The Future of Marine Spatial Conservation: From Science to Policy, 28-29 October 2025, Liepāja

SUSTAINABLE MANAGEMENT OF THE INVASIVE ROUND GOBY IN LATVIAN COASTAL WATERS: LESSONS LEARNED AND WAYS FORWARD

LIFE PROJECT "RESEARCH OF MARINE PROTECTED HABITATS IN EEZ AND DETERMINATION OF THE NECESSARY CONSERVATION STATUS IN LATVIA" LIFE19 NAT/LV/000973 REEF IN THE FRAMEWORK

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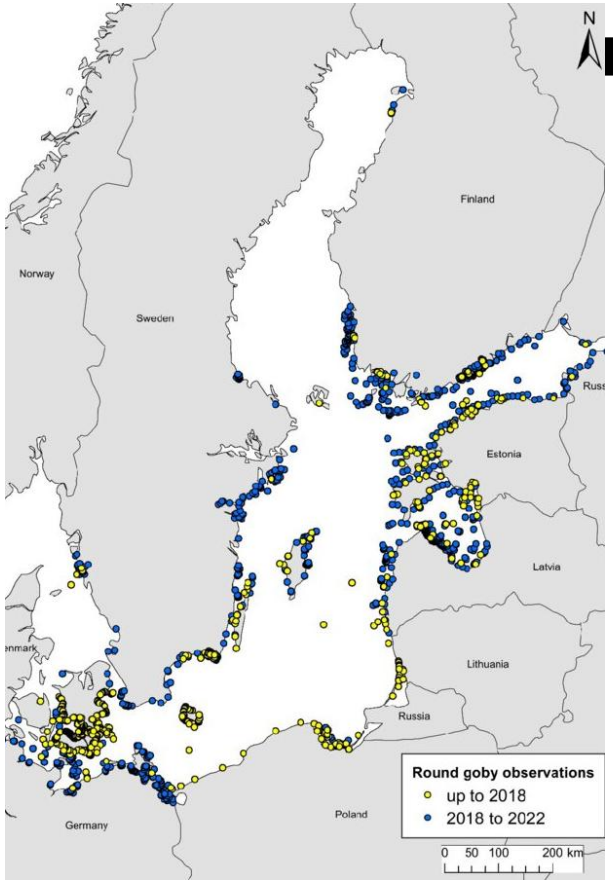
Valsts reģionālās attīstības aģentūra

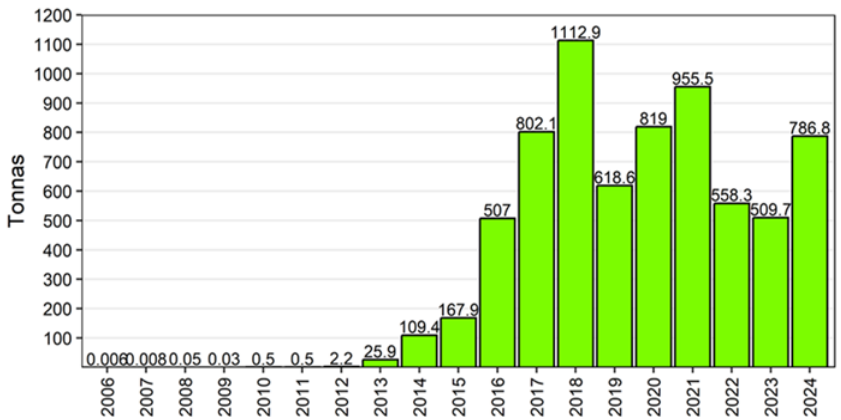
Dabas aizsardzības pārvalde

BACKGROUND

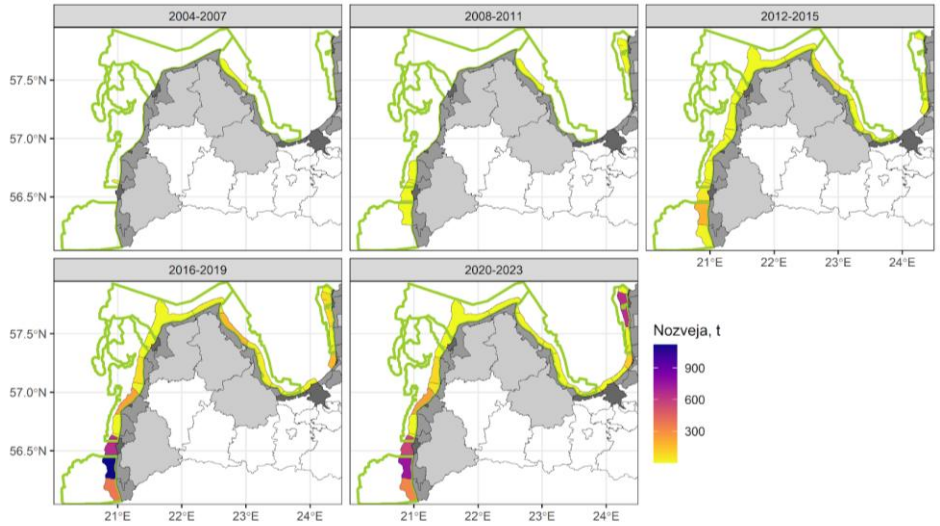
HISTORY OF THE ROUND GOBY INVASION IN LATVIA



Distribution of round goby in the Baltic Sea (ICES 2022)



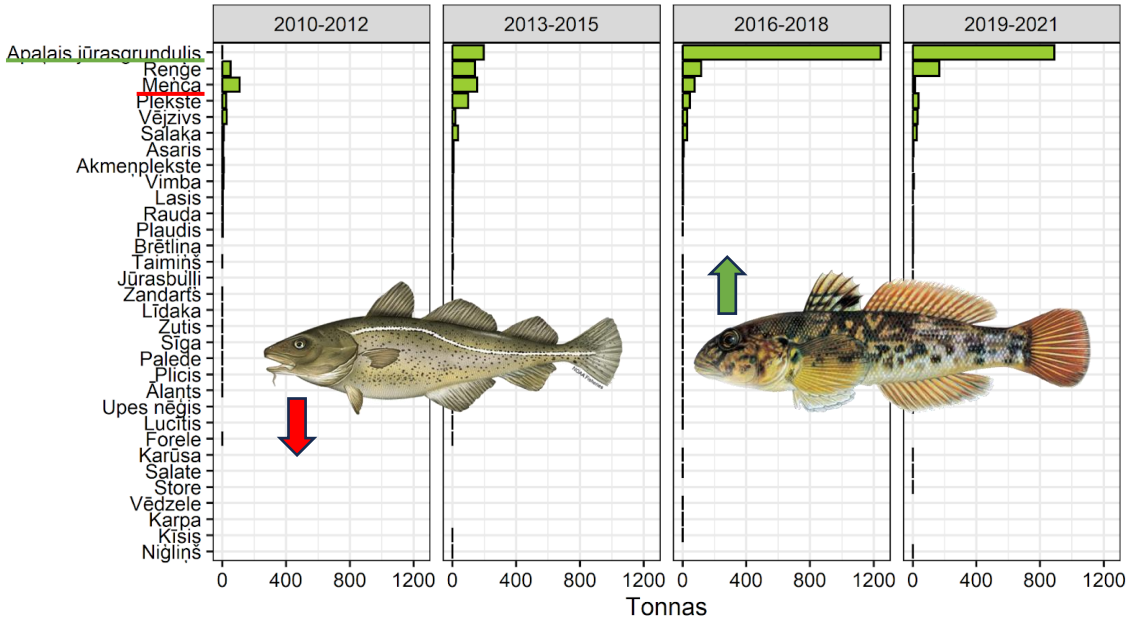
Catches of round goby in Latvian coast(BIOR 2024)



Distribution of total round goby catches across Latvia's coastal parishes and towns, 2004–2023 (BIOR 2024)

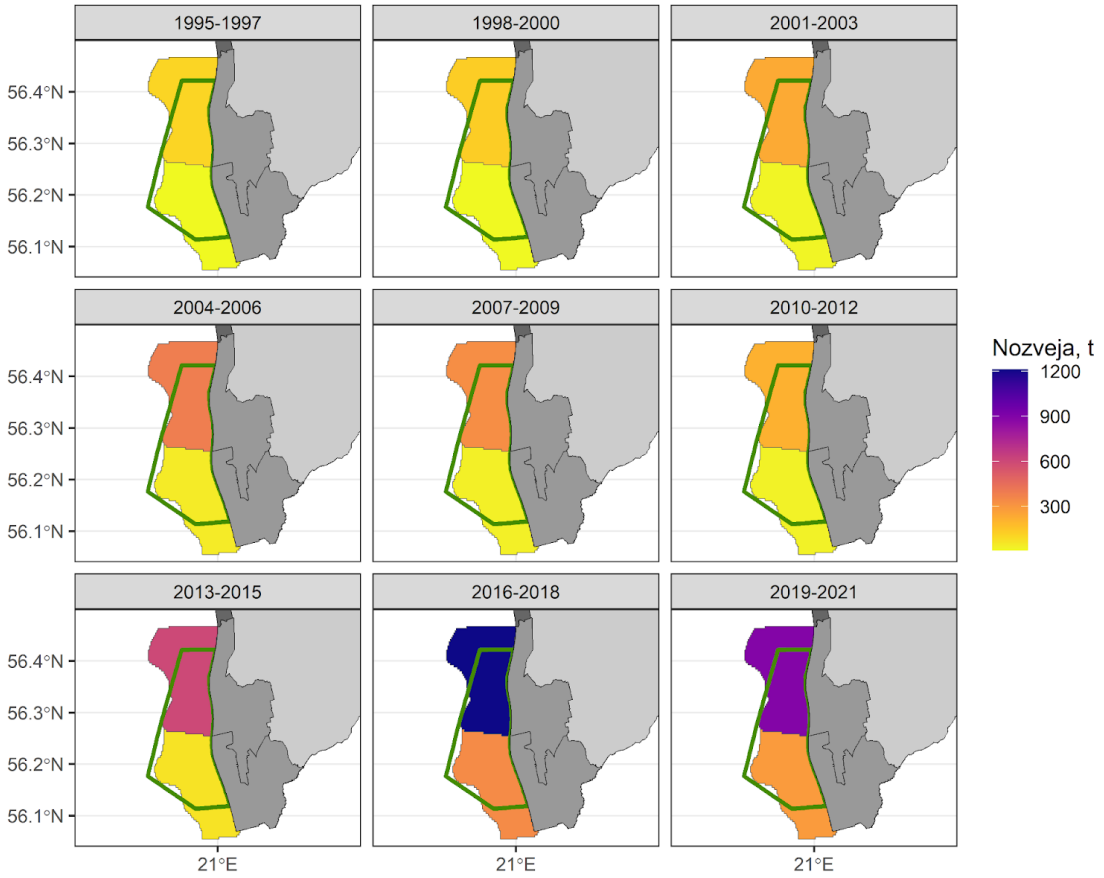
DOMINANT FISH SPECIES IN COASTAL FISHERIES, 2010–2021

