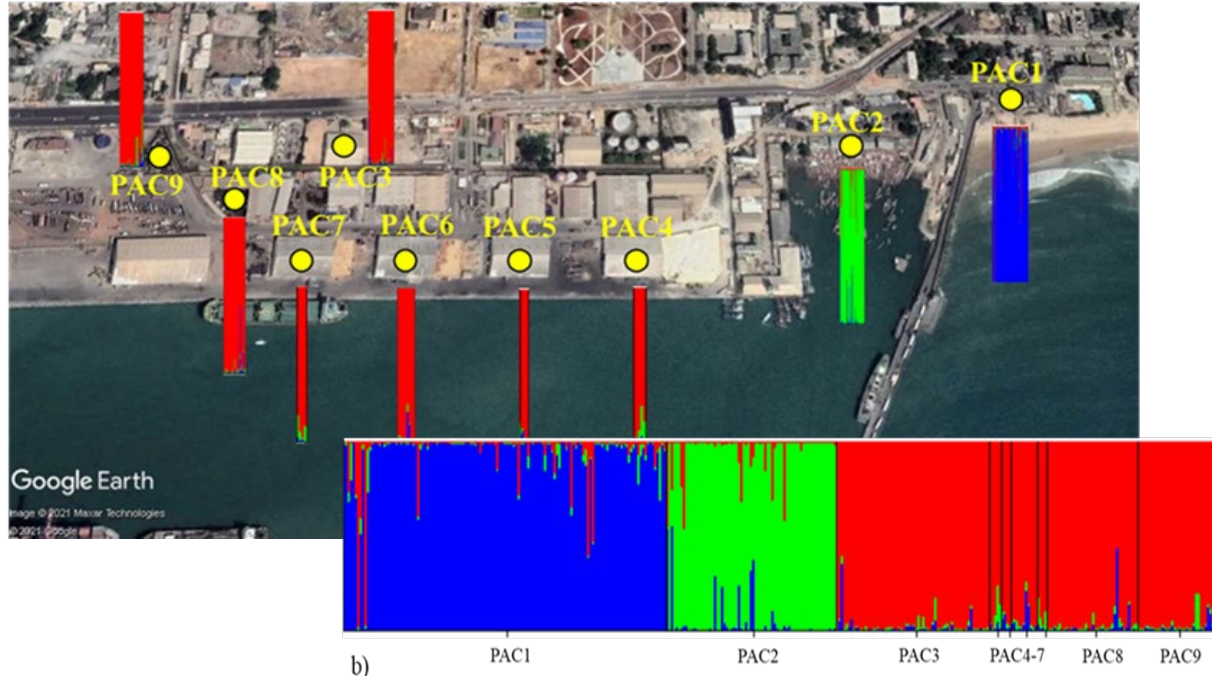
The port is a favourable site (a gateway ?) for invasive alien species

Population genetic structure of invasive species ?



(366 individuals genotyped, 18 microsatellites)

