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Protein changes in shell and epidermis of shrimp (*Pandalus borealis*) after maturation on ice or in salt

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Background

Mechanical peeling of boiled cold-water shrimps requires a preceding maturation period, a procedure that at the same time leads to reduced quality.

It is hypothesized that during maturation the protein profile (the proteome) of the epidermis layer and the shell of the shrimp is changed, mainly due to proteolytic activity and altered protein solubility, and that some of these changes facilitate the shell loosening that is required for mechanical peeling. These aspects are studied in the collaborative project TECHSHELL

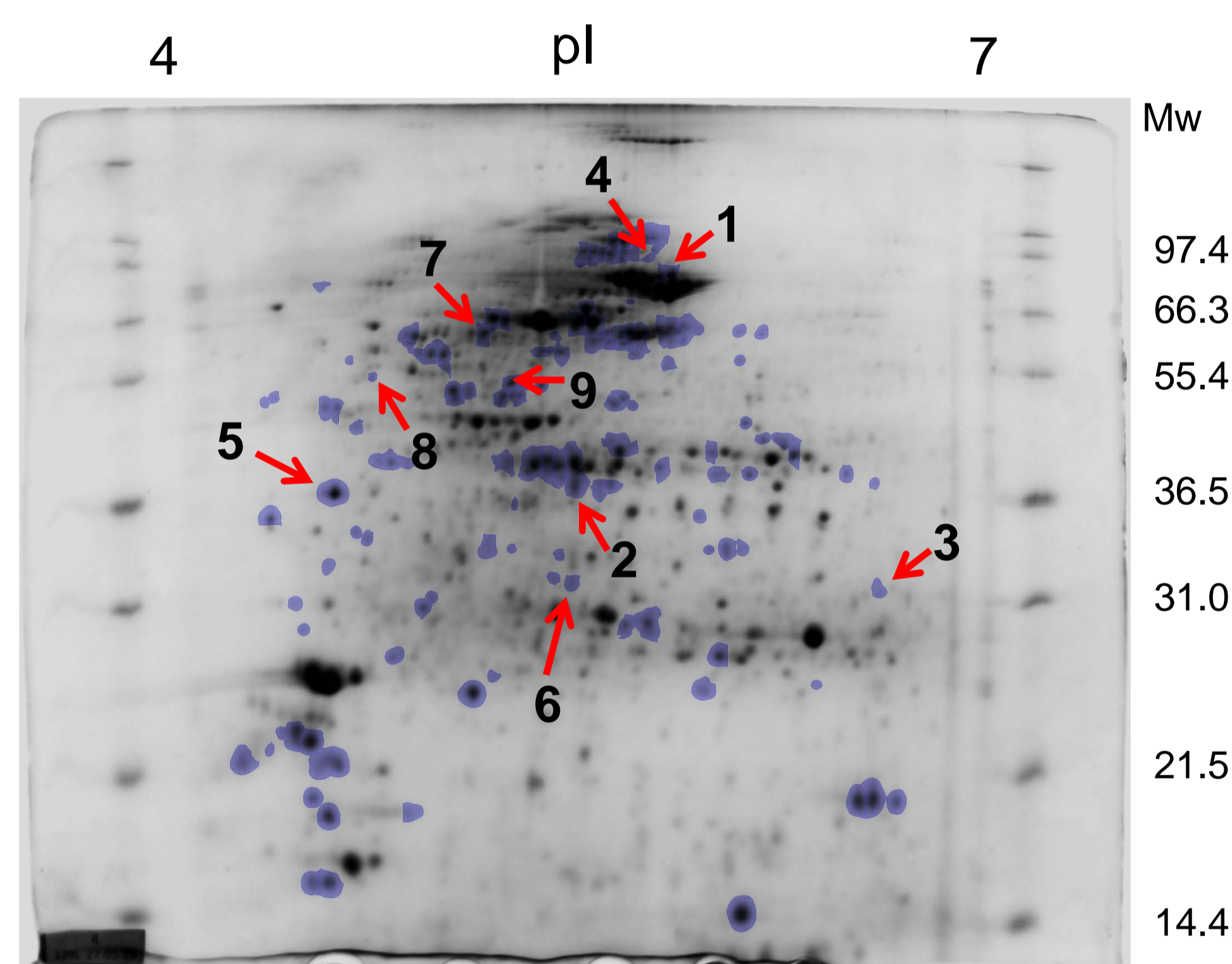
Aim & Approach

To investigate the impact of maturation on the proteome of shrimp epidermis and shell.

Non-matured, frozen shrimps (n=20) and shrimps that were matured using two different procedures: ice maturation for 4 days (n=20) or maturation in 2% salt brine for 40-44 h (n=20) were compared. Proteins from shell and epidermis were profiled by 2D-gel based proteome analysis and proteins of interest were identified by tandem mass spectrometry.

