

Pilot 2: “Crustacean production in RAS systems in Pomerania”-

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„INNOVATIVE AQUACULTURE/ INNOWACYJNA AKWAKULTURA”

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Pilot 2: Research related to product quality

National Marine
Fisheries Research
Institute

NMFRI-about the institute



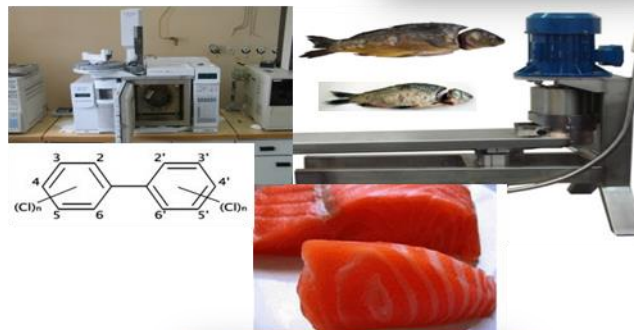
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Poland's oldest marine science center, located in Gdynia

Main research areas and activities are:

- Ecology of species exploited by fisheries
- Sustainable exploitation of marine ecosystems
- Fisheries economics
- Seafood safety and quality
- Chemical contaminants and their environmental fate
- Fish processing technology and mechanization
- Educational offer in Gdynia Aquarium



Quality and commercial value of food products from aquaculture



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Quality factors include:

- Taste and flavour
- visual appearance
- nutritional value
- consumer safety (chemical and microbiological contamination)
- technological suitability



They are determined by :

- Species
- Conditions of breeding : physicochemical parameters and quality of water, feed quality
- Technology of breeding

Aimes of the study



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- Determine the quality of shrimps bred in RAS systems
- Compare the quality of shrimps bred in RAS system with the quality of other shrimps available in Polish market
- Determine the influence of processing methods applied through value chain on the quality of the products reached by consumers (experiments and desk study)

Nutritional value of shrimps



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Different species of shrimps popular on Polish market, originated from different geographical regions and shrimps bred in RAS systems will be subjected to chemical analysis.

The samples will be collected in time intervals to ensure that the results of the study will reflect the variation in chemical content



07.04.2017



Place/meeting



First data from the project- nutritional value

species	origin	Fat content %
Parapenaeopsis styliifera (kiddi shrimp)	Indian Ocean (FAO 51)	0.65
Penaeus monodon (black tiger)	farmed in India	0.75
Litopenaeus vannamei (white shrimp)	farmed in India	0.75
Pleoticus muelleri (argentine red shrimp)	S-W Atlantic (FAO 41)	0.55
Litopenaeus vannamei	Ekwador	
Penaeus monodon (black shrimp)	Farmed in Bangladesh	

Data from a label:

Fat: 0.16g/100g

SFA: 39.81g/100g

Protein: 18.51 g/100g

Analysis will involve:

fat and protein content, fatty acid profiles , vitamins content

Data from literature:



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species	origin	Fat content %
Black tiger shrimp	Thailand	1.23
White shrimp	Thailand	1.30
Red shrimp	Portugal	0.1-0.3
Jinga shrimp	Turkey	1.1-1.3
Green tiger	Mediterranean Sea	1.1-1.3

Chemical contaminants in food



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- Chemical contaminants in food rise a concern related to human health

Metals	Permissble limit	
Hg	0.500 mg/kg	Commission Regulation no. 1881/2006
Cd	0.050 mg/kg	Commission Regulation no. 1881/2006
Pb	0.300 mg/kg	Commission Regulation no. 1881/2006
Sum DDT	1000 ng/g	Council Directive 86/363/EEC (maximum permissble limit for food)
ndl- PCBs	75 ng/g	Commission Regulation 1259/2011/EC

Chemical contaminants in shrimps: first data from the project



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species	origin	Hg mg/kg	Pb mg/ kg	Cd mg/kg	DDT ng/g	ndl-PCB ng/g
Parapenaeopsis stylifera (kiddi shrimp)	Indian Ocean (FAO 51)	0.0031	0.0114	0.0058	0.29	0.11
Penaeus monodon (black tiger)	farmed in India	0.0061	0.0095	0.0055	0.14	0.07
Litopenaeus vannamei (white shrimp)	farmed in India	0.0068	0.0078	0.0028		

Data from literature



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- *Penaeus monodon*, *Penaeus vannamei*, *Litopenaeus vannamei* (Bangladesh, the Netherlands)

n-dl PCBs 0.11 ng/g

- brown shrimp (*Crangon crangon*); the Netherlands

n-dl PCBs 3.27-39.9 ng/g

- Shrimps from Catalonia

Hg 0.12 mg/kg Cd 0.02 mg/kg Pb 0.013 mg/kg

- *Penaeus monodon* (Bangladesh farms and rivers)

Pb 0.42 mg/kg Cd 0.05-0.09 mg/kg

Notification in RASFF



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information for attention	07/11/2011	2011.1583	Germany	cadmium (0.573 mg/kg - ppm) in chilled tiger prawns from Senegal
alert	23/09/2013	2013.1294	Latvia	cadmium (1.09 mg/kg - ppm) in frozen shrimps (Pandalus spp) from Canada
information for attention	14/11/2014	2014.1539	Norway	cadmium (1.8 mg/kg - ppm) in dried shrimps from Thailand
information for attention	07/11/2011	2011.1583	Germany	cadmium (0.573 mg/kg - ppm) in chilled tiger prawns from Senegal
information	10/06/2010	2010.0753	France	cadmium (0.597 mg/kg - ppm) in frozen Akiami paste shrimps (Acetes japonicus) from Vietnam

Commercial handling of the raw material



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Among various method currently used the most important are those based on action of low temperatures which preserves taste and nutritional value. However, also antioxidant agents are used.

RASFF:

16 notifications related to altered organoleptic characteristics and poor temperature control - rupture of the cold chain - of chilled shrimp tails

In 2017, 6 notification too high content of sulphite (1873.2 mg/kg - ppm) in frozen whole deep-water rose shrimps (*Parapenaeus longirostris*)

during 2010-2016 period, 100 notifications (majority for shrimps) related to elevated levels of sulphite or other food additives and flavouring

Commercial handling of the raw material



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During frozen storage of shrimps quality changes are related to:

- disrupting muscles cells resulting in the release of enzymes from mitochondria to sarcoplasm
- lipid oxidation that can affect the texture of muscles
- oxidative deterioration of muscle proteins that causes changes in their solubility

These can result in:

- off-flavors
- colour fading
- dehydration and weight loss
- loss of juiciness and toughening
- textural changes

Good quality preservation



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Storage temperatures for shrimp in commercial handling and distribution vary, and **it is important to be able to reliably estimate the effect on shelf life and the quality of variable temperature conditions** that are likely to occur in the actual frozen food chain.

The extent of possible quality loss depends on many factors, including the species, the rate of freezing and thawing, storage temperature, temperature fluctuations.

White shrimp (*Penaeus vannamei*) generally underwent physiological changes induced by freeze-thawing process to greater extent than did black shrimp (*Penaeus monodon*).

The influence of different parameters of freezing on the quality of shrimps bred in RAS will be examined (experiments and desk study).

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Thank you for your attention