MPA “PAPES KALVA”



Dominant fish species in coastal fisheries in the MPA “Papes kalva”, 2010–2021 (BIOR 2024)

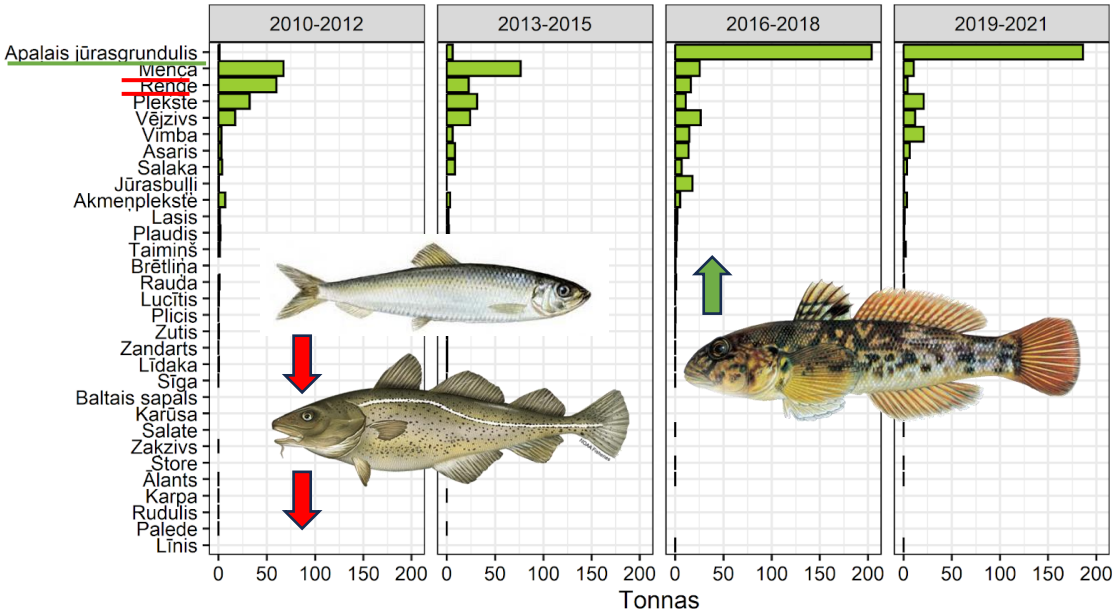
- First record of RG in area: 7.5 kg (2007).
- Share of Latvia’s coastal RG catch: 61% → 39% (2013–2018 → 2019–2022).
- Replaces cod fishery since 2014. RG now dominates catches in this MPA (up to 88%).



Total catch by coastal municipality, 1995 –2021 (BIOR 2024)

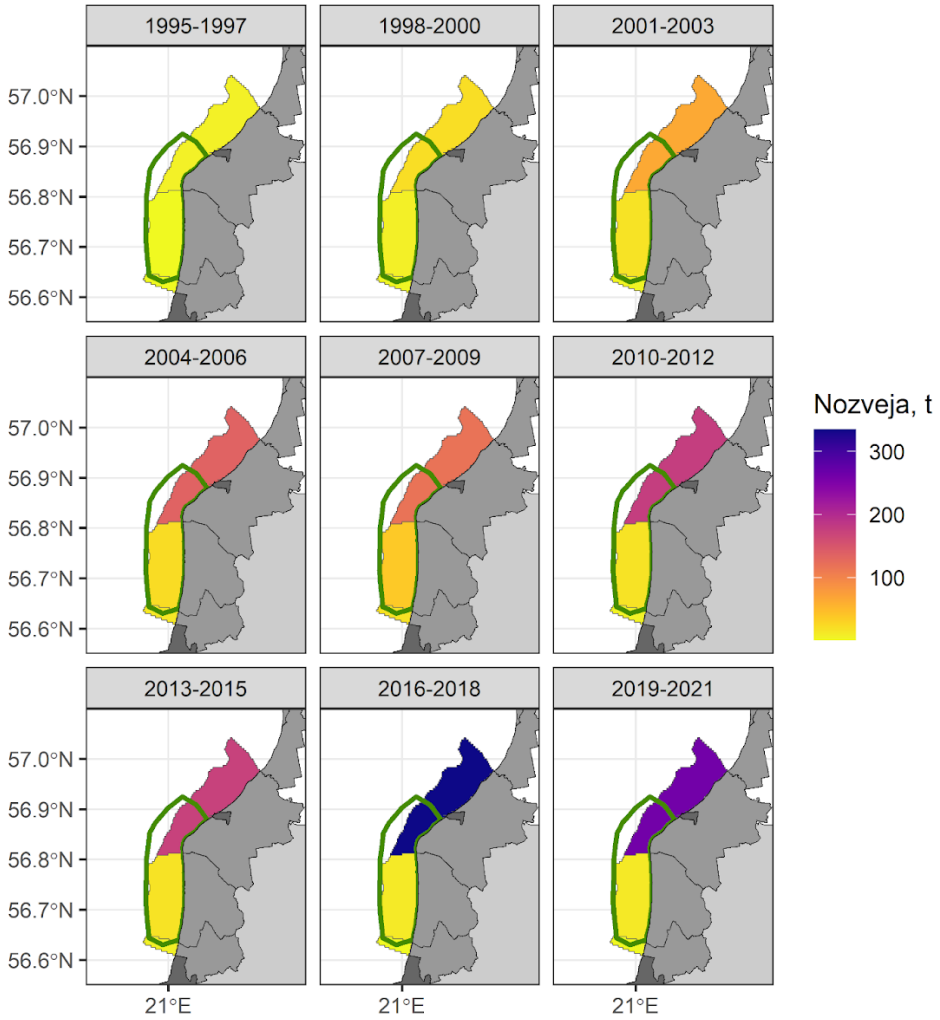
DOMINANT FISH SPECIES IN COASTAL FISHERIES, 2010–2021

MPA “RIETUMKURZEMES PIEKRASTE”



Dominant fish species in coastal fisheries in the MPA “Rietumkurzemes piekraste” 2010–2021 (BIOR 2024)

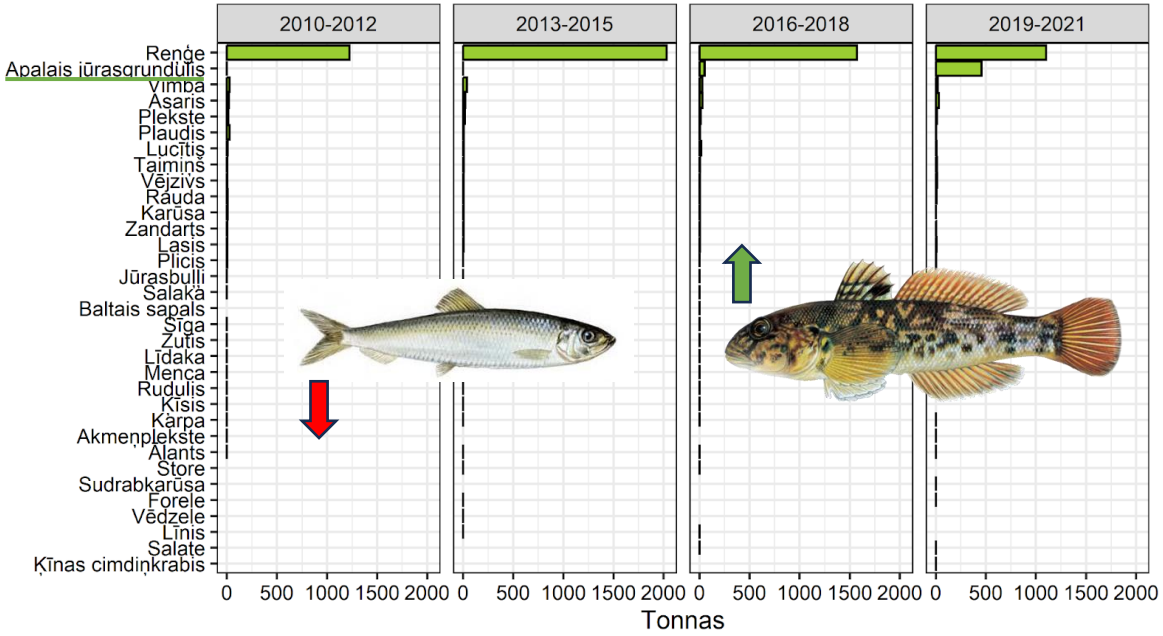
- First record of RG in area: 0.42 t (2010).
- Share of Latvia’s coastal RG catch: 1–9% (2010–2021).
- Replaces cod fishery since 2016. RG has become the dominant coastal species as cod declined. RG up to 70% of total catch in recent years.



