

Effects of production method on technical properties of fishmeal intended for feed production

NORDIC CENTRE OF EXCELLENCE NETWORK IN FISHMEAL AND FISH OIL

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Presentation outline

- Nofima bioprocessing facilities in Bergen
- Raw material
- Fishmeal process
- Analysis and technical fishmeal properties

Nofima bioprocessing facilities in Bergen

Scale: 1  x10

- Lab-scale equipment (batch 1-5 kg)



- Pilot-scale (30-200 kg/batch)
- Feed extrusion (150 – 200 kg/h)



Downstream processing

- Conservation
- Heat treatment
- Separation
- Cell rupture
- Hydrolyzation
- Filtration
- Extraction
- Evaporation
- Drying

Feed processing

- Milling/sieving
- Mixing
- Preconditioning
- Extrusion
- Drying
- Vacuum coating

Raw material



Fresh Norwegian spring spawning herring produced at three different factories i Norway



Fresh sand eel with variable degree of feed (zooplankton) in the stomach and gut (seasonal variation) produced at one factory in Norway



Fresh blue whiting. Press cake and stickwater concentrate collected at one factory in Norway



Impact of variability in fishmeal physicochemical properties on the extrusion process, starch gelatinization and pellet durability and hardness

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Influence of type of raw material on fishmeal physicochemical properties, the extrusion process, starch gelatinization and physical quality of fish feed

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Plasticization effect of solubles in fishmeal