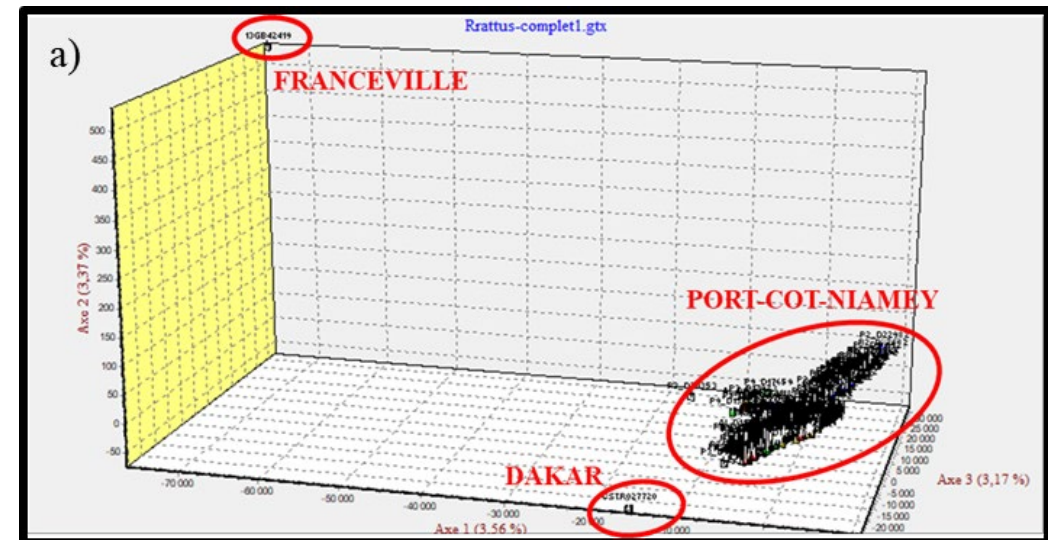
Rattus rattus



3 genetics groups

High genetic structure at fine scale

☐ Detection of new migrants



NB: No new introduction in 3 years

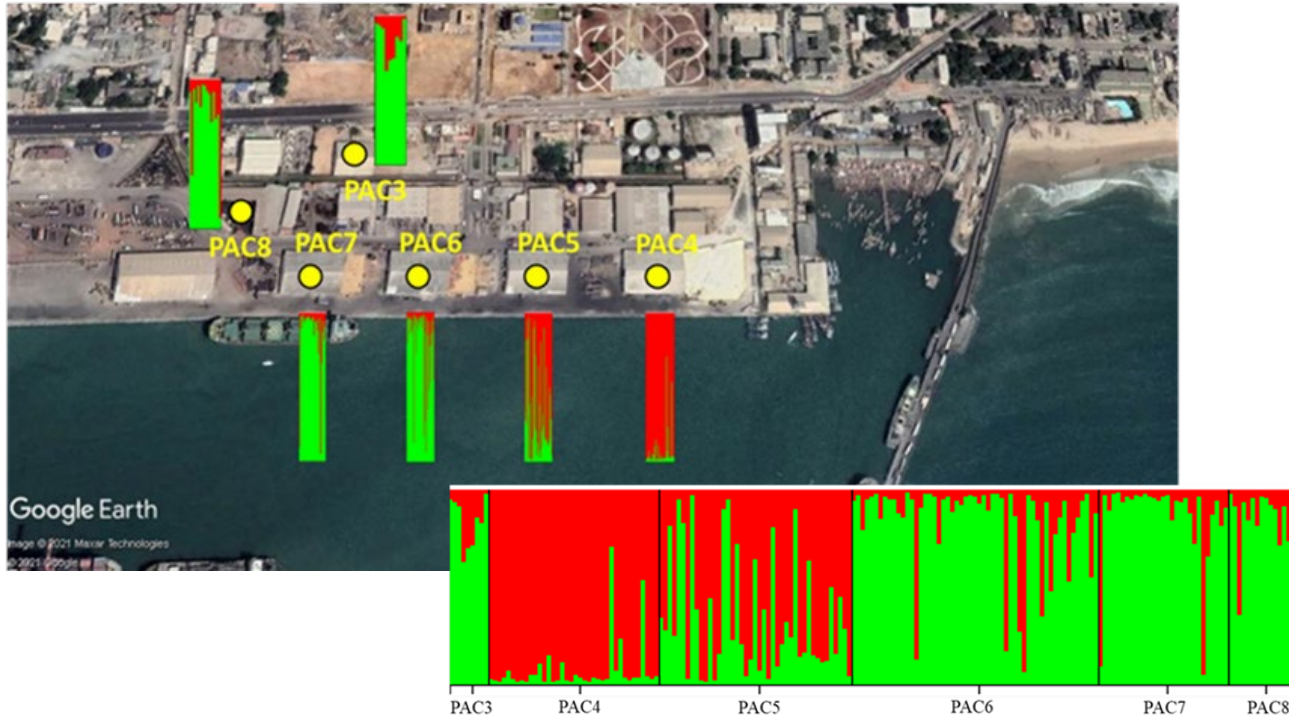
Port-Cotonou-Niamey same group

Population genetic structure of invasive species ?



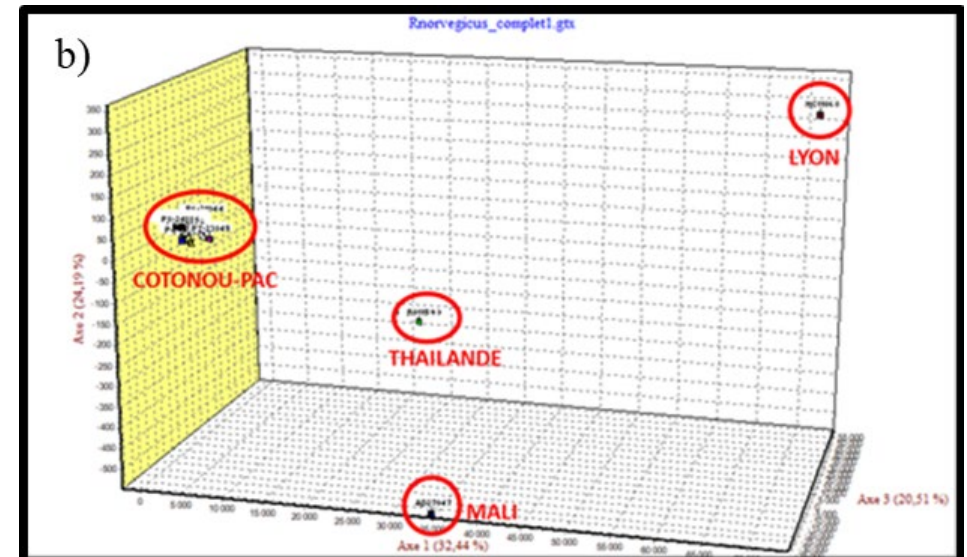
(189 individuals genotyped, 16 microsatellites)

Rattus norvegicus



- ❑ 2 genetics groups
- ❑ High genetic structure at fine scale

❑ Detection of new migrants



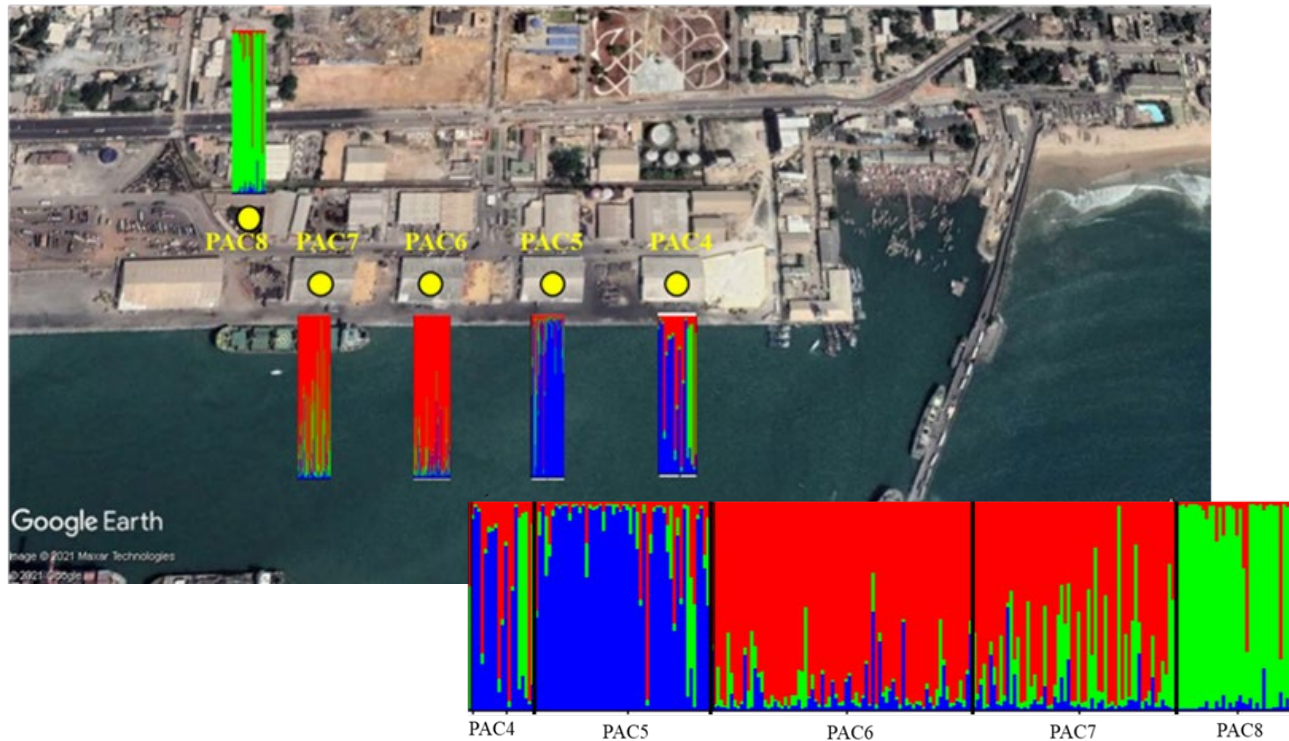
NB: No new introduction in 3 years

Population genetic structure of invasive species?



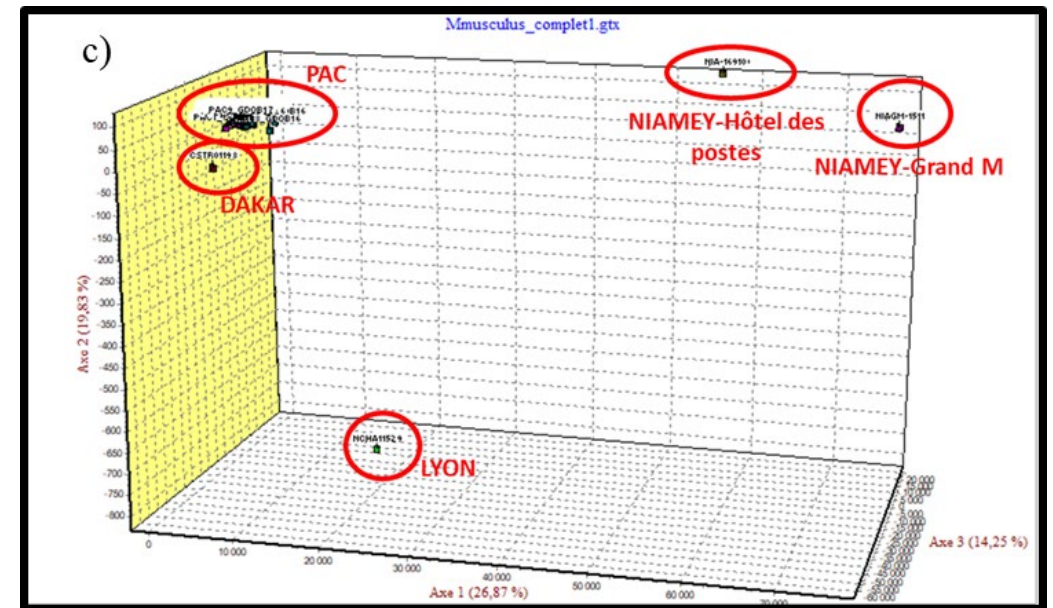
(247 individuals genotyped, 17 microsatellites)

Mus musculus



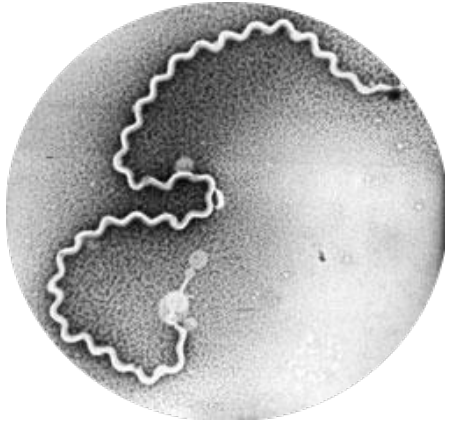
- ❑ 2 genetics groups
- ❑ High genetic structure at fine scale

❑ Detection of new migrants



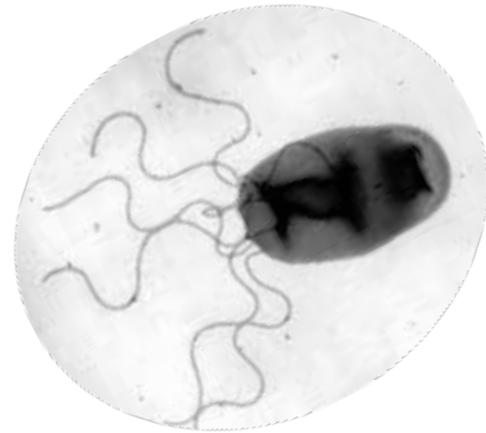
NB: No new introduction in 3 years

Zoonotic pathogens and health risks ?



