

Development of a Snow Crab Soft-Shell Measurement Device:

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Background:

A snow crab grows by periodically shedding its old, smaller, hard shell and forming a new, larger and soft shell, which then gradually hardens over time. With respect to managing the snow crab fishery, it is important to distinguish soft-shelled crab for two reasons:

1. To **quantify growth rates** for modeling the dynamics of the snow crab population and determine the status of the commercial stock.
2. To **estimate the quantity of soft-shelled crab** being caught by fishermen. High proportions of soft-shells can lead to local closures of the fishery in order to protect these vulnerable crab, which can then harden and be fished the following year.

Currently, soft-shelled crab are using a number of **subjective external characteristics** of the crab's shell, such as colour, opacity, iridescence, or the quantity of surface organisms on the crab shell. Training and field testing is required to achieve the desired level of consistency between field samplers, with varying levels of success. The task is further complicated by the fact that the external appearance of crab varies between different locations and over time, creating much uncertainty as to the reliability of these observations. Thus there is a **need** of a way **objectively** distinguish between soft and hard-shelled crab in the field.



Snow crab moulting: A soft-shelled crab is shown emerging (left) from its old, hard shell (right). Note the larger size of the soft-shelled crab. Soft-shelled crab are undesirable for fishermen, due to their low meat content, but suffer mortality when they are caught, even when they are returned to the sea.

General approach:

Explore the material properties of certain parts of the snow crab (likely the claw), with a view towards developing a prototype of a handheld device whose output data can be used to identify soft-shelled crab. Devices can be based on mechanical, optical or acoustic measurements. The main purpose of such a device would be field identification of soft-shelled crab.

Specific applications:

A field device would have immediate applications on all our (DFO) Science surveys, as well as for the snow crab soft-shell protection protocol, in that at-sea observers could use it for monitoring snow crab fishery catches.

Technical challenges:

1. The characteristics of soft-shelled crab change during the fishing and survey sampling seasons. This can include the shell colour, shell opacity and meat content of the crab.
2. Field work environment is often wet and dirty. Electronic devices need to be both waterproof and shockproof.



A catch of snow crab. Between 50 to 100 million snow crab are caught each year in the New Brunswick and PEI and Quebec. Only male snow crab are caught.

DFO support:

- Provide required background biological information, technical expertise (i.e. field sampling and data analysis) and field testing (laboratory or at-sea science survey) for the project.
- Possibility of a pilot project with at-sea observer companies, which currently monitors soft-shell levels during the snow crab fishery.