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Aquaculture Nutrition



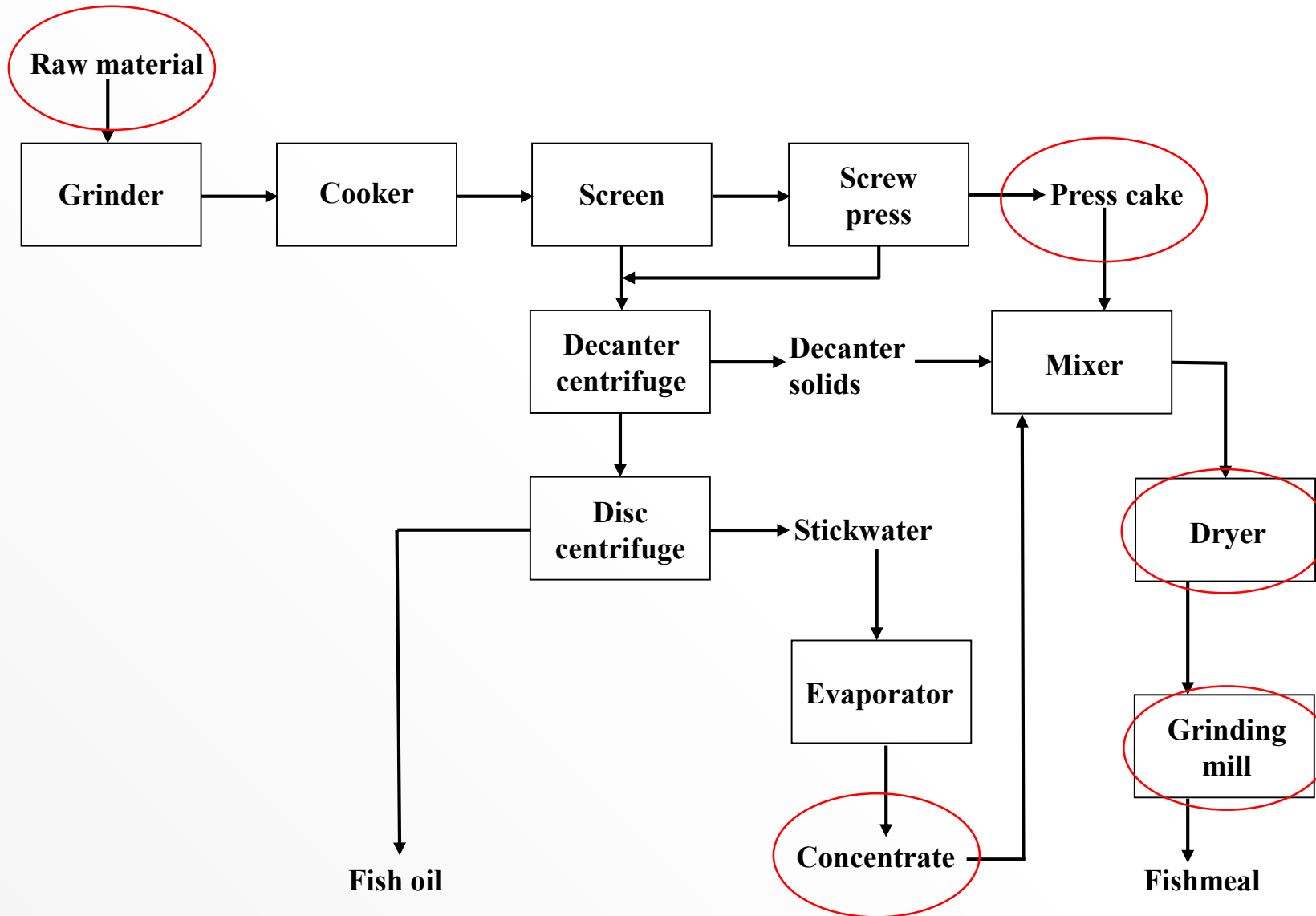
Aquaculture Nutrition 2015

doi: 10.1111/anu.12235

Water-soluble protein level in fishmeal affects extrusion