Total catch by coastal municipality, 1995 –2021 (BIOR 2024)

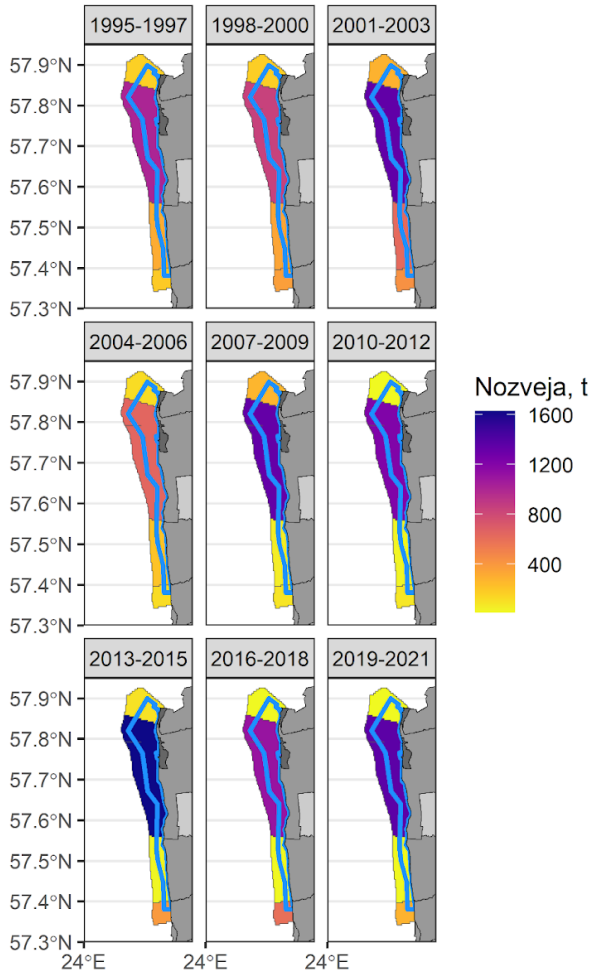
DOMINANT FISH SPECIES IN COASTAL FISHERIES, 2010–2021

MPA “RĪGAS LĪČA VIDZEMES PIEKRASTE”

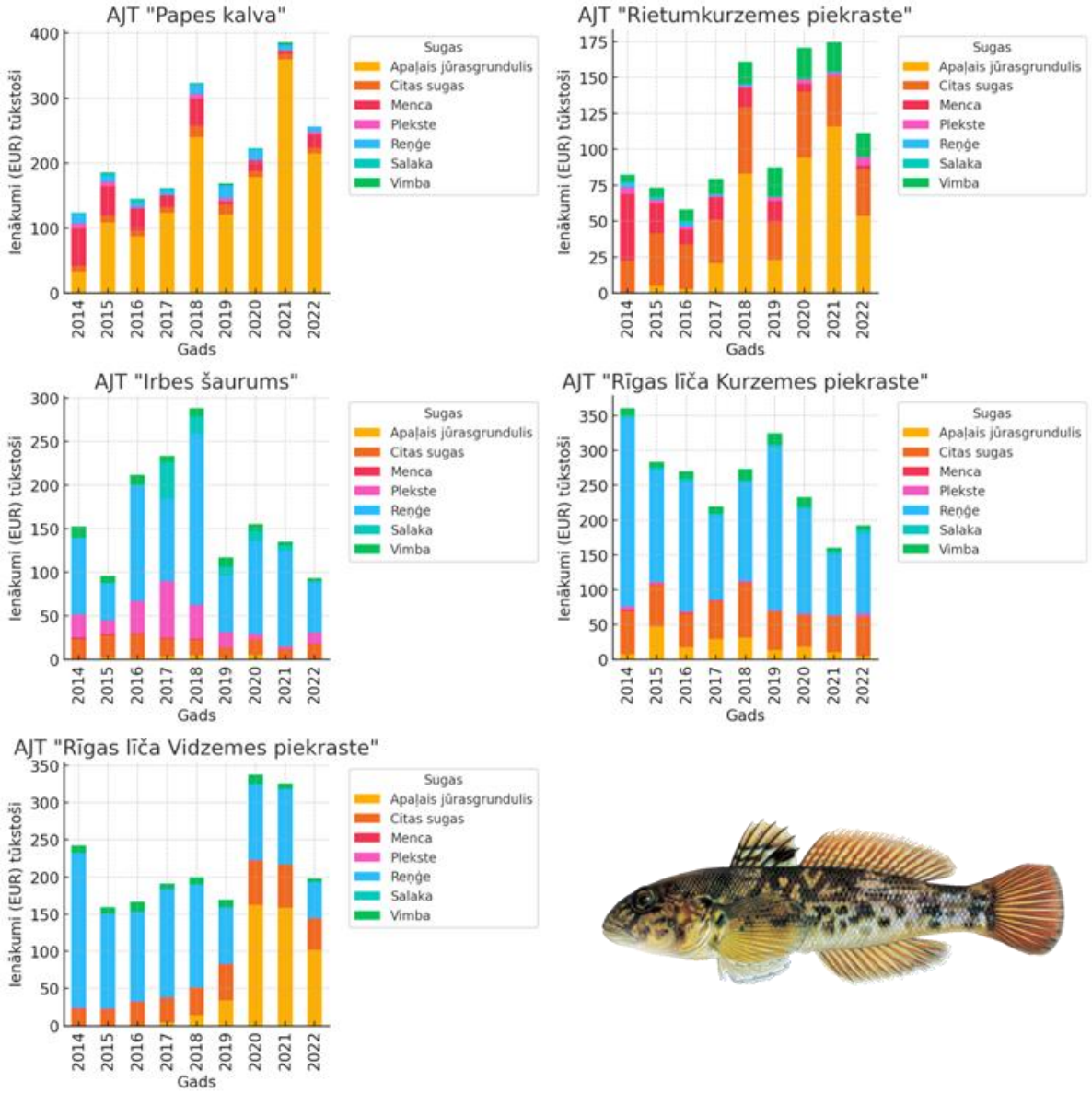


Dominant fish species in coastal fisheries in the MPA “RĪGAS LĪČA VIDZEMES PIEKRASTE”, 2010–2021 (BIOR 2024)

- First record of RG in area: 4 kg (2010) .
- RG catch increase, reaching ~500 t (2019–2021) in the coastal fishery.
- After a peak >2,000 t (2013–2015), herring catches declined post-2016 (still >1,000 t per period).



Total catch by coastal municipality, 1995 –2021 (BIOR 2024)



MPA “Papes kalva”, “Rietumkurzemes piekraste”, “Irbes šaurums”, “Rīgas līča Kurzemes piekraste” un “Rīgas līča Vidzemes piekraste” commercial fishing revenue distribution (EUR, thousands) by fish species, 2014–2022. **RG with yellow area** (BIOR 2024)

MPA “Papes kalva”:

26.7% (2014) → 71.4% (2019) → ~93% (2021).
Became the dominant source.

MPA “Rietumkurzemes piekraste :

0.6% (2014) → 31.1% (2019) → ~70.6% (2021)
Increase every year.

MPA “Rīgas līča Vidzemes piekraste”:

0.1% (2015) → 51.5% (2022)

Very rapid growth.

MPA “Irbes šaurums”:

~4% throughout

Herring still dominates

MPA “Rīgas līča Kurzemes piekraste”:

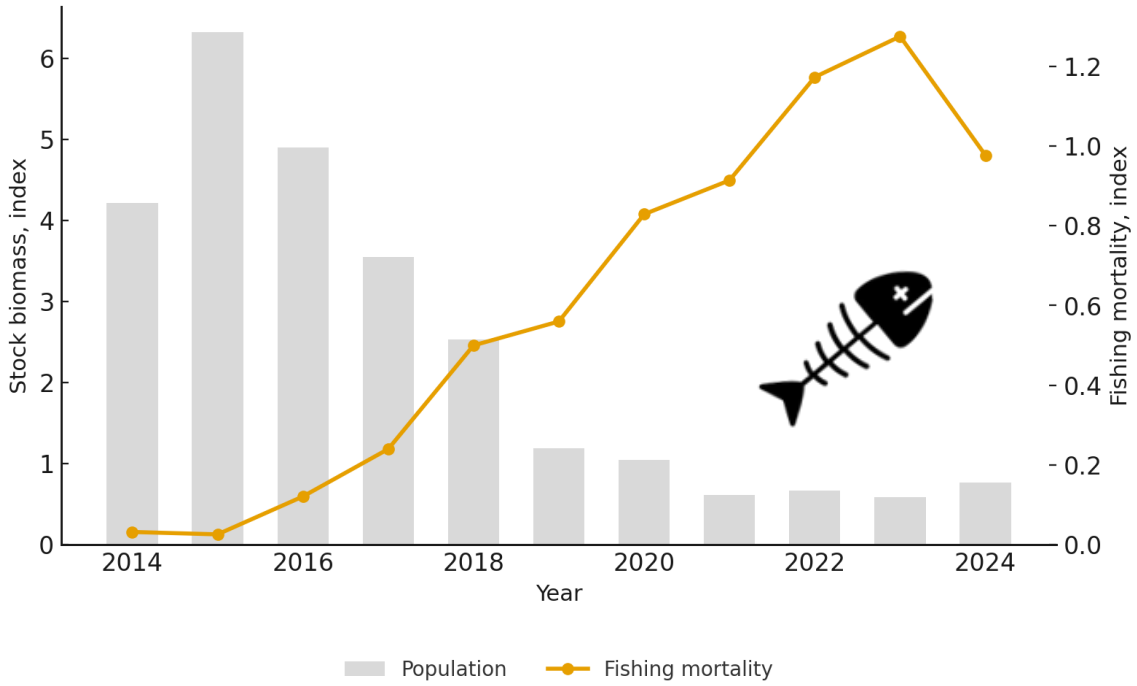
2.2% (2014) → 6.4% (2021)

Low and stable.

FISHING FROM NATIVE TO NON-NATIVE SPECIES – SHIFTING MARKET PRIORITIES

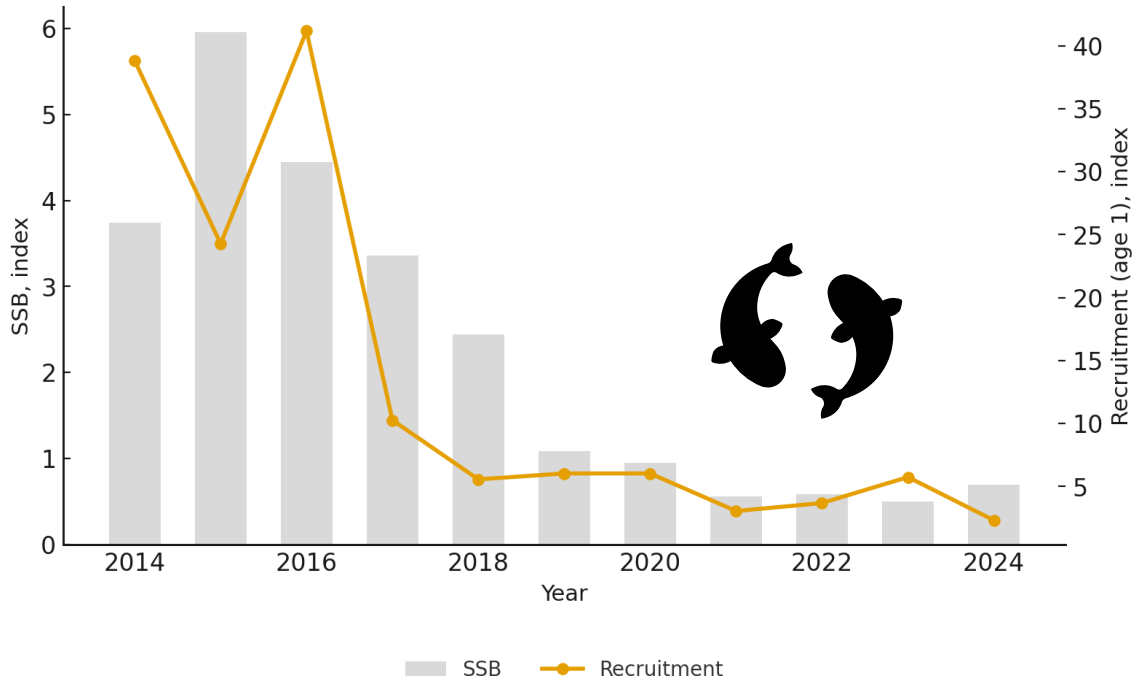
- The EU ban on targeted cod fishing shifted effort to round goby.
- RG from bycatch to target fishery - export to the Caspian Sea started in 2017. The purchase price ~0.70 €/kg.
- In 5 of Latvia's 15 coastal municipalities, RG made up 80% of total catch (BIOR 2022).
- From 2014 to 2022, round goby prices +123% (EUR 0.39→0.87/kg), while herring only + 3.7%, (EUR 0.27→0.28/kg) (BIOR 2024)

EFFECT OF FISHING PRESSURE ON POPULATION STRUCTURE



Round goby population fishing mortality changes on the Latvian coast (BIOR 2024)

- Biomass ↓ 8.5× since 2015
- **Fishing mortality ↑ ~10×** (since 2016) relative to total population
- **High fishing pressure** is the main driver, especially on **age 4–6 fish**



Round goby population spawning stock biomass changes on the Latvian coast (BIOR 2024)

- **Declines now slower;** year-to-year swings are smaller → **signs of stabilization.**
- Fishing is an effective control tool for invasive species.
- High fishing pressure + declining population = bycatch avoidance? socio economic paradox?

INVASIVE SPECIES MANAGEMENT RULES

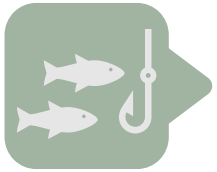
No Quotas 01

•No quotas set for invasive species in the Baltic Sea. Regulation is handled nationally.

Impact Reduction 02

•The goal of round goby fishing is to reduce its impact on native fish stocks, not to keep the RG at a safe population level.

Bycatch Avoidance 03



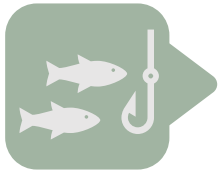
•Management focuses on avoiding bycatch of native species, especially juveniles.

MPAs 04

•Reducing the impact of invasive species is one of the cornerstones of sustainable MPA management.

Latvia is currently the only country in the Baltic sea region with a commercial round goby fishery and management system!

Round goby fishing in Latvia is regulated by specific national legal acts



Cabinet Regulation No. 1375

- "Regulations on coastal commercial fishing limits and their use," Latvijas Vēstnesis, 85 (3648), 30.11.2009

Cabinet Regulation No. 296

- "Regulations on commercial fishing in territorial waters and in the waters of the exclusive economic zone," Latvijas Vēstnesis, 72 (3648), 05.05.2007).

MANAGEMENT OF ROUND GOBY ON THE LATVIAN COAST

Figure 6: Round goby pot. A: aerial picture on dock, B: View of opening from inside the wings, C: rear view with codend
Source: A: Peter Ljungberg, Swedish University of Agricultural Sciences, B & C: Ēriks Krūze, BIOR

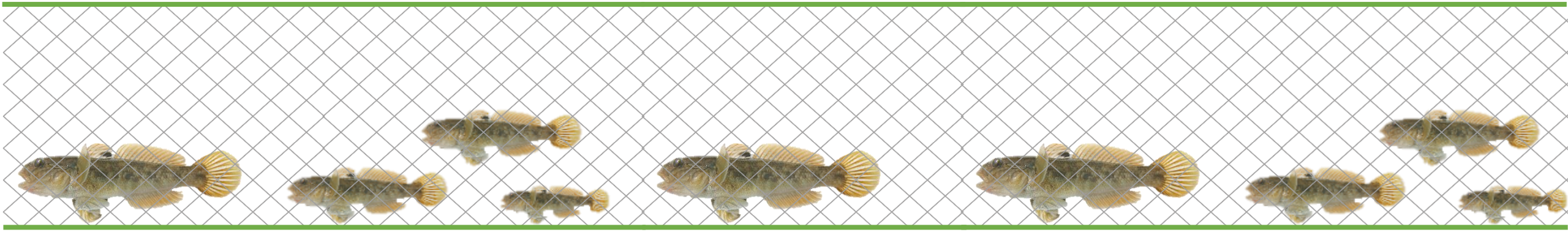
SINCE 2018, SPECIAL GEARS TO PROMOTE TARGETED FISHERY AND REDUCE BY-CATCH

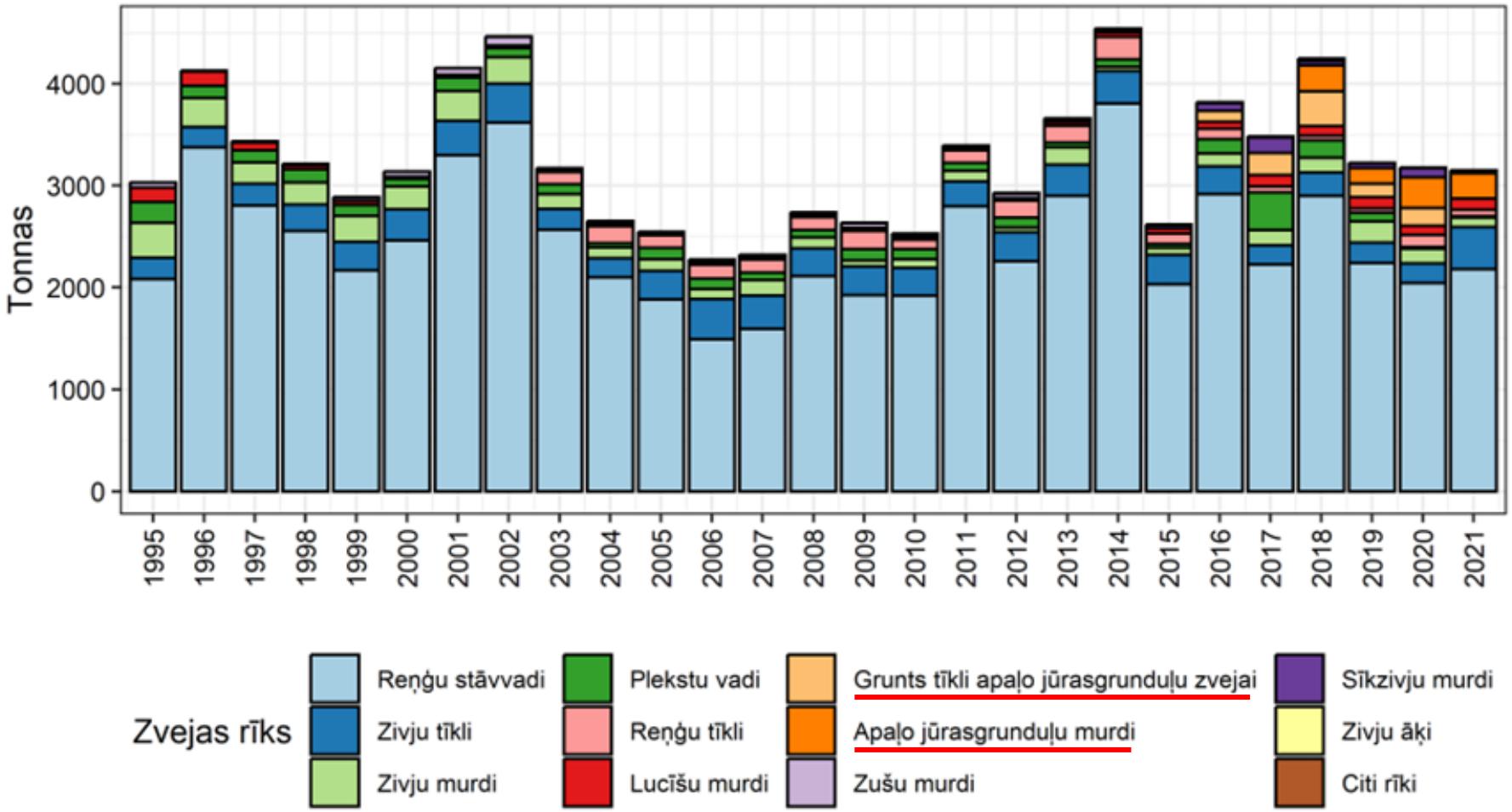
Round goby trap-nets

- Height limit 150 m
- Mesh size: 24-36 mm

Round goby gillnets

- Mesh size: 60-70 mm
- Diagonal width: 1,5 m



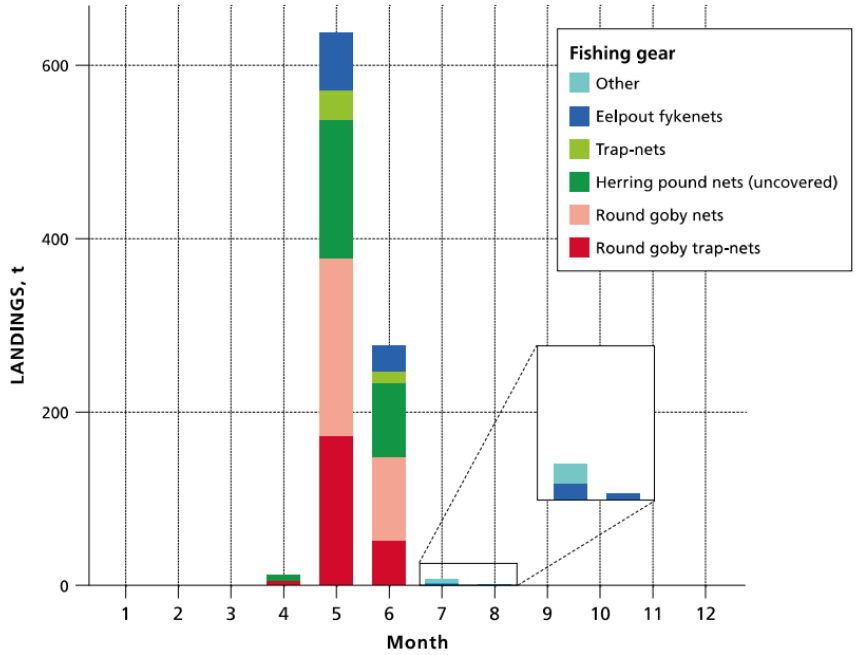


Total catch by coastal fishing gears, 1995–2021 (BIOR 2021)

