Technical Note

Application in cold-water prawns (*Pandalus borealis*)

Grading by color: Image analysis is a prominent choice to increase the commercial value of seafood products

Who in the seafood industry isn't looking to increase the value of their products? Nowadays, the seafood industry is looking to produce high-quality products for a much more demanding global market. Color plays a major role since it is the first and most important parameter for purchase decisions by consumers. For instance, color is used to grade seafood products to obtain a high-quality product, meet consumer expectations and get better prices.

One example is cold-water prawns (*Pandalus borealis*). Their attractive pink color makes them preferred for buffets or as a garnish for main dishes. Therefore, their "pink color" is a key quality indicator assessed by visual inspection. However, visual inspection is time-consuming, labor-intensive, and less accurate due to high subjectivity.

Currently, the seafood industry is looking for objective techniques to grade cold-water prawns, but their unique characteristics (non-uniform color distribution, size, shape, and surface texture) make them difficult to measure the "pink color" with accuracy and reproducibility. In addition, cold-water prawns are assessed per batch, and instruments that possess a large measurement area that covers the whole sample size are needed to assure the representation of the entire lot.

For instance, colorimeters have been claimed to be less successful to obtain accurate color representation and consistent reproducibility in foods with non-uniform color, surface texture, size, and shape, as well as having a small measurement area that usually takes several points to compensate for the heterogeneity of the product. Also, spectrophotometers are commonly used to measure color in food products, but they require space to operate as well as demanding specialized training for sampling preparation and data analysis. Under this context, image analysis is a prominent choice as an objective technique to obtain an accurate, representative, and reproducible quantification of color.

We, at Quality by Images, have developed an image analysis method to grade cold-water prawns. Three different samples were used for this proof of concept: extra-large and large luxury cold-water prawns, peeled, cooked, and frozen, and cold-water prawns in brine. The extra-large and large luxury samples were

unfrozen before image acquisition. The sample size was between 130g to 180g and spread evenly to allow better visualization for color quantification.

The level of pink color was quantified and expressed in percentage as “pink fraction” (PF). The conclusions drawn from this work were:

- Our image analysis method can be used for “value grading” cold-water prawns. Extra-large cold-water prawns were classified as the product of the highest color quality, which leads to a better sale price.
- Our image analysis method can overcome the challenges of a non-uniform product (color, texture, shape, and size) to obtain a reliable quantification of pink color.
- Our image analysis method allows accurate quantification of pink and has a high degree of reproducibility.
- Our image analysis method provides a better representation of color due to the use of a bigger measurement area. Thus, the sample size is not a limiting factor for the application of our method.

Extra large	Large luxury	Medium
PF= 4.5%	PF=2.7%	PF=1.0%

Figure 1. Grading of cold water prawns by color (PF=pink fraction)

Our image analysis method empowered by mobile technology, cloud service, internet, and using cost-efficient image acquisition devices (e.g., mobiles, scanners) can be tailored to the specific needs of customers.

Our solution leads to a high “value grading”, and your seafood product can be arranged/graded into specific color quality criteria, leading to consumer acceptance and compliance with industry standards.

Would you like to hear more? Contact us: kdeza@qualitybyimages.dk