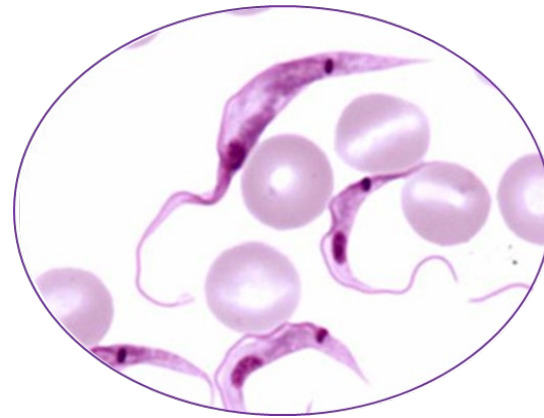
Leptospira

11% of rodents



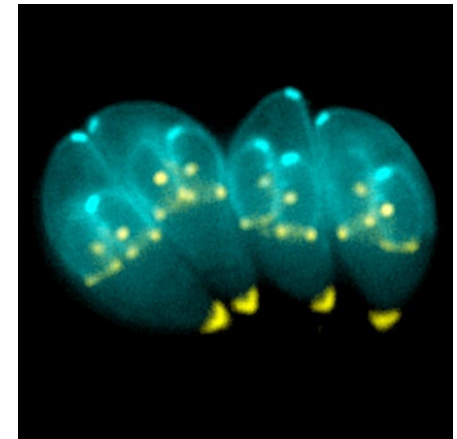
Bartonella

40%



Trypanosoma

28%



Toxoplasma

17%

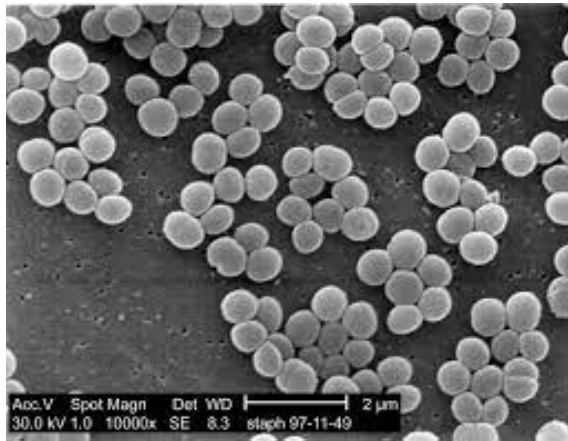
No native positives



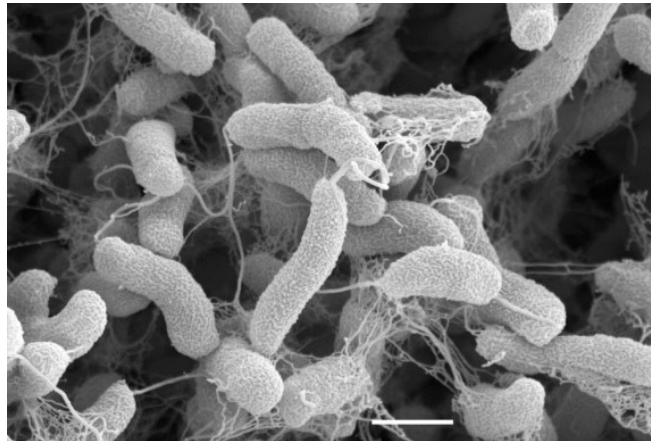
26% of rodents carriers of fleas

4.15% of small mammal parasited and 0.68/small mammal

Zoonotic pathogens and health risks ?



Staphylococcus 3%



Vibrio 2.73%



Rickettsia 1.09%

Zoonotic pathogens and health risks ?

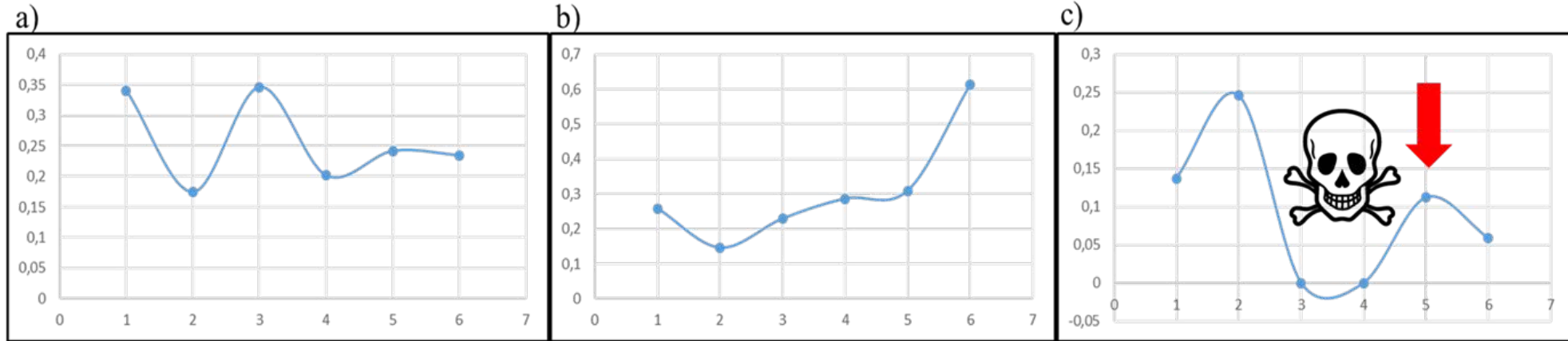


Rattus norvegicus



Detection of hantavirus responsible for hemorrhagic fever (Asian origin)

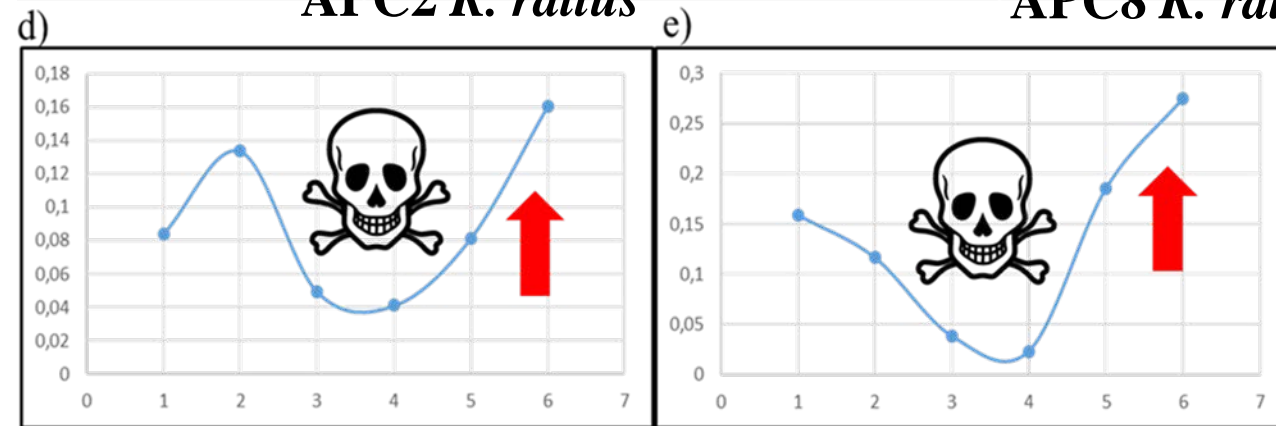
Rodent control: poisoning ?



APC1 *R. rattus*

APC2 *R. rattus*

APC8 *R. rattus*



APC4-8 *R. norvegicus*

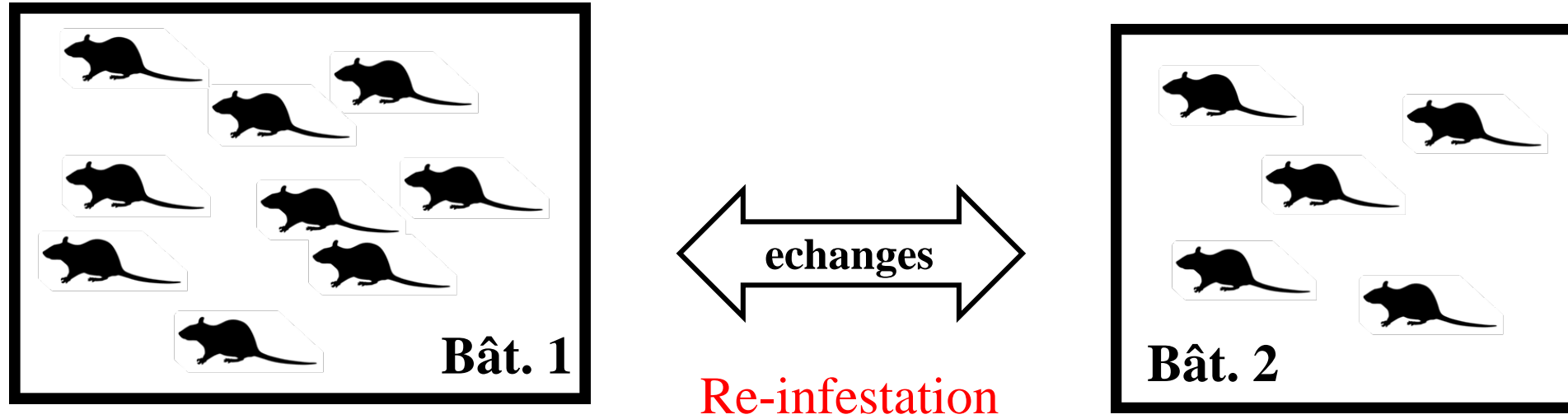
APC4-8 *M. musculus*



Modification of protocols ...

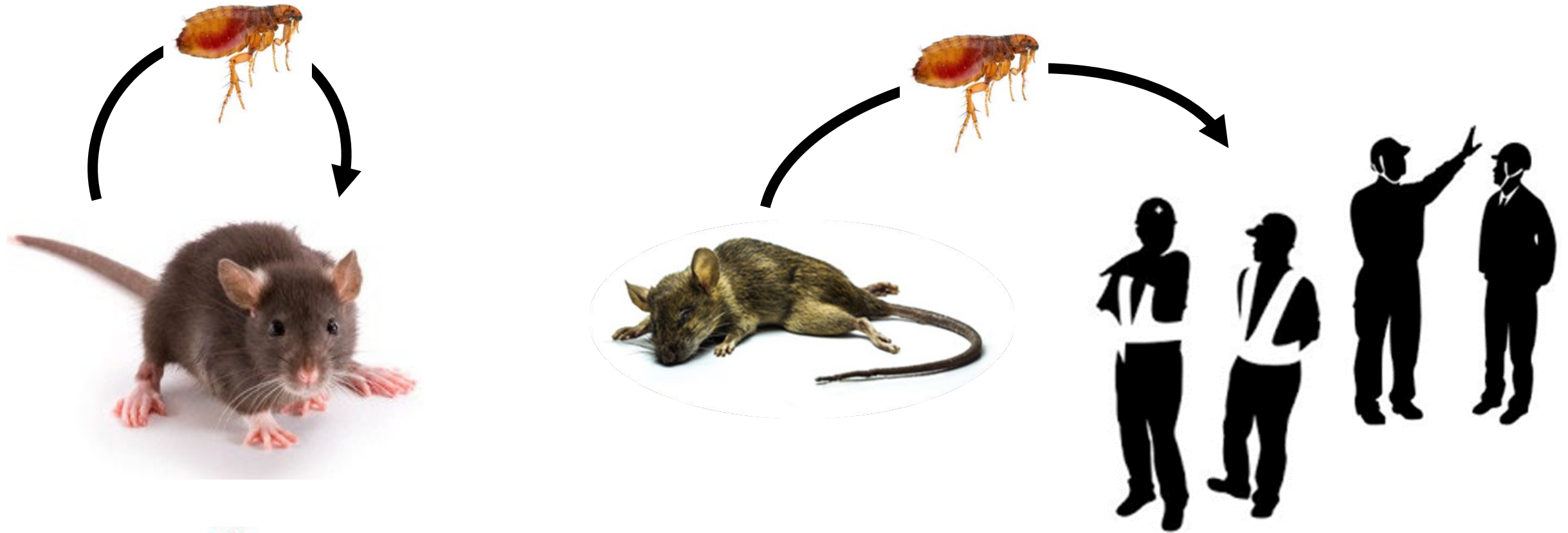
... and/or accompanying measures already taken

Rodent control: poisoning ?



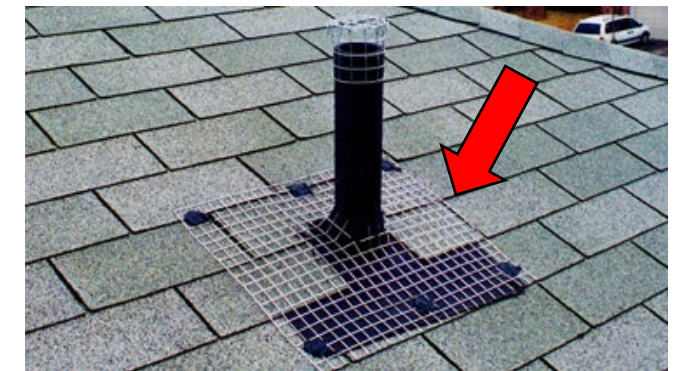
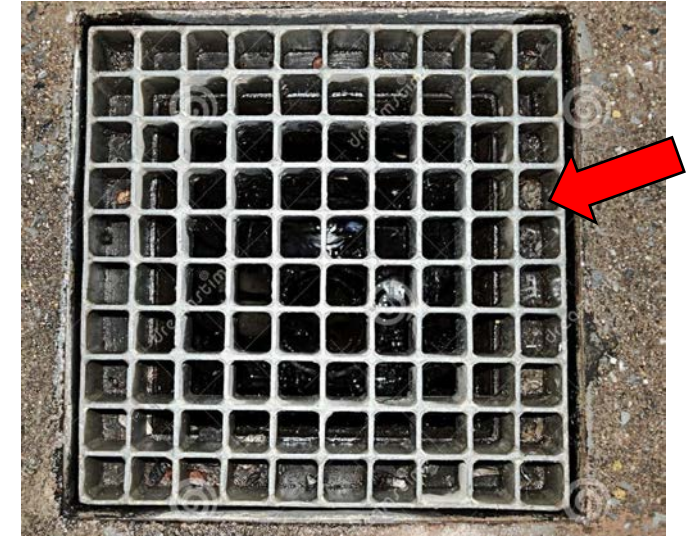
**Importance to synchronize actions
between port actors !!!**

Rodent control: poisoning ?



No rodent control without insect control !!!

Rodent control: Environmental management ?

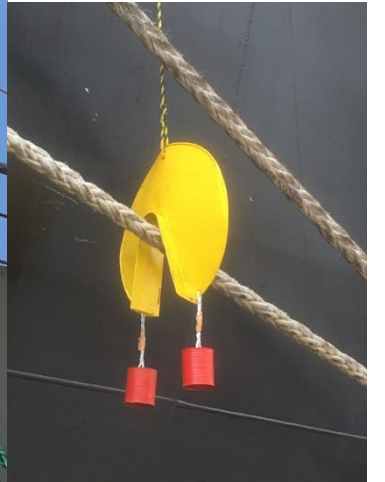


**Avoid giving shelter and food to rodents !
cleanliness and watertightness of the installations (steel!) 20**

Rodent control: pare-rats ?



Avoiding re-infestations



Rodent control: trapping ?



Testing of high capacity traps

Rodent control: other types of traps ?



Electrical traps



Glues



Low adapted in the Cotonou case

Rodent control: anticoagulants ?

Resistances

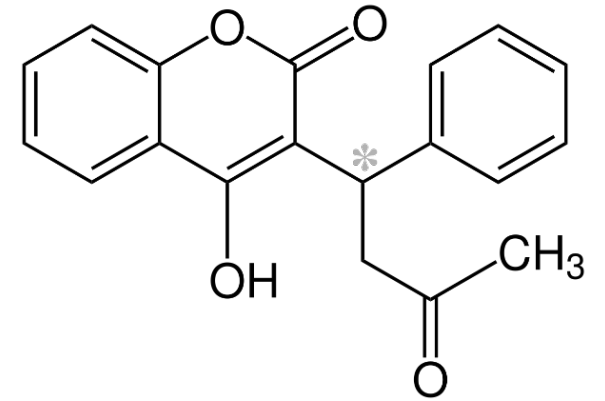
First generation :

- Coumafène
- Coumatéralyl
- Chlorophacinone

Persistants in environment

Second generation :

- Bromadiolone
- Difénacoum et Brodifacoum
- Diféthialone
- Flocoumafène



Adapted in the Cotonou port case

Rodent control: gas ?



Dry ice tested in New York (2018)

Low adapted in the Cotonou port case

Rodent control: predation ?



Experience in New York (2019)
with dogs (RATS©)

➔ 13 rats in 30 minutes



Adapted in the Cotonou case

Rodent control: laboratory PPSE ?



- Define eradication units;
- Introduction of news invasives alien species ;
- Risks by identification of zoonotic pathogens ;
- Follow-up of resistance to anticoagulants.



THANKS FOR YOUR ATTENTION