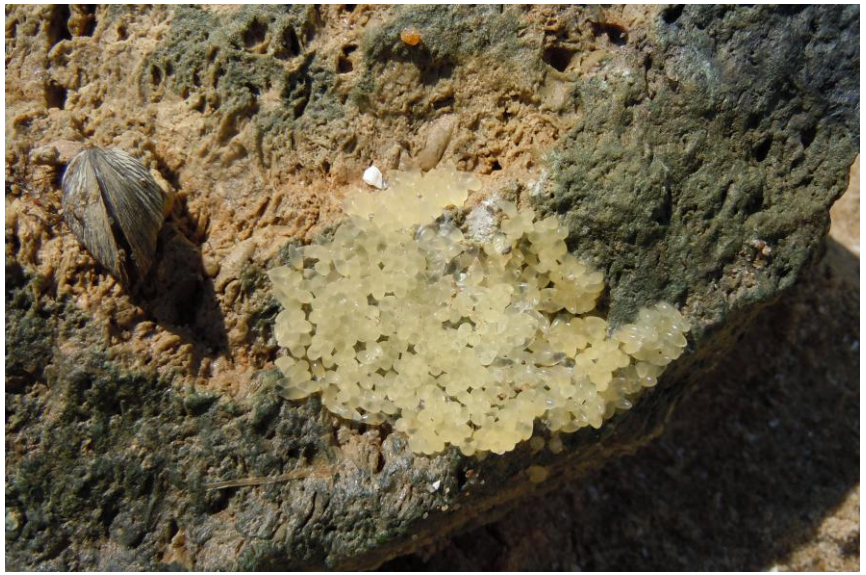
MANAGEMENT OF ROUND GOBY ON THE LATVIAN COAST

Seasonal fishing with specialized gears from 01.04.-30.06.

- *1. Round goby trap nets can be used from 1 April to 30 June.*
- *2. Within the overall gillnet limit, during 1 April to 30 June, bottom-set gillnets with 60–70 mm mesh may be used for round goby fishing.*

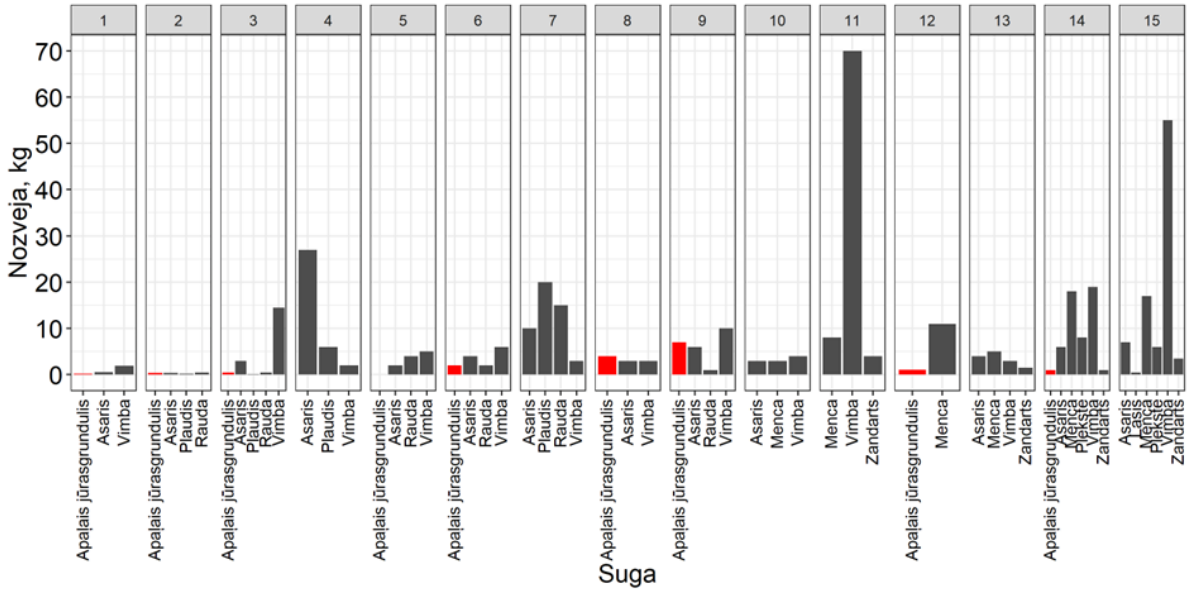


RG monthly landings by fishing gears in the Latvian coastal fishery (BIOR 2021)



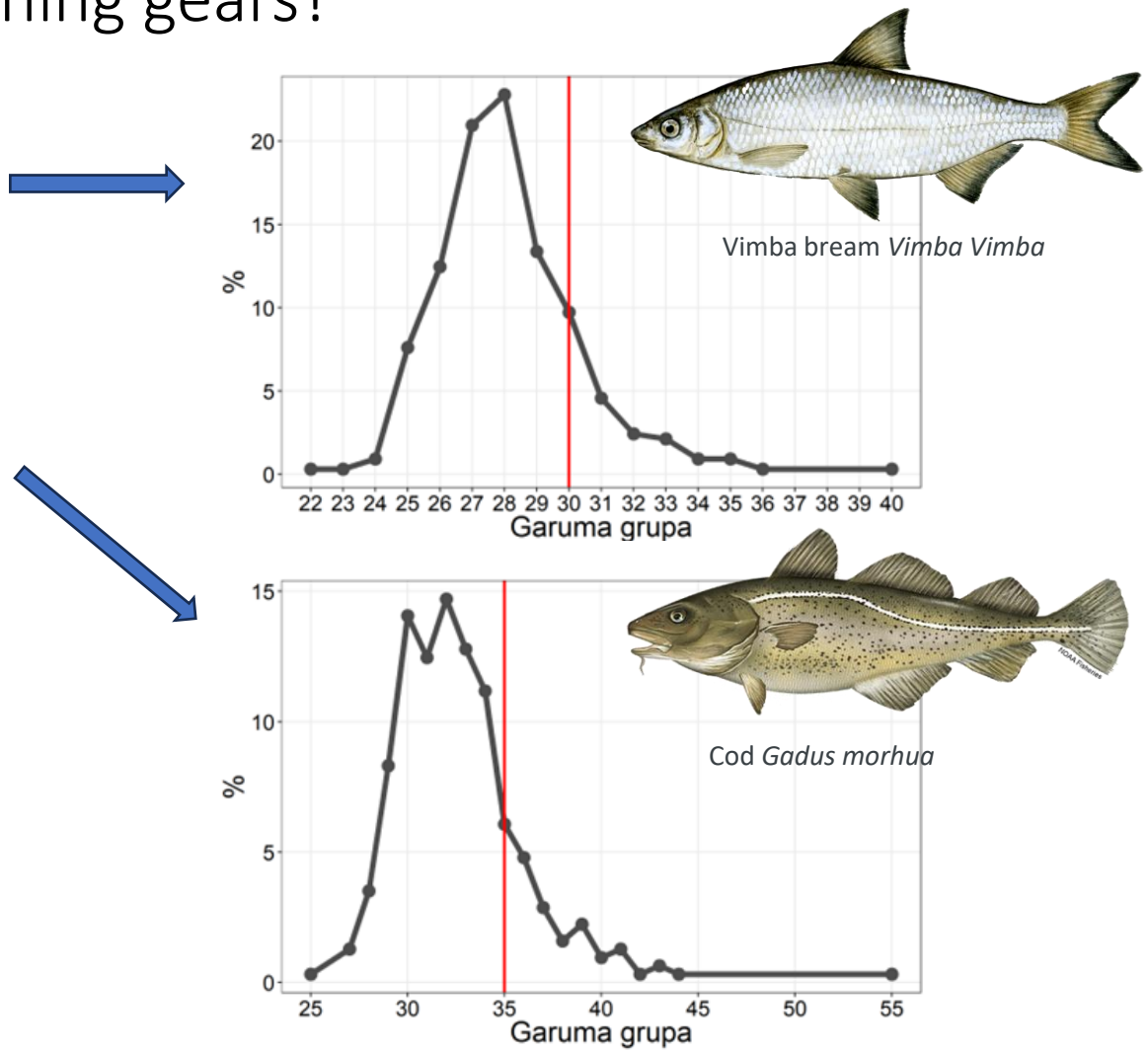
- *Spawning begins/stop at water temp. +10 °C*
- *Spawning in shallow coast (≤ 1.5 m)*
- *Post-spawning - move deeper, become inactive, passive gears ineffective*

Fishermen: “Could we extend the fishing season to autumn with specialized RG fishing gears?



Total catch by species in Latvian coastal research fishing acts. RG marked in red. (BIOR 2018)

- *The amount of RG by mass in one fishing act was low, only 0–18.6% per haul (avg 4.8%).*
- *Cod 52.6% and vimba 28.9% dominated by biomass.*
- *79% of both species were below the legal minimum size set for industrial fishing according to the Cabinet of Ministers and EU*

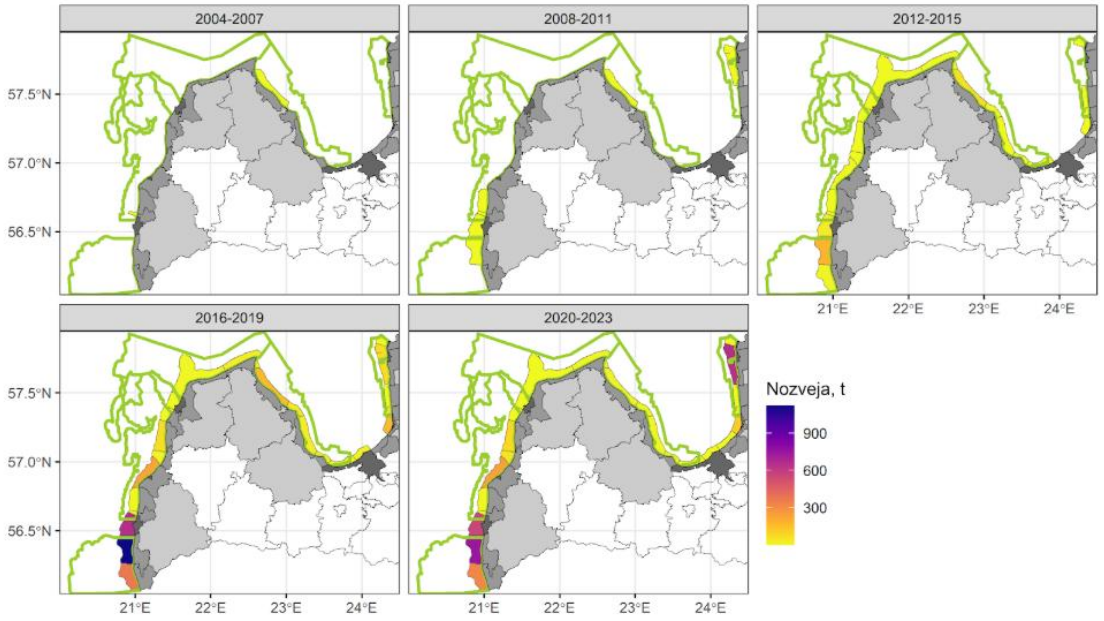


% distribution of length groups of vimba and cod in observed RG research fishing acts. Minimum size limit marked in red (vimba – 30 cm, cod – 35 cm). (BIOR 2018)

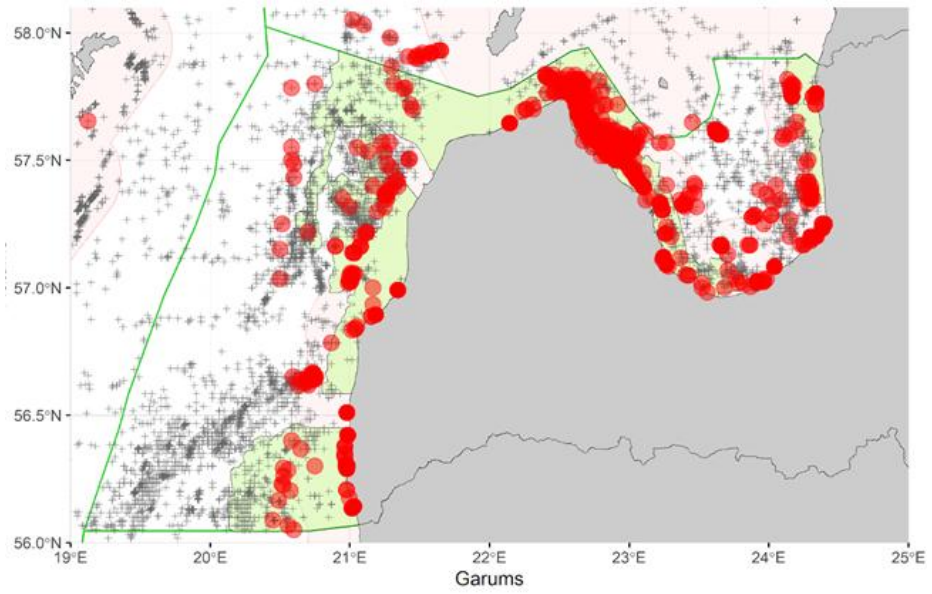
MANAGEMENT OF ROUND GOBY ON THE LATVIAN COAST

Specialized gear limits by coastal municipality;

1. Legal basis for coastal gear limits: Cabinet Regulation No. 1375 (“Regulations on industrial fishing limits and their use in coastal waters”).
2. Allocation: gear limits are set separately for each coastal municipality/district.
3. Review cycle: limits are revised annually based on commercial catches and scientific recommendations
4. Additional fishing opportunities without reducing the current number of fishing gears. Based on Cabinet Regulation No. 1375 total limit of 90 specialised RG trap nets.

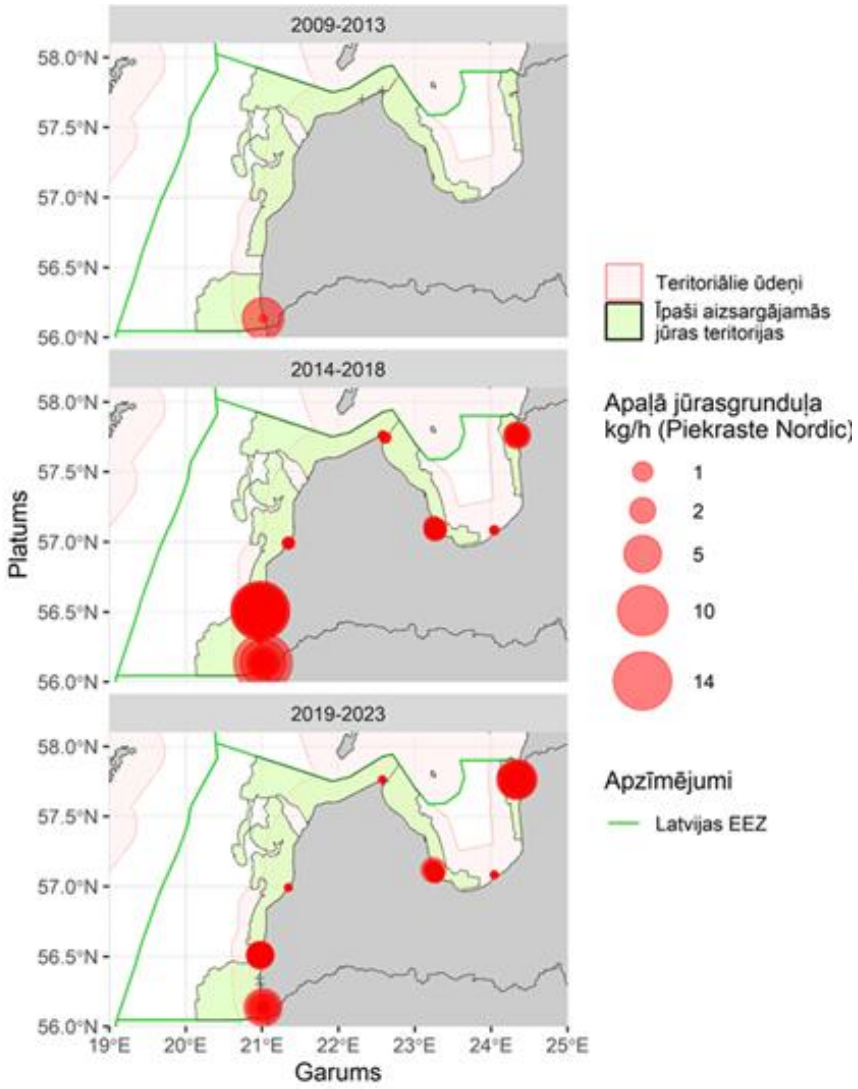


Total commercial catch of round goby in Latvian coastal municipalities and cities, 2004–2023 (BIOR 2023)

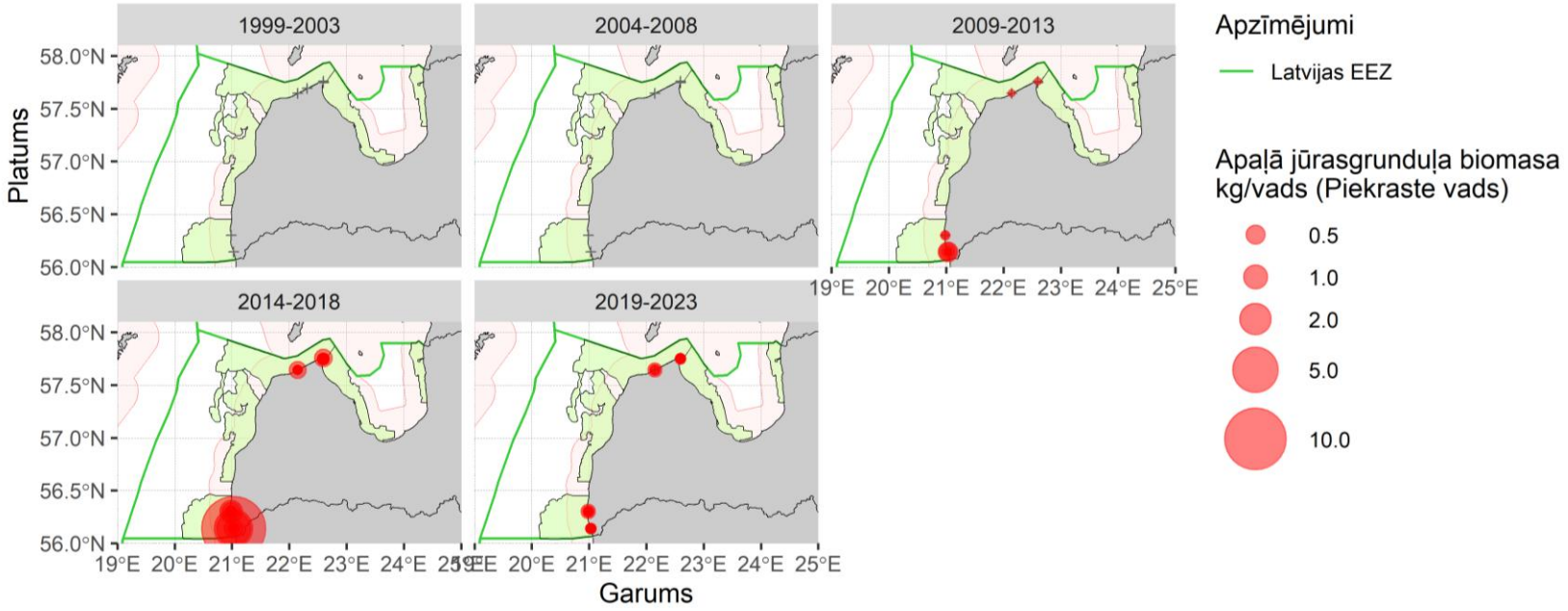


Records of RG (red points) in scientific surveys in Latvian coastal waters, 2009–2023 (BIOR 2023)

ROUND GOBY DISPERSAL IN MPA AREAS

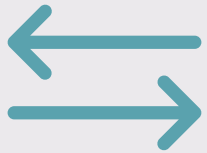


CPUE (kg/h) of RG in scientific surveys with Nordic nets in Latvian coastal waters, 2009–2023 (BIOR 2023)



CPUE (kg/h) of RG in scientific surveys with coastal seine in Latvian coastal waters, 2009–2023 (BIOR 2023)

Available information about the local invasion behavior is incomplete



In autumn and spring they move the most and start spawning in shallow water. (Behrens et al., 2022)

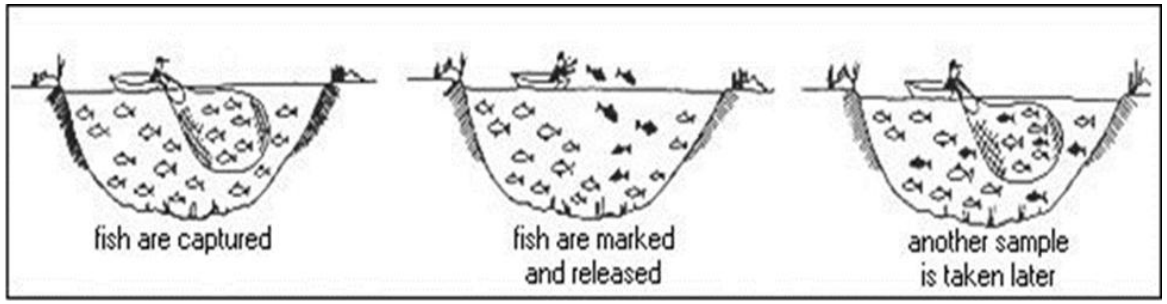
On Latvia’s coast they are most common at 10–15 m where the bottom is rocky; there can be about 3 fish per m^2 there. (Putnis et al., 2018)

They are most active at night, likely to avoid predators. (Christoffersen et al., 2019)

They can spread to new areas that are very different from their natural range. (Kornis et al., 2011)

ASSESSMENT OF DISTRIBUTION RANGE DURING THE SPAWNING PERIOD USING TAGGING METHODS (2022-2023)

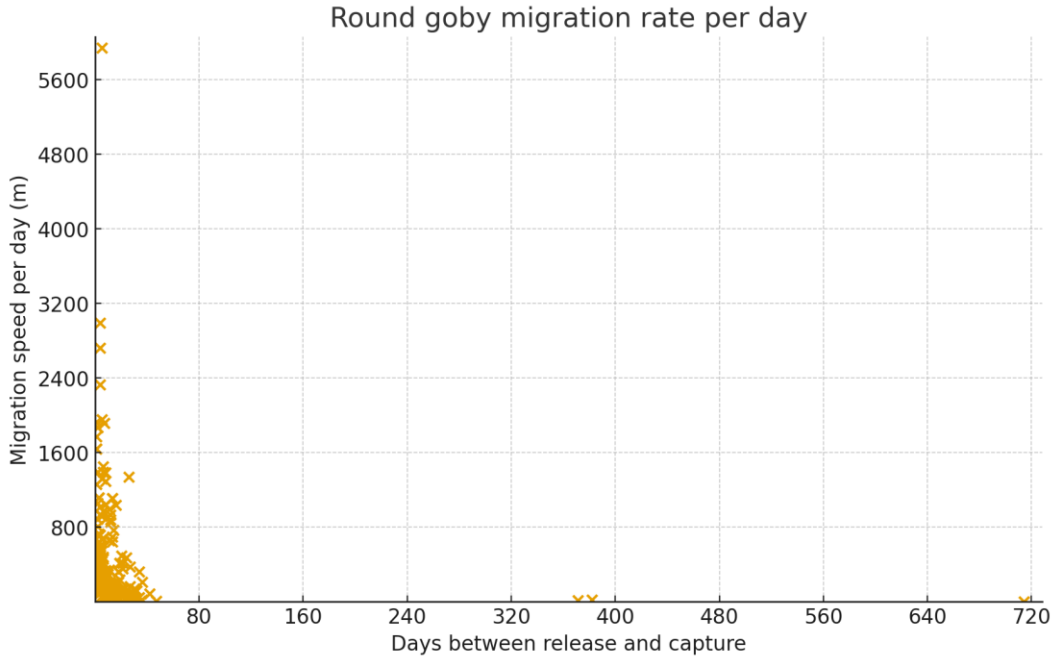
(8000 tagged - areas were selected based on the highest fishing activity)

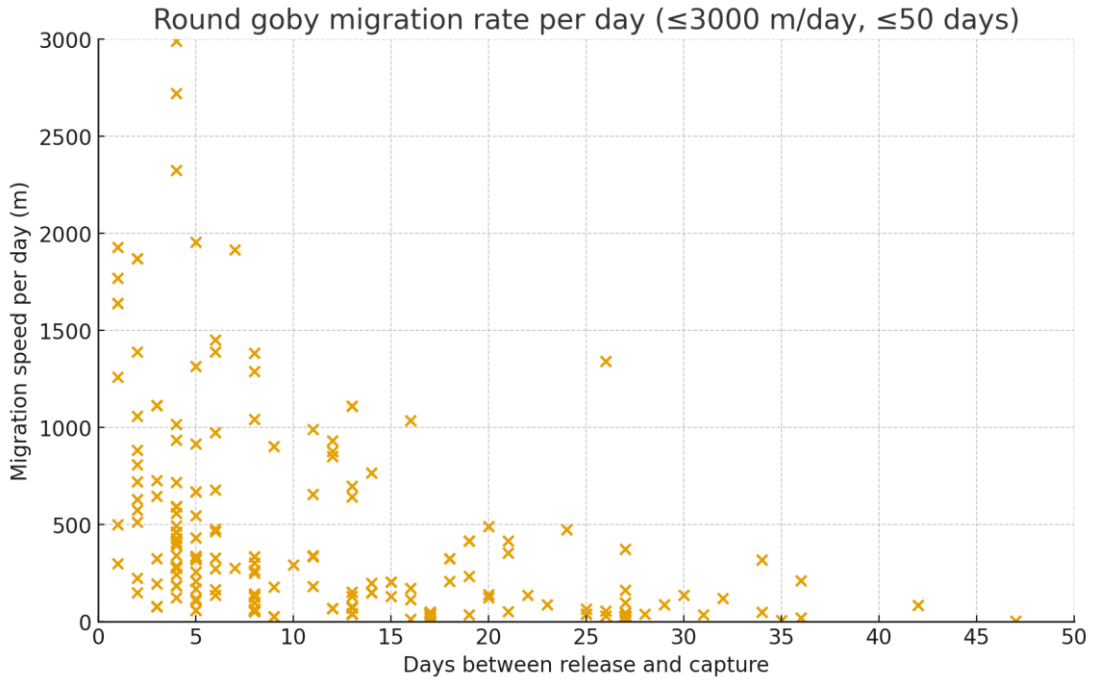


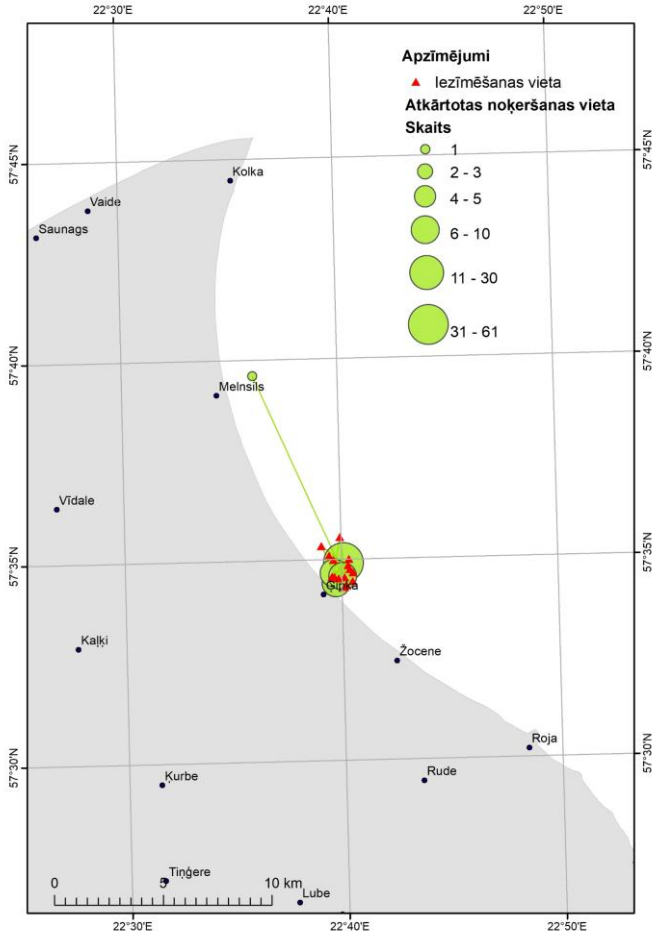
WHAT DO WE FIND OUT?

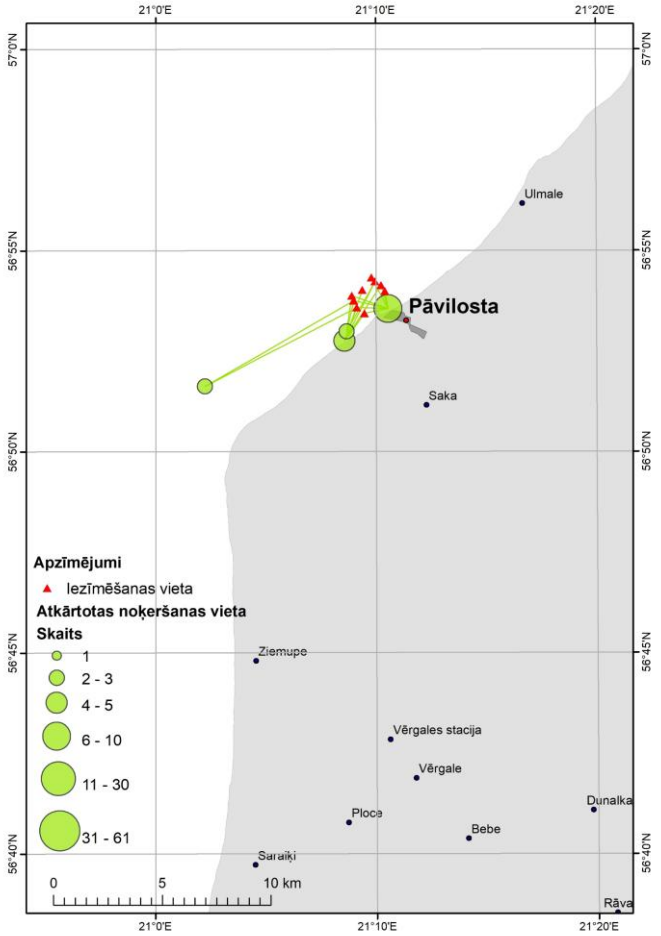
~3% of tagged fish recovered (8000/248 recaptured)

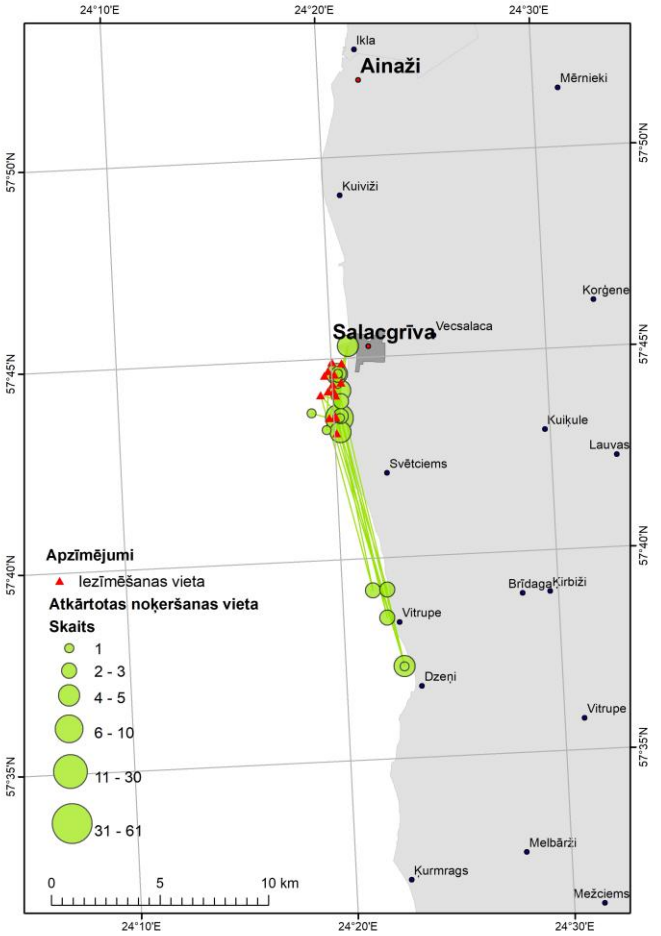
- Territorial behavior;
- The range of movement of the population on the Latvian coast is limited. Average daily speed 0.494 km/day (95 % cl [0.361, 0.647]). Max 5.94 km/day







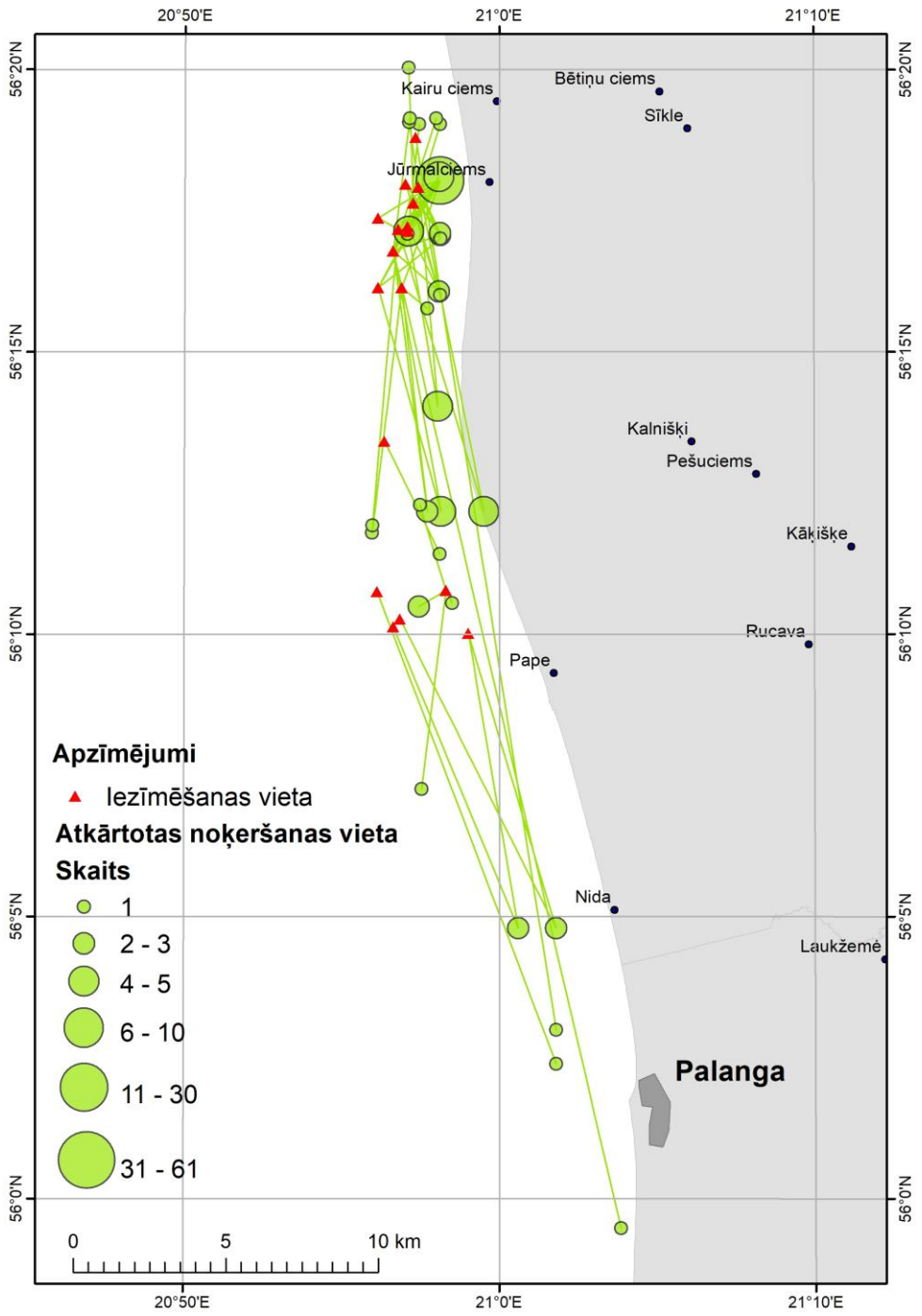




- 66% of the tagged fish were caught again within about 15 days, in fishing gear located within 2 km of where they were released.
- 3 tagged fish were recaptured at least a year later, and in that time moved only 2.6 –7.6 km. Territorial behavior.

- *19 individuals were detected >10 km from their release sites, with daily migration rates >1.5 km*
- Record case: a tagged fish was recaptured just under 35 km from its release site (Jūrmalciems → Palanga).

Secondary range expansion: fish make longer movements to reach lower-density habitats, reducing competition for nesting sites and food.



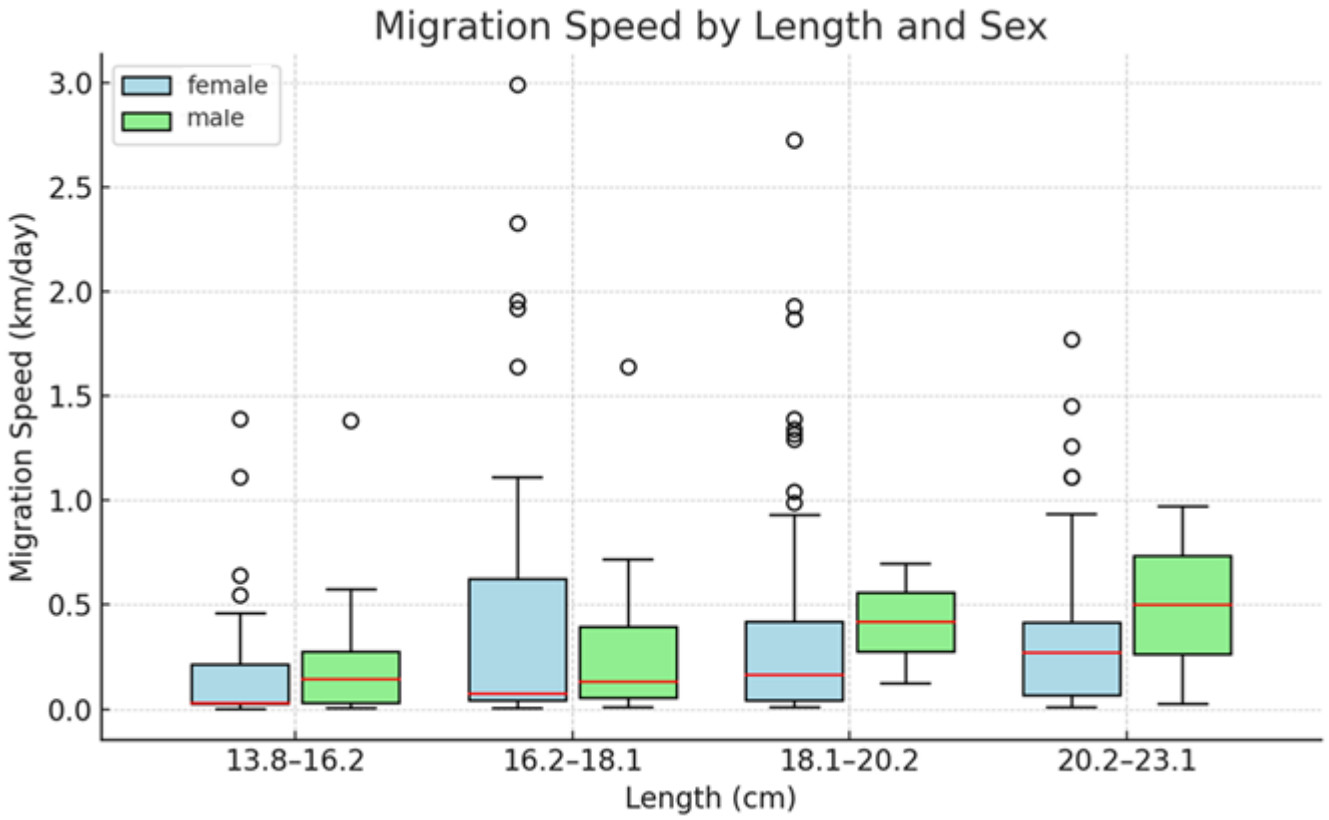
From tag–recapture data, the estimated annual length growth of round goby was

- 29.6 mm (17.3%) for the 17.1 cm fish;
- 21.5 mm (11.0%) for the 19.5 cm fish;
- 18.7 mm (9.9%) for the 18.9 cm fish.

Body size can affect average speed

- Body length increases speed: each +1 cm in length is associated with about +7.2 m/day higher migration speed ($\beta=0.0072$, $p<0.001$).

- Sex effect is smaller: on average, females move 45 m/day more slowly than males ($\beta=-0.045$ km/day, $p=0.013$).



TAKE-HOME MESSAGE

- Due to territorial behavior and low migration speed, it is expected that in places where stable populations have already been established, they will continue to persist;
- Changes in migration speed and population density will only be detected if the availability of food or spawning grounds decreases rapidly.

FOTO: ĒVALDS URTĀNS

Valsts reģionālās attīstības aģentūra

Dabas aizsardzības pārvalde

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