

Rainbow trout farming in Italy



Rainbow trout is the main farmed fish in Italy

Rainbow trout is a typical cold water species like all the SALMONIDS species

Rainbow trout is farmed in several countries in the world

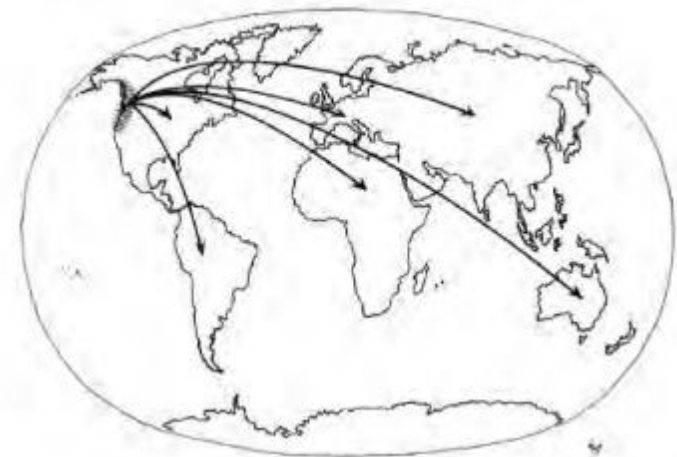
Typical species of **cold water**

The duration of productive cycle is 12 – 14 months

World distribution

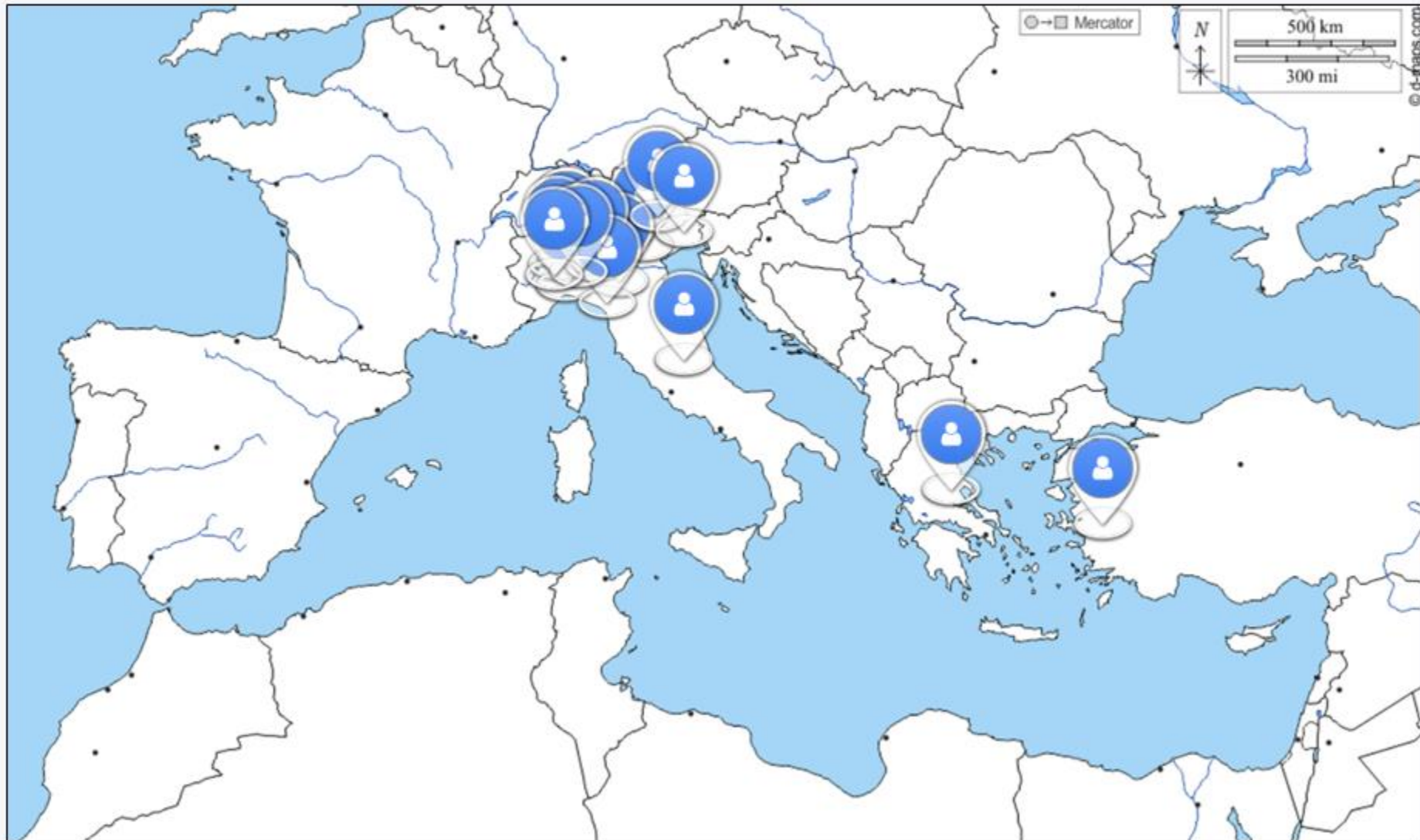


Native range and international introductions of rainbow trout



Vai su [wooclap.com](https://www.wooclap.com) e usa il codice **ACHZCJ**

Where do you come from?



What is your background (previous university education) ? (2 or 3 words)



A word cloud representing university backgrounds. The words are arranged in a roughly rectangular shape, with 'VETERINARY' and 'AQUACULTURE' being the largest and most central. Other prominent words include 'BIOLOGY', 'ENVIRONMENTAL AQUACULTURE AND FISHERIES', 'AQUACULTURE AND FISH FARMING', 'VET UNIVERSITY', 'MARINE BIOLOGIST', 'TECHNOLOGY', 'FISHERIES', 'ANIMAL SCIENCE', 'MAGISTRAL', 'DEGREE', 'AQUACULTURE AND FISH DISEASE', and 'MARINE BIOLOGY'. The colors of the words vary, including shades of green, blue, orange, red, and purple.

ENVIRONMENTAL AQUACULTURE AND FISHERIES
AQUACULTURE AND FISH FARMING VET UNIVERSITY
FISHERIES MARINE BIOLOGIST TECHNOLOGY
BIOLOGY VETERINARY ANIMAL SCIENCE
AQUACULTURE MAGISTRAL
DEGREE AQUACULTURE AND FISH DISEASE
MARINE BIOLOGY

Indicate one or more aquaculture species in your country



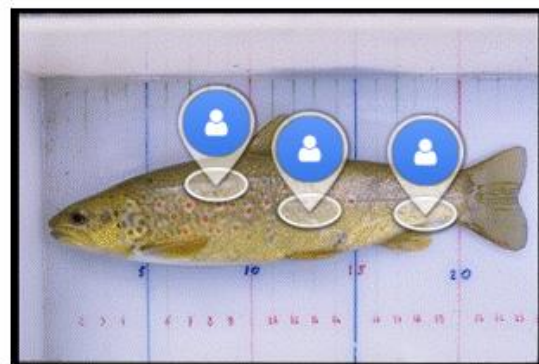
A word cloud of aquaculture species. The word 'TROUT' is the largest and most prominent, centered in red. Other words are scattered around it in various colors and sizes. The words include: SEABREAM (orange), TROUT/STURGEON (blue), CATFISH (purple), RAINBOW (teal), FRESHWATER (blue), STURGEON (green), SEABASS (yellow), TILAPIA (orange), RED FISH AND KOI (blue), SEA (green), MARBLE TROUT (orange), BREAM (red), SEA BASS (orange), EEL (green), RAINBOW TROUT (orange), CARP (red), SHRIMP (pink), BASS (green), MEDITERRANEAN BROWN TROUT (red), and SHRIMP AND TILAPIA (blue).

What is the main ingredient in fish feeds in aquaculture?

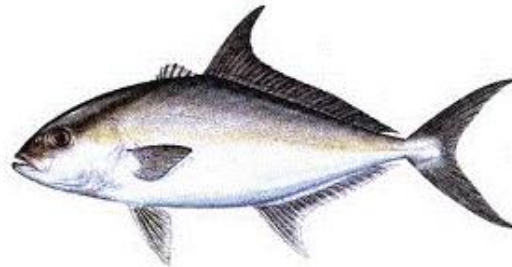
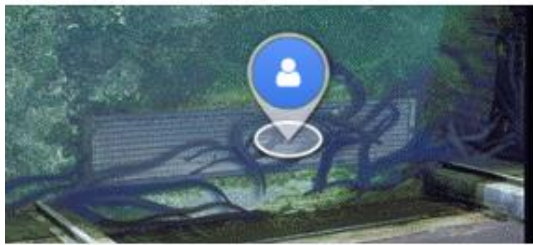
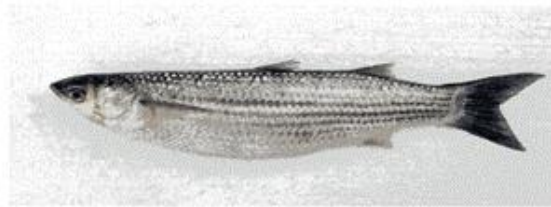
A word cloud of protein sources for fish feeds. The words are arranged in a roughly rectangular shape, with 'PROTEIN' and 'POULTRY' being the largest and most prominent. Other words include 'FISH MEAL', 'SOY MEAL', 'FISHMEAL', 'FISH', 'PAT', 'POULTRY MEAL', 'PROTEIN SOURCES', 'PROTEIN FLOUR', 'CEREALS MEAL', and 'FISO MEAL'. The colors of the words vary, including orange, red, green, blue, and yellow.

PROTEIN
POULTRY
FISH MEAL
SOY MEAL
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POULTRY MEAL
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Imported by North America at the beginning of 20° century

Natural reproduction is rare

In Italy in Trentino region , San Michele all'Adige)
Introduction in the natural environment has treatedened natural population of brown trout (*Salmo trutta*)



Artic charr (*Salvelinus alpinus*)



Brown trout

Other farmed salmonids



Brook trout (*Salvelinus fontinalis*)

Marble trout (*Salmo trutta marmoratus*)



Arctic charr (*Salvelinus alpinus*)



Brown trout (*Salmo trutta*)

Atlantic salmon (*Salmo salar*)



First fish species of European aquaculture

In Italy has been introduced (unsuccessfully) in Piedmont, in Campania, in Lombardia e in Lazio

Norway is the first country in the world

ICON of modern fish farming in the western countries

WATER quality: temperature and dissolved oxygen

- **Dissolved Oxygen** (next to saturation level 10- 12 mg/l)
- **Optimal temperature** (13 - 15 °C, ‘cold water species’)
- pH around 7

Typical rainbow trout farm in Piedmont region



Over **18 °C** trout physiological conditions rapidly go worse, with reproductive ability and immune response

Trout survival almost impossible over 25 – 26 °C

Oxigenation towers:

the input water in the farm must be made optimal for trout rearing



TROUT FARMS



Self feeder

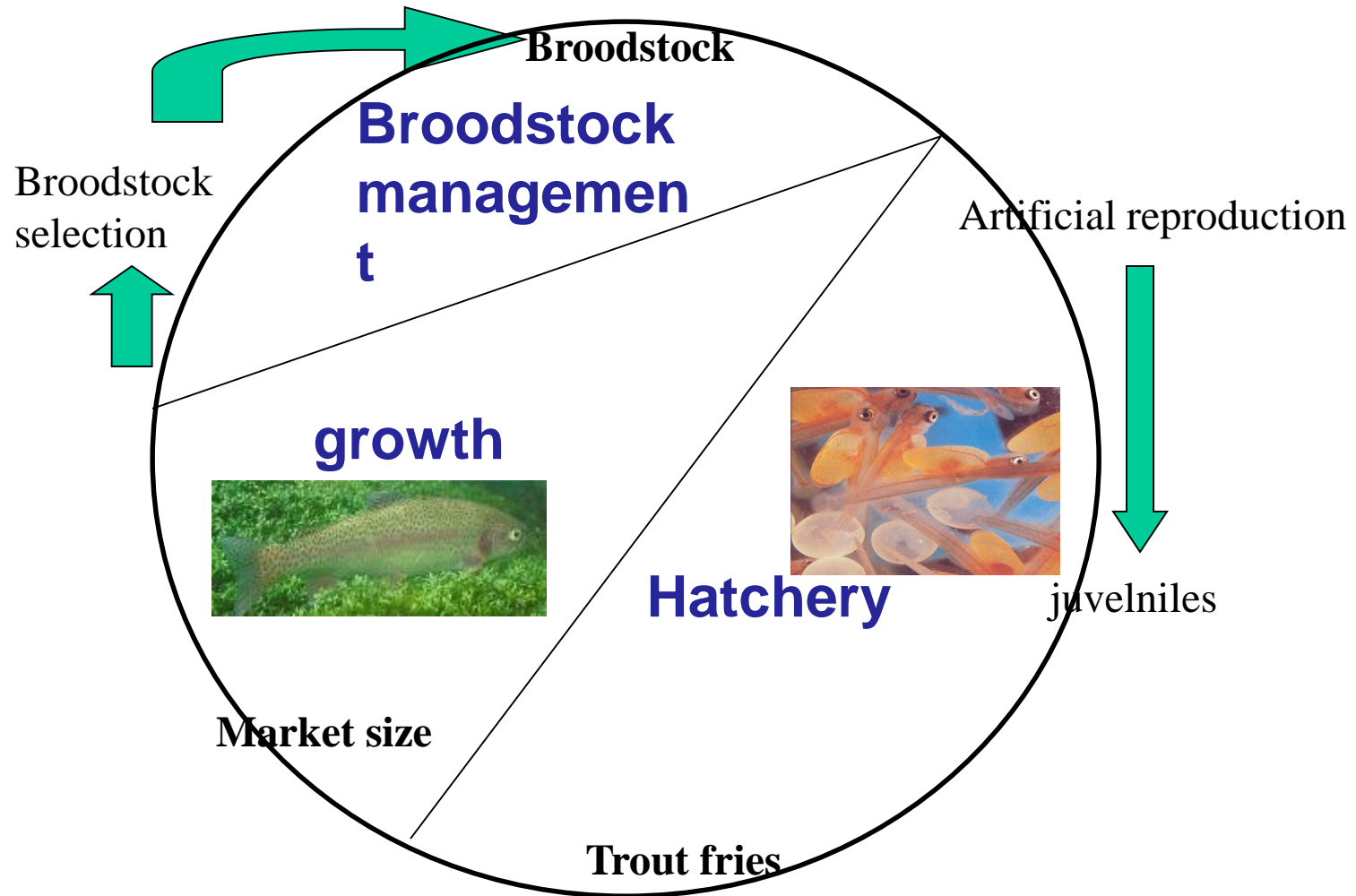
Earthen pond



Raceway tanks

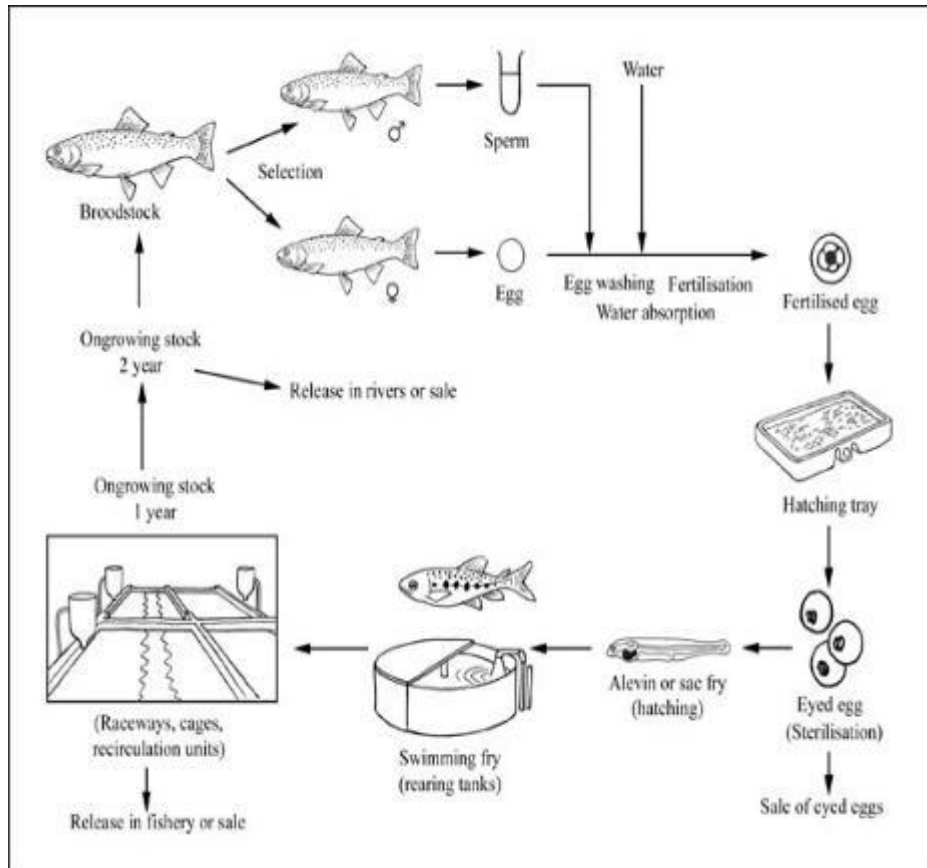


Rainbow trout cycle



Natural reproduction occurs in winter, currently with fotoperiod change, the reproduction has been extended during almost all the year

Artificial reproduction of rainbow trout



Fish are gently squeezed for production of eggs (females) and seminal liquid (males)

Eggs and seminal liquid in contact for few minutes, successively transferred to hatchery

DISINFECTION of eggs, in order to reduce occurrence of fungal diseases: **Saprolegnia**

ARTIFICIAL REPRODUCTION IN RAINBOW TROUT



Female trout are gently squeezed for eggs emission

Male trout are gently squeezed for sperm emission



Artificial fecundation



Trout farm infrastructure:

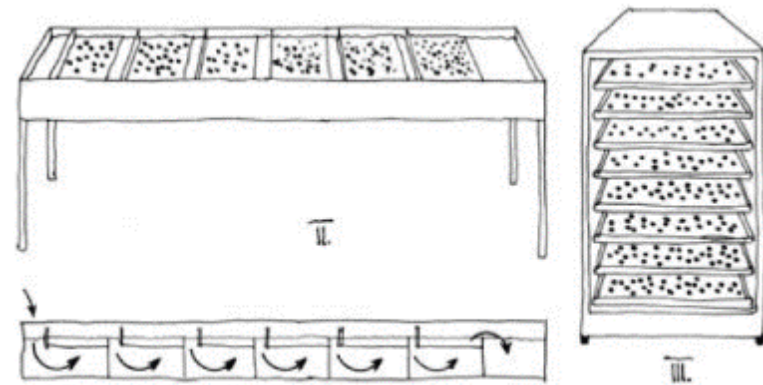
Hatchery and growth out tanks

Hatchery

- Optimal water temperature 10 °C



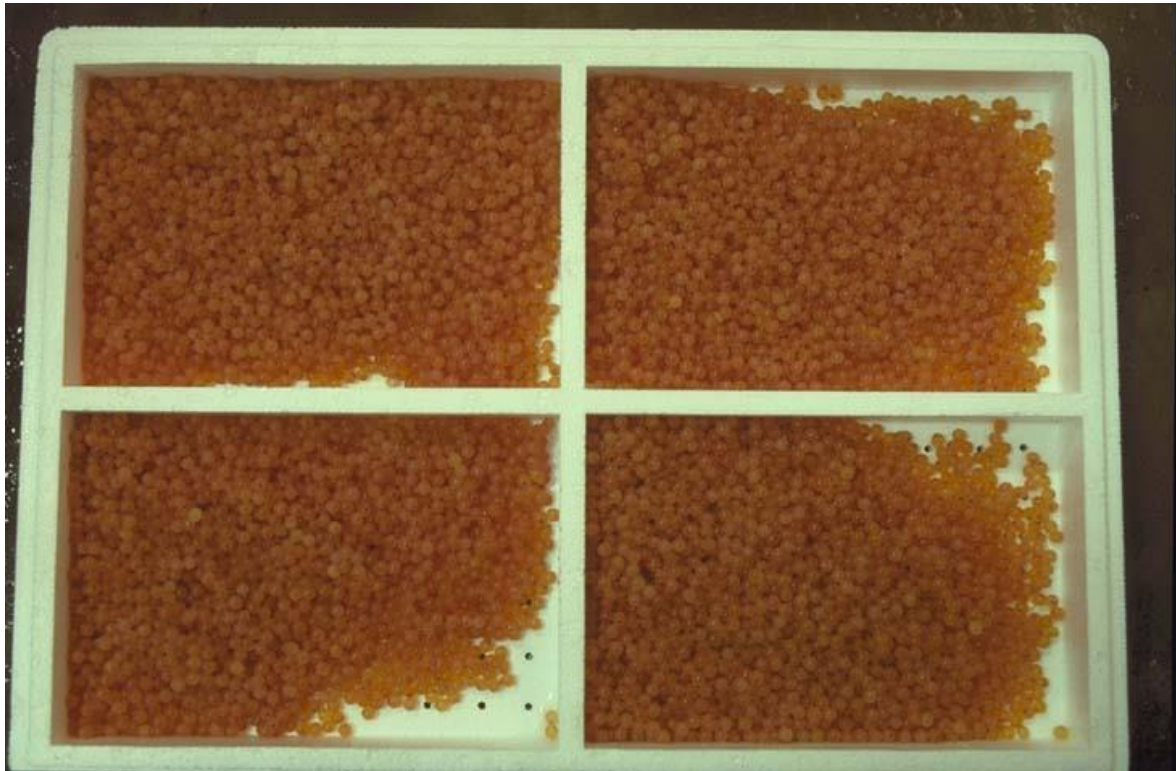
Hatching trays are the devices for incubation of eggs and sac fry,



Trout eggs

Natural reproduction between November and April

Optimal water temperature: 10 °C



At 10 °C, rainbow trout incubation lasts 30 – 32 days

Water TEMPERATURE effects

Fish are **poikilotherm**, their metabolism is heavily influenced by water temperature

Water temperature is particularly important during early stages of development

Trout egg incubation duration is expressed in degree days.

Rainbow trout incubation is **300 – 320 degree days** that corresponds to 30 - 32 days at temperature of 10 °C.

Brown trout has ideal temperature between 12 and 14°C.

Reproduction between 7 e 10 °C

Incubation of 450 degree days



Vertical incubation devices

Zug jars

Plastic or fibreglass cylinders often ranging in capacity from 20 to 80 l.

Water flux from the bottom to the top

Trout eggs keep moving during the incubation

Water comes out from the top

The temperature of the incubator water influences the development and hatching of the eggs.

During eggs incubation, incubator should be controlled

Elimination of non vital eggs (by colour)



Rainbow trout hatchery



Zug jars and hatching trays



Trout eggs in the Zug jars



When juveniles reach 12 - 15 cm size
Growth tanks until commercial size

**Tanks for growth phase are the most extended part
of the farm**

Fibreglass tanks

Concrete tanks

Artificial ponds

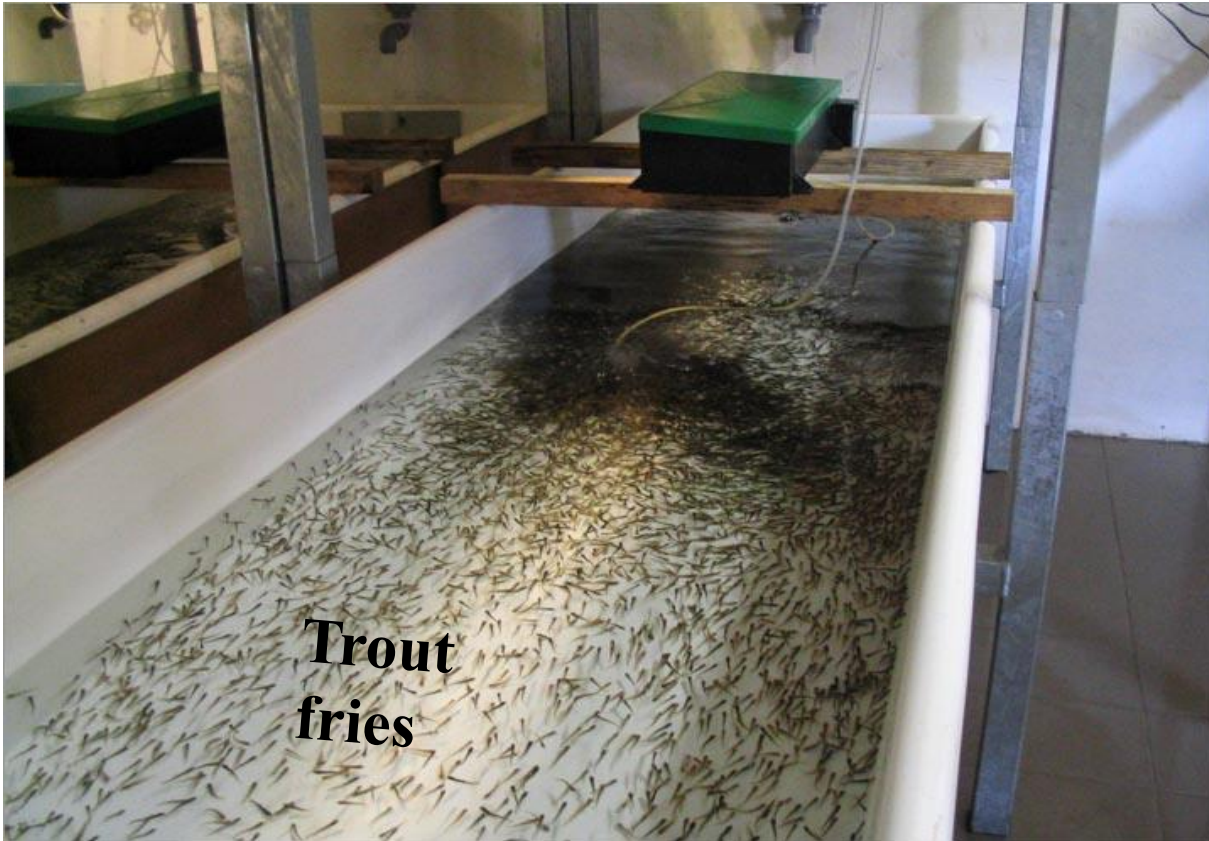
Natural (earthen) ponds

Floating cages



TROUT HATCHERY

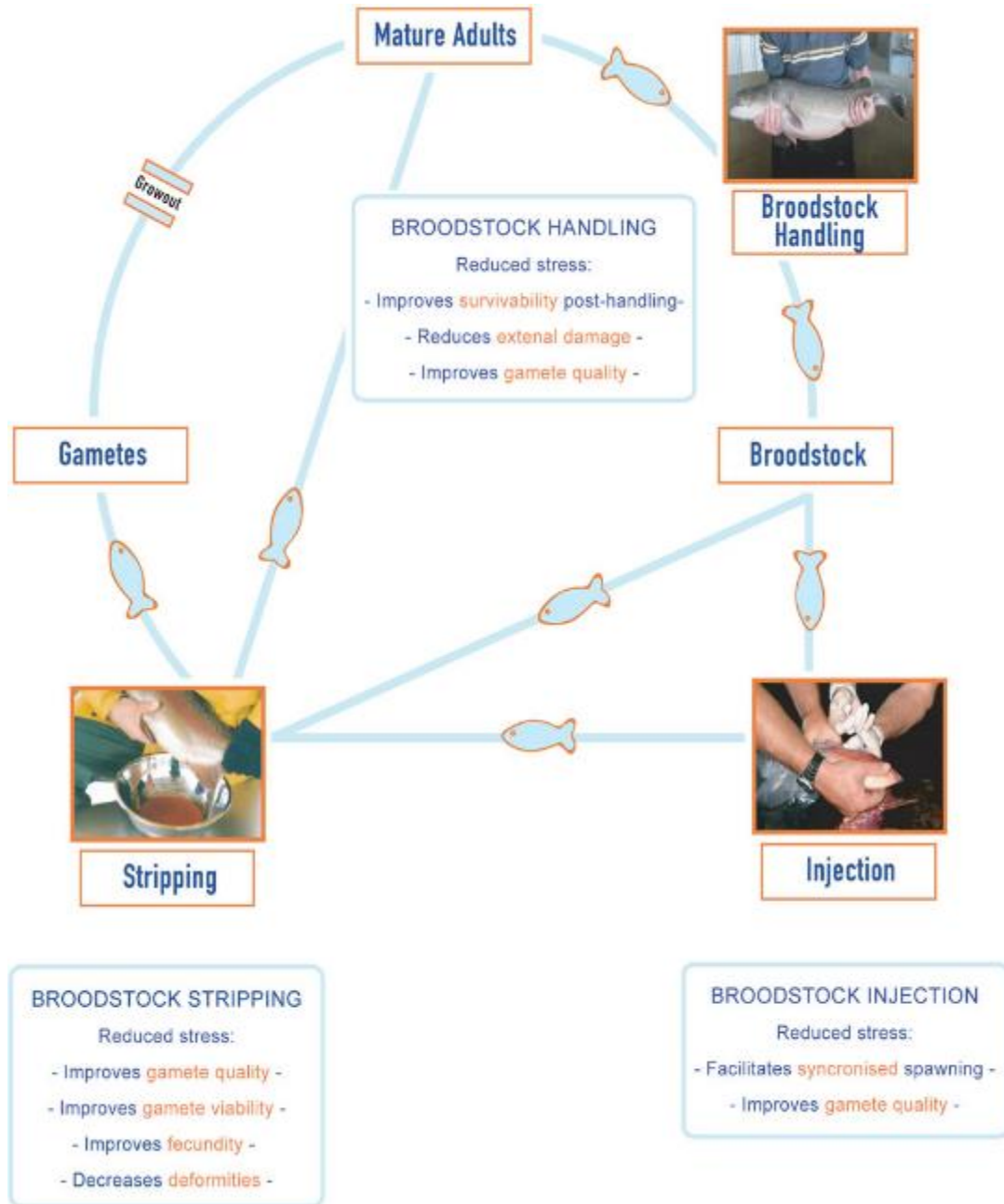
**Automatic
continuous
feeder**



**Fiberglass
tank**

**Trout
fries**

Artificial reproduction in rainbow trout



Trout hatchery



Trout eggs in vertical incubators

Hygienic conditions must be carefully controlled
Solar light is dangerous during incubation as trout eggs are laid under the sand of river bottom, in the high part of the rivers

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DISINFECTION

1. Detarox: Oxygen peroxyde+ Peracetic acid (conc. 20 e 4.5%), against virus, bacteria, trematods and aquatic fungi
2. Cloramine T, for the treatment of gill disease (5/7 g/m³ x 15/30')
3. Ammonium salts , (4ml/m³ for 15/30')
4. Formaline, ectoparasites and miceta (saprolegnia in fish eggs), 375 ml/ m³ for temperature <10°C or 300 ml/ m³ between 10 e 15°C, 225 ml/ m³ >15 °C

Artificial nutrition for rainbow trout

Basic nutritional requirements:

Protein

Lipids

Vitamins and minerals



CARNIVOROUS FISH

FISH MEAL

Fish meal is obtained by harrings mainly in the Pacific Ocean (Peru').



That fish could be used for human consumption !



There is a kind of competition between man and fish farming

Several researchers in the world try to do a substitution of fish meal with vegetal protein

Soybean meal is largely used in fish feeds

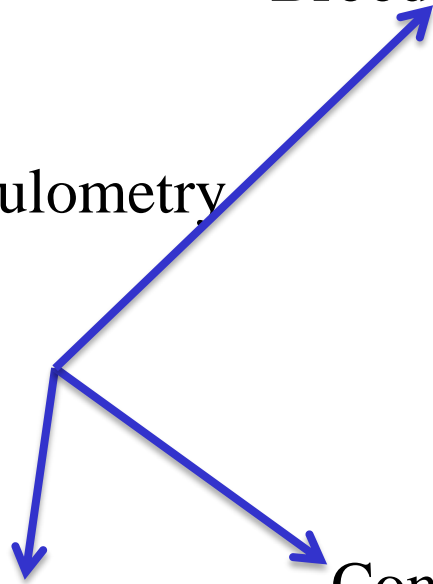




Broodstock



Fish quality and granulometry is modified along the productive cycle



Commercial size fish

Fry





Average rainbow trout feed composition:

- 45 - 65 % protein
- 18 - 25 % lipids
- 10 % water
- 5 % carbohydrates
- 1 – 2 % Mineral and vitamins

Feed Conversion Rate is about 1,2 for rainbow trout, which means that rainbow trout can increase 1 kg of body weight for 1,2 kg of consumed feed

Sea bream and sea bass 1,4 – 1,7; Carp: 1,5 - 2

Fish density in growth tanks in North West Italy, is about 25 kg/mc

In intensive farming, fish density can reach 150 kg/mc (Norway)



BROODSTOCK

- Low stocking densities and better quality of food
- Sexual maturity is reached at 2 or 3 years and natural reproduction period is between October and March



PUFA omega 3 should be added to artificial diet