Game-based tools to transmit freshwater ecology concepts
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INTRODUCTION

- There is an increasing awareness of the public on environmental issues.
- Expert knowledge is often required to understand them.
- A need for simple and understandable tools to explain environmental issues.
- Games provide a virtual world with given boundaries (rules) that the player needs to understand and to follow to win.
- Furthermore, games are dynamic and interactive: the player engagement and its knowledge retention increase.
- Games display interesting features to spread scientific thinking.

OBJECTIVE

The games aim to be complementary:
- In term of player interactions and system dynamics.
- In the targeted players (groups vs isolated gamers).

TO DEVELOP A BOARD GAME AND A COMPUTER-BASED GAME TO EXPLAIN THE BASIC CONCEPTS OF AQUATIC ECOSYSTEM

METHODOLOGY

- Context
- Design of the games (players, token, board).

PROTOTYPES

- Size and layout of the board.
- Coding and calibration of the model.

TEST AND EVALUATION

- Gathering player feedbacks.
- Refining and adapting the games.

DIFFUSION

- Identification of funding opportunities.
- Construction of a diffusion network.

DEVELOPMENT OF THE PROTOTYPE

- Context
- The player controls an ecosystem with prey (the roach) and predators (the pumpkinseed).
- The objective of the game is to maintain the stability of the ecosystem.
- Concepts illustrated: population dynamics and ecosystem resilience.

BASES OF THE BOARD GAME

- Species: the roach (Rutilus rutilus) as a prey and the pumpkinseed (Lepomis gibbosus) as a predator, two common European small fish.
- Illustration of a native European shoal fish (the roach) and of an invasive species (the pumpkinseed) with specific life history characteristics.

HOW TO PLAY THE GAME

- The board represents the edge of a lake with plants, crustaceans, and mollusks.
- The player chooses a fish species and starts the game with 2 tokens (male + female).
- The players use dice to move the tokens on the board.
- Each resource provides the fish with a given amount of energy that it accumulates.
- This energy can further be used to reproduce (adult fish), to grow (juvenile) or to attack a prey (predator).
- Each turn, the player takes a card « chance » representing the events impacting the lake.

ECOLOGICAL CHARACTERISTICS OF EACH PLAYER:

PLAYER 1: PREY
- The roach
- RESOURCES:
  - Crustaceans and mollusks
- PREY:
  - Crustaceans and mollusks
- COMPETITION:
  - The eggs stick to the plants

PLAYER 2: PREDATOR
- The pumpkinseed
- EXAMPLE OF « CHANCE » CARD:
  - A solitary pike is swimming around. Watch out! You just lost one fish.
  - Tonight is full moon. You see as well as in day light: play again.
- The forestry guards cut trees near the lake: plants become much more light. Shoals eat more: they bring twice more energy for 2 turns.
- A fisherman puts his boat onto the water. He reported it with antifouling: no mollusc for 2 turns.

Opening of a fishing contest. The introduced fish destroyed the whole bottom of the lake: no more resources in the area for 2 turns.

DISCUSSION

- Demonstration of the proof-of-concept: the prototypes are available for testing.
- Both games are complementary as they integrate different time scales and illustrate diverse basic concepts of aquatic ecology.
- No knowledge in aquatic ecology is needed to play both games: wide possibilities in targeted audiences.
- The methodology is flexible and adaptable.
  - On-going development of the games.
  - Refinements and changes are easy to integrate in new versions of the games.

REFERENCES: