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Health & Welfare

Freshwater prawns on ice

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Product stores better deheaded, peeled

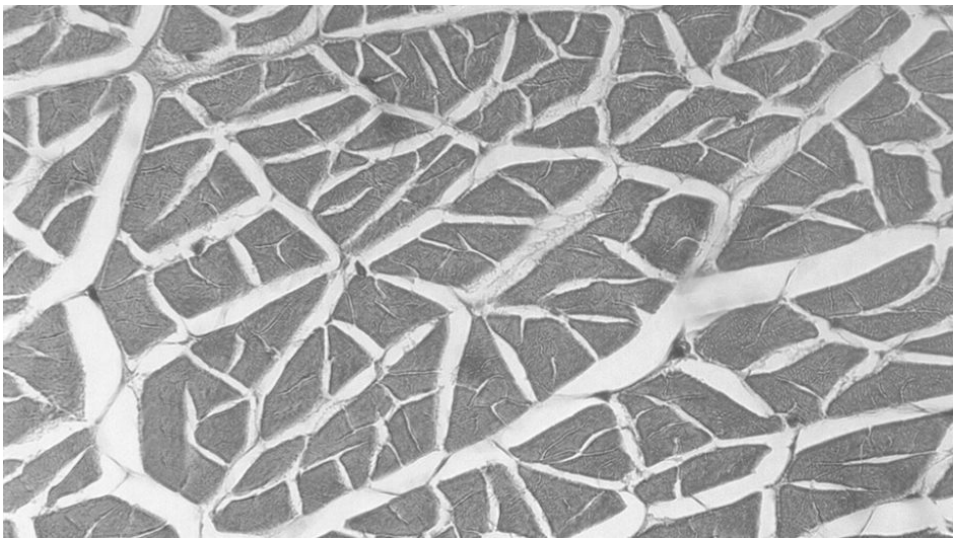
Freshwater prawn culture is currently expanding significantly around the world, with the Malaysian or giant prawn (*Macrobrachium rosenbergii*) one of its most highly regarded species. Now produced in many countries, the prawns can be marketed live, chilled, or frozen. However, farmers face constraints regarding meat quality deterioration.

Although the biology, larviculture, and production management of *Macrobrachium* are well known, there is limited information on their postharvest conservation and processing methods, as well as the possible histological changes that take place in their muscles after processing treatments.

Main processing problem

From the processing point of view, the main problem with giant freshwater prawns is the development of mushiness in the tail muscle, which can occur after four to eight days of storage. This phenomenon is characterized by a large loss of muscle integrity, especially in the first segment of the tail, which is caused by the diffusion of proteolytic enzymes, including the collagenase enzymes. The fact that mushiness always appears in the first segment adjacent to the hepatopancreas suggests the involvement of this organ, which softens and may suffer partial autolysis.

Improved processing procedures that could delay the appearance of mushiness are extremely important for prawn conservation. The authors recently conducted a study to evaluate the structural changes in the muscles of giant prawns stored in ice and compare whole and deheaded, peeled specimens.



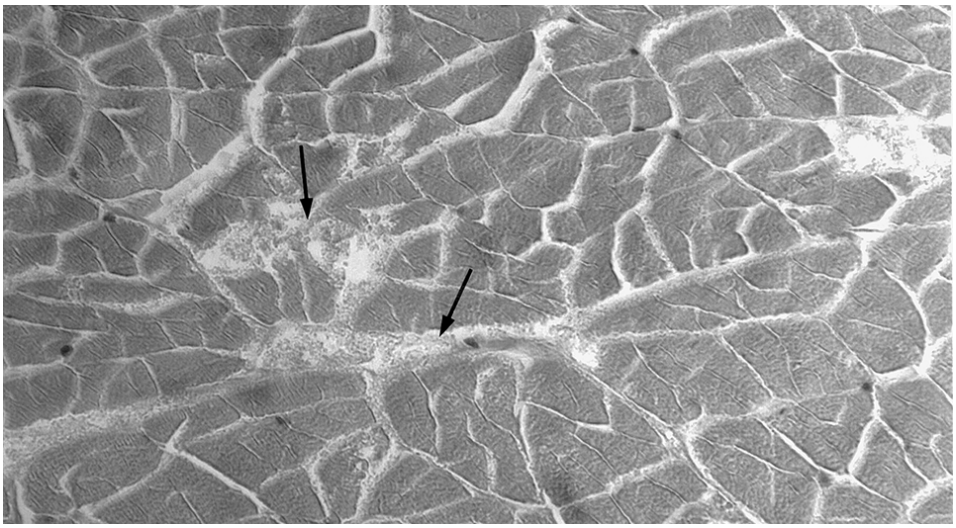
Cooked prawn muscle showed undamaged connective tissue with intact muscular bundles.

Experimental setup

The animals used in this study were bred in ponds at the Aquaculture Center of Universidade Estadual Paulista in Jaboticabal, São Paulo, Brazil. The prawns were collected from ponds, washed immediately with clean, chlorinated water, and sacrificed by temperature shock in ice water.

The animals were divided in two groups: deheaded and peeled, and whole. The two populations were separately stored in thermally insulated boxes with the addition of triturated ice for 10 days. The fusion water was continuously drained and the ice replaced daily.

Two specimens of each group were collected for histological analysis at the beginning of the experimental period and at two, four, seven, and 10 days of storage. The prawns were placed in boiling water for four minutes, then their first and second abdominal segments were collected and fixed in 10 percent buffered formalin. Samples were embedded in paraffin, sliced, and stained.



Prawns stored whole showed progressive degradation of both connective and muscle tissues.

Results

The connective tissue in prawn muscles is composed of collagen fibers. It is classified into three types: epimysium, perimysium, and endomysium, based on location in the muscle. The epimysium is the thick, dense, and more resistant connective tissue that forms the outer covering of the muscular tissue. The perimysium and endomysium are the thin connective tissues that surround the muscle fiber bundles and each muscle fiber, respectively.

The samples of cooked prawn muscle showed undamaged connective tissue with intact, well-organized muscular bundles. During storage, progressive ruptures of both epimysium and perimysium were observed, with partial disorganization of fibers in both segments of the prawns when stored deheaded and shell off.

In the prawns stored whole, a homogeneous and progressive degradation of both the connective tissue and muscle was observed during the storage period. It occurred first in the perimysium and later in the endomysium. The degradation of the connective tissue was more intense in the first segment, confirming that the action of collagenase enzymes discharged by the disintegration of the hepatopancreas was responsible for the beginning of tissue degradation, which induced the mushy condition during storage in ice.

Conclusion

On the fourth day of storage, the prawns stored whole showed degradation similar to the deheaded, peeled specimens on the seventh day of storage. The difference in condition increased with time, and on day 10, the whole prawns showed the strongest degradation of connective tissue.

Tail mushiness may have been due to autolysis of the hepatopancreas in the whole prawns, which released proteolytic and collagenase enzymes into the muscles, thus increasing their degradation. The less-intense muscle degradation observed in prawns stored deheaded and peeled suggested that this conservation condition yields better meat quality, as well as longer durability during ice storage.

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