behaviour, phase transitions and physical quality of feed

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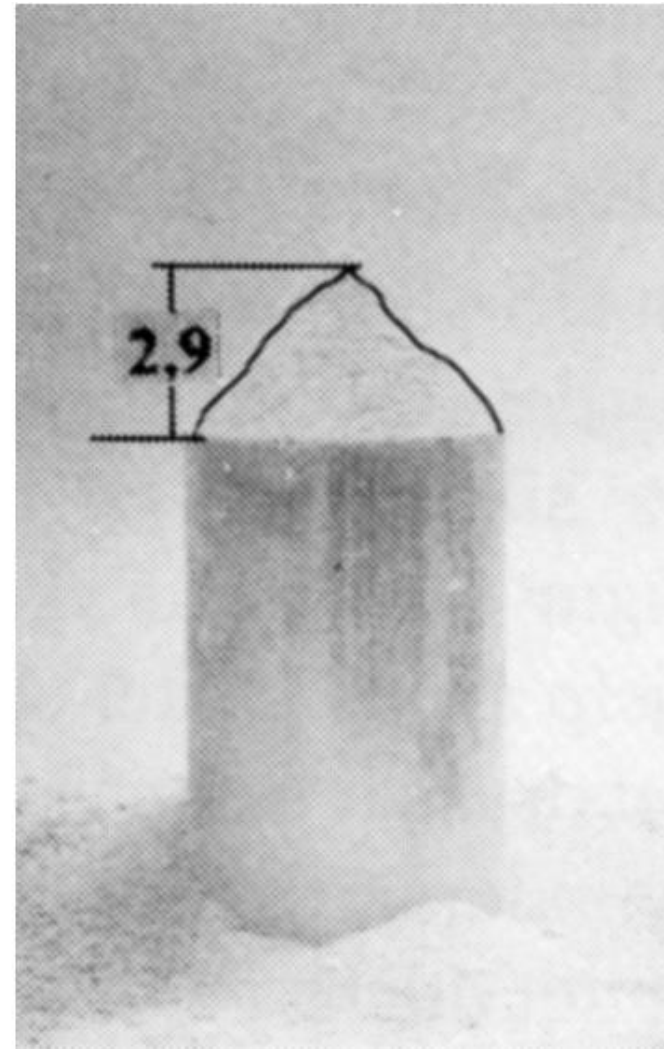
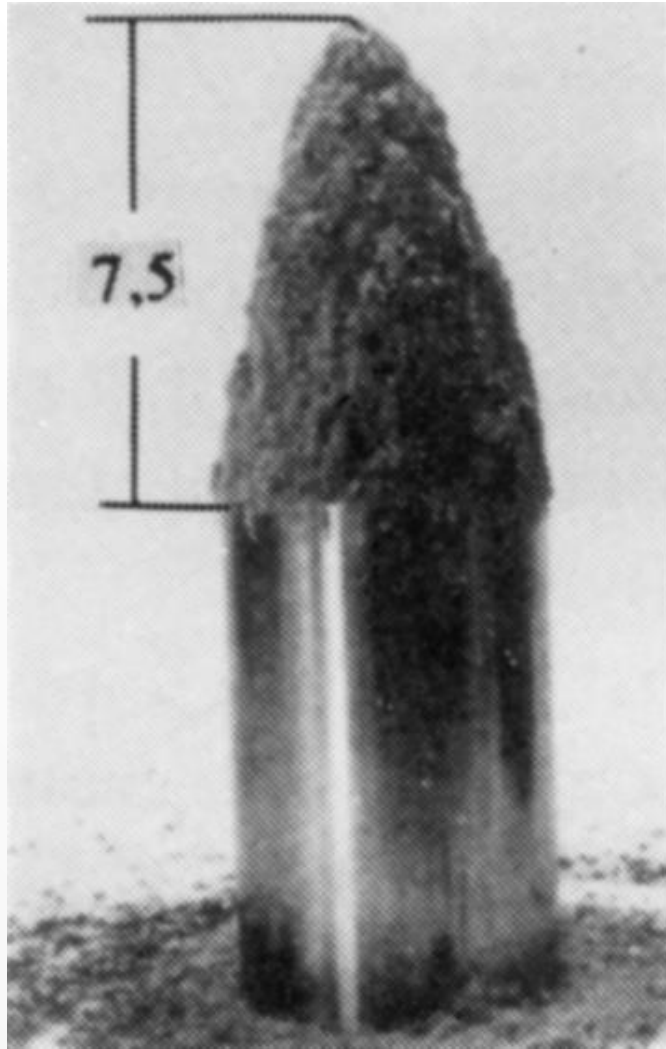
Fishmeal and oil process



Physical properties

Flow-figure





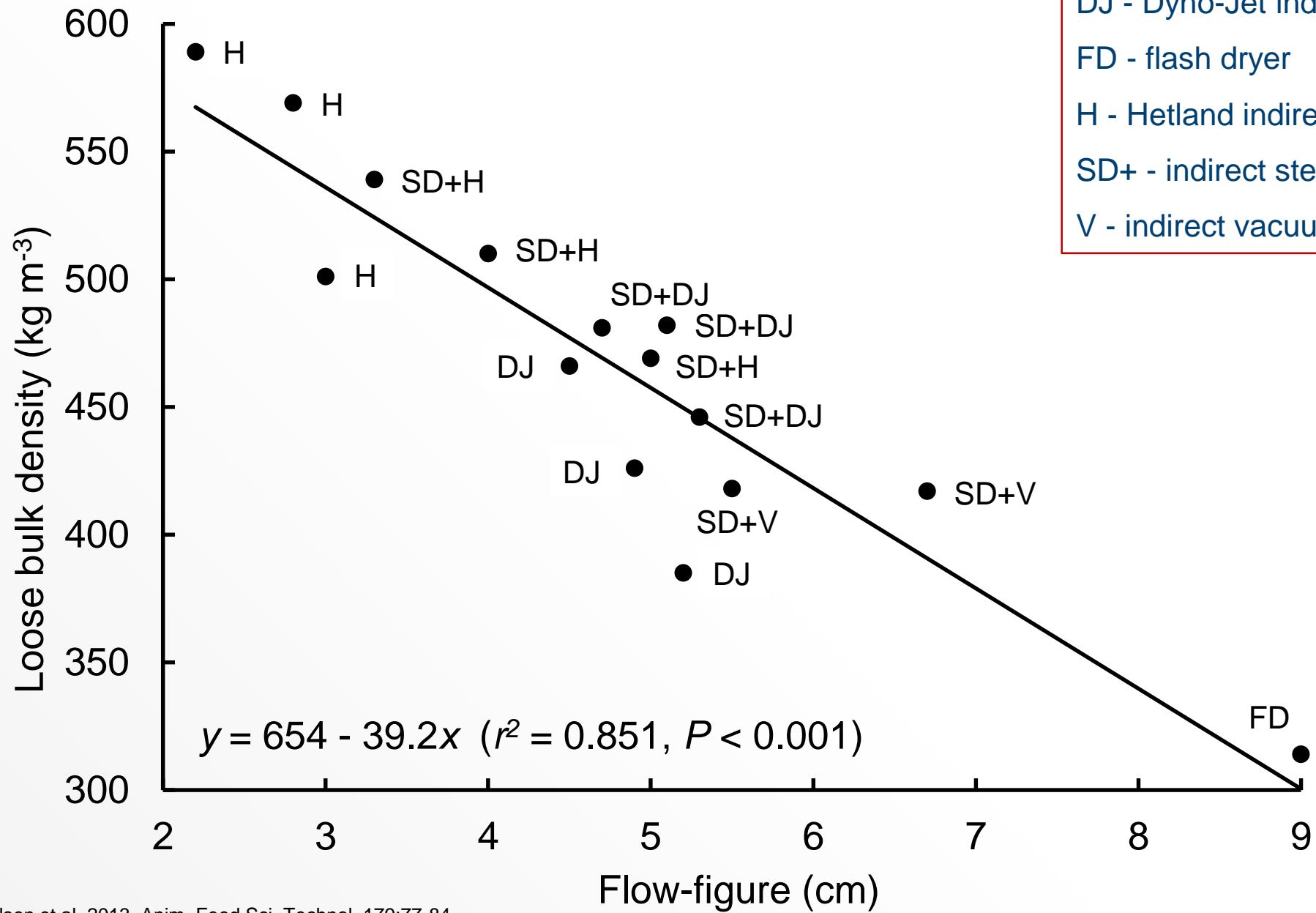
Physical properties

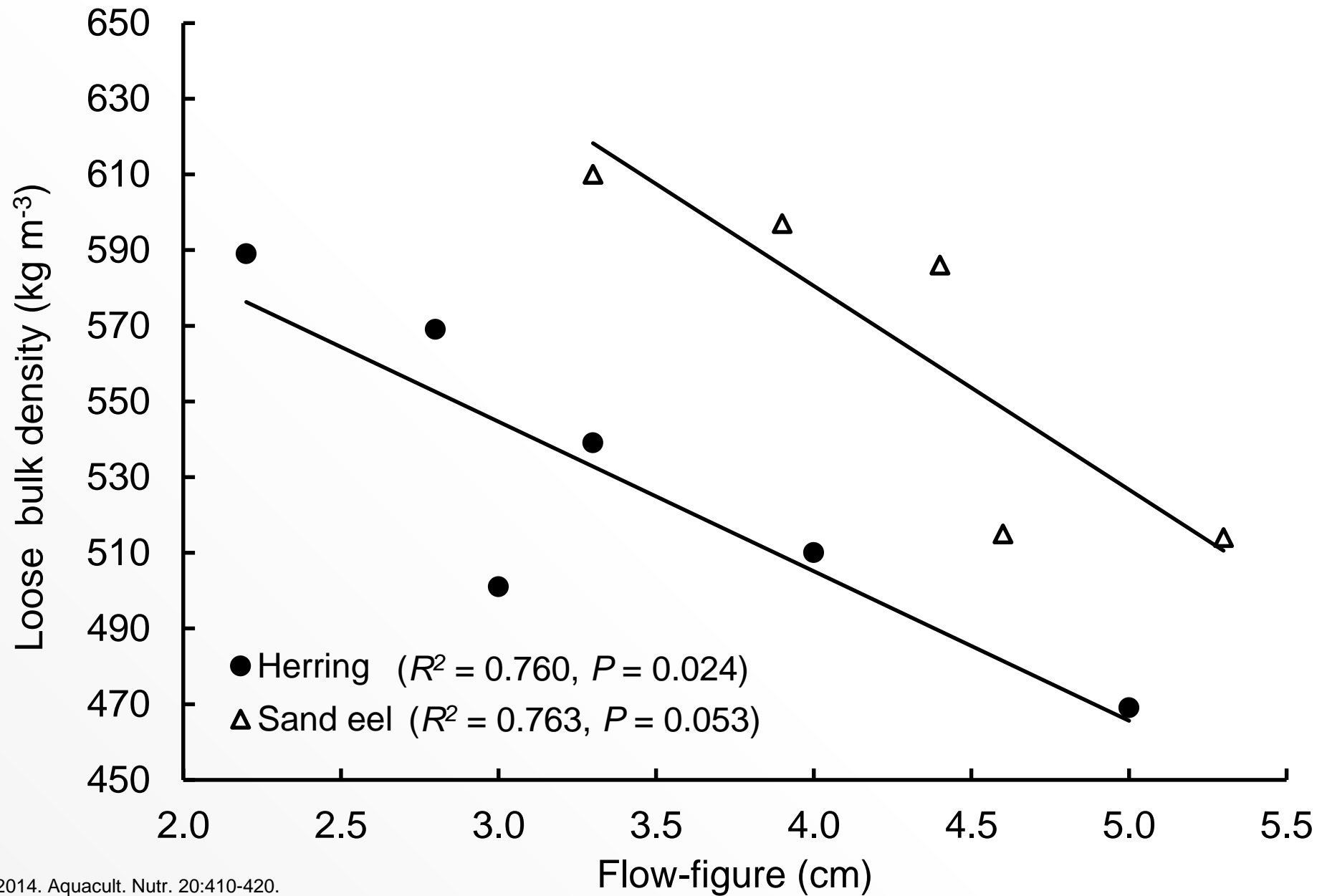
Flow-figure

Loose bulk density



- DJ - Dyno-Jet indirect air dryer
- FD - flash dryer
- H - Hetland indirect air dryer
- SD+ - indirect steam dryer used as pre-dryer
- V - indirect vacuum dryer





Physical properties

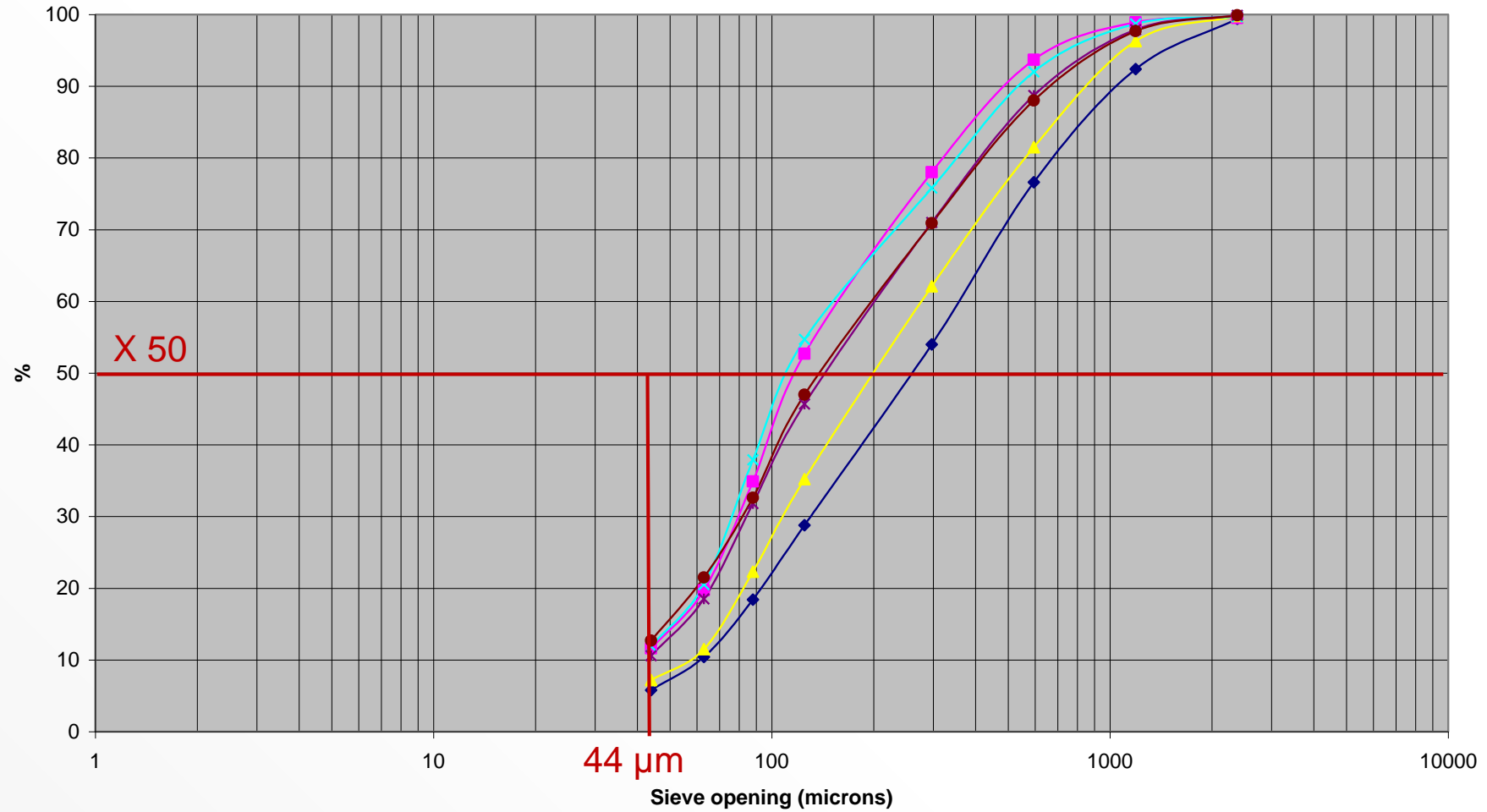
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Loose bulk density

Particles size distribution



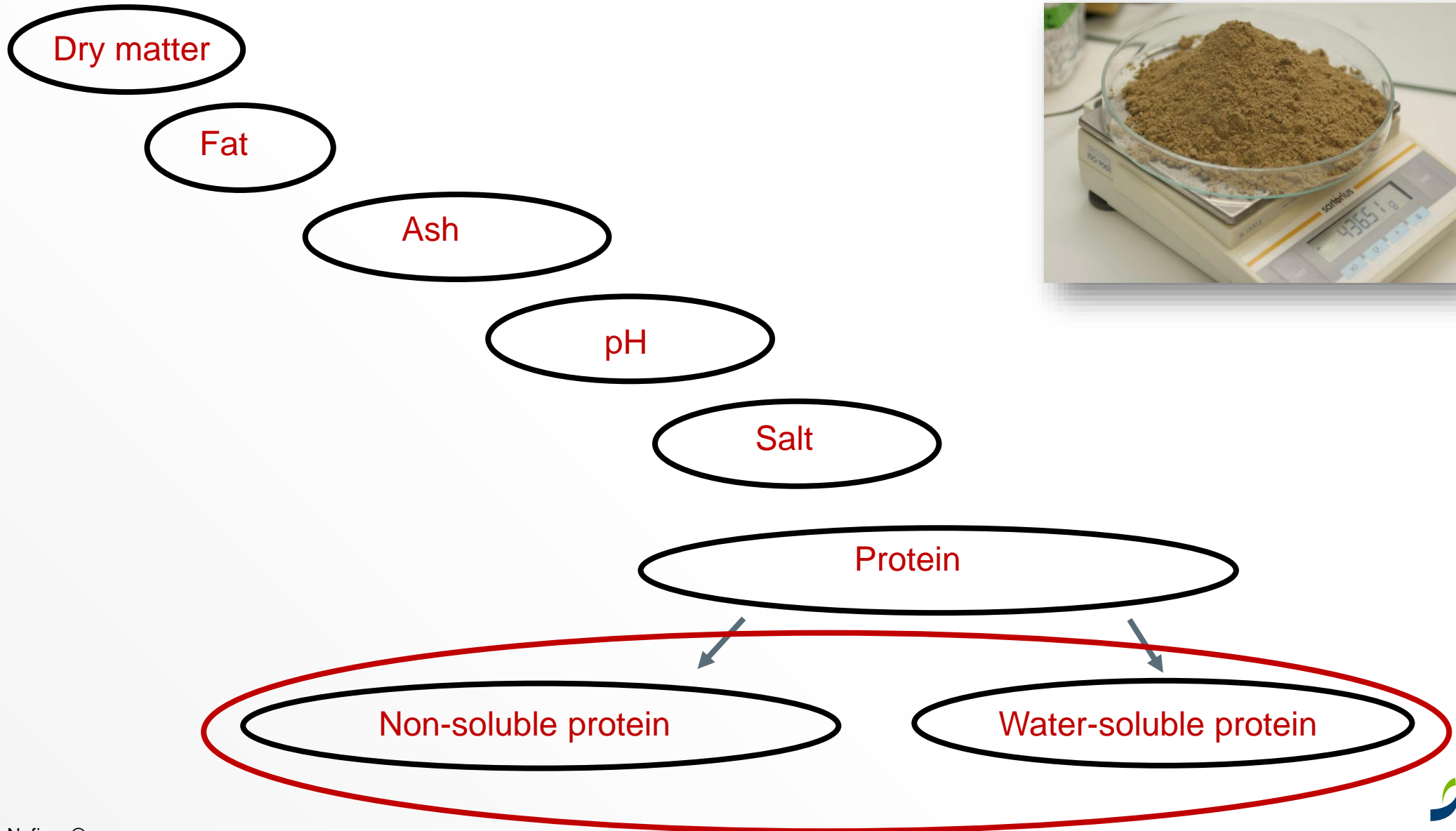
Particle distribution



X50 range 75 – 266 μm

44 μm range 7-25% (by weight)

Chemical composition



Water-soluble protein



9 – 28% of total protein content



26 – 43% of total protein content



9 – 42% of total protein content

Water-soluble protein (WSP) fraction

HPLC gel filtration →
molecular weight distribution



WSP < 0.2 kDa

42%

58%

36%

WSP 5–6 kDa

24%

31%

24%

WSP 11–12 kDa

3%

1%

0%

WSP 20–35 kDa

11%

4%

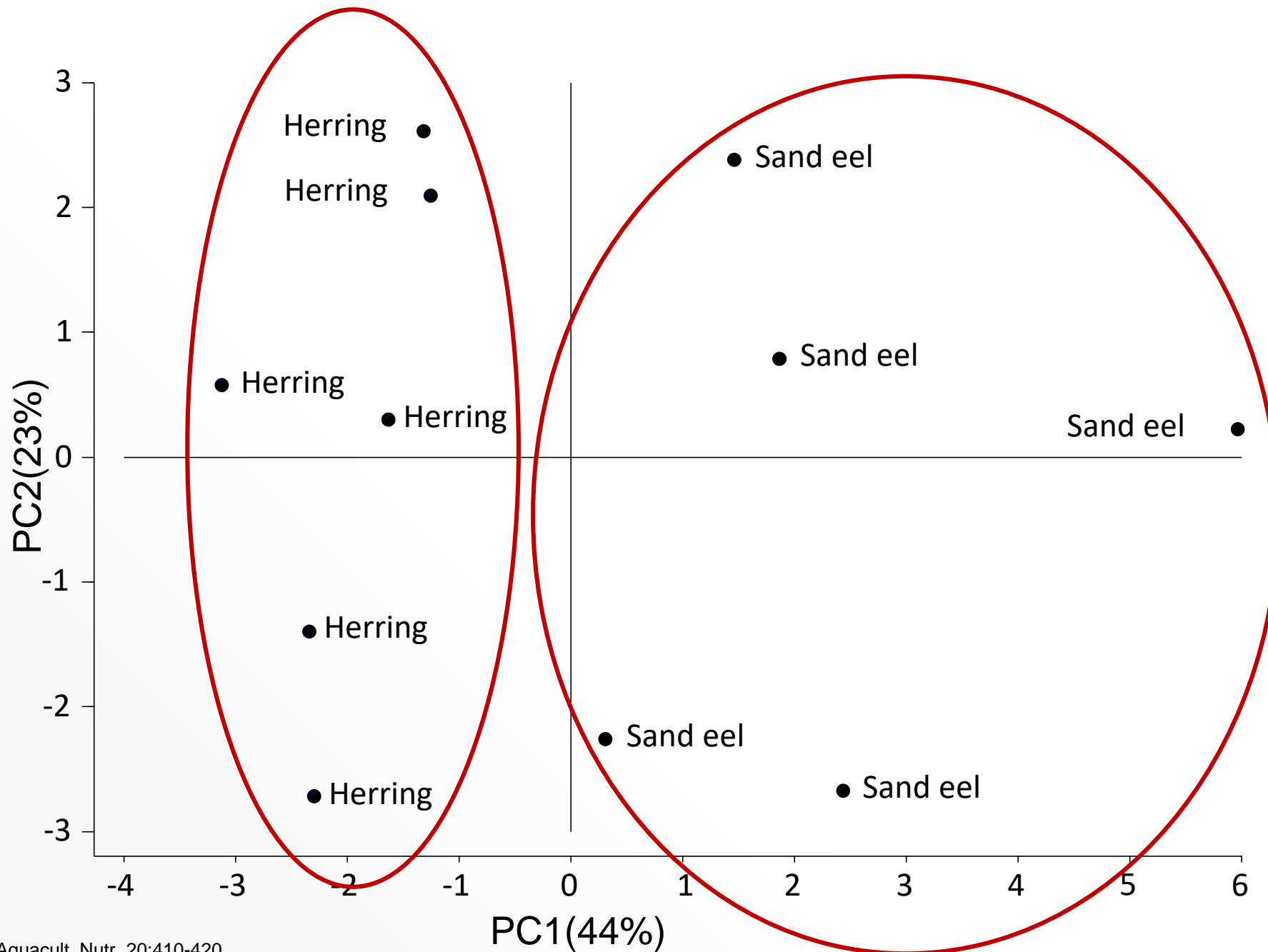
7%

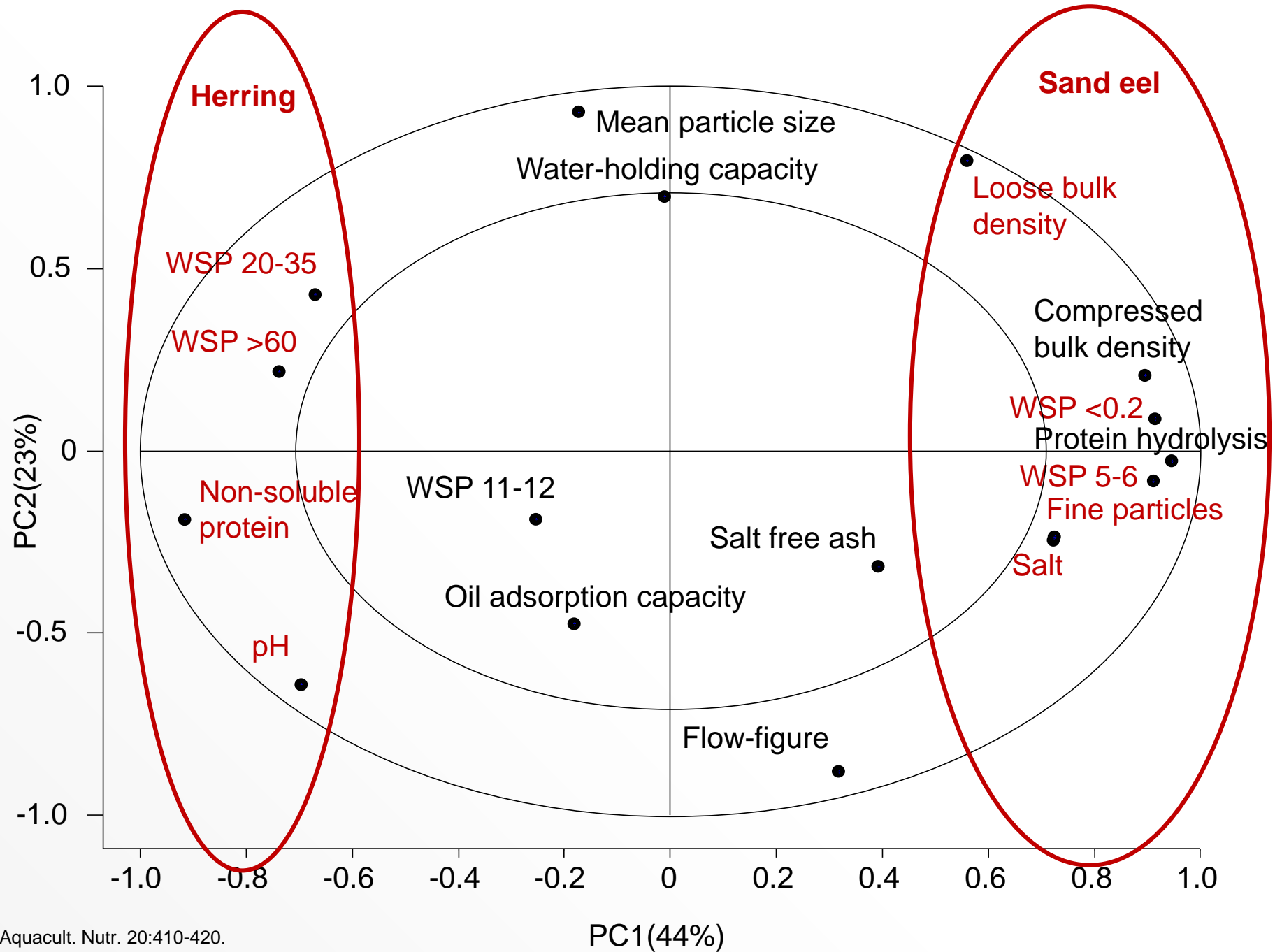
WSP > 60 kDa

20%

7%

34%





Research challenges

The differences in fishmeal technical properties impact the feed extrusion process and physical feed quality

- Several physical and chemical analysis were used to characterize the technical properties of fishmeal. Can these analysis be used as quality control analysis on a fishmeal factory or should other rapid methods be developed?
- Fishmeal is a complex and variable ingredient creating challenges for the fish feed producers. Are there ways to “narrow” the observed differences in technical properties to enable delivery of a more predictable product?

Thank you for your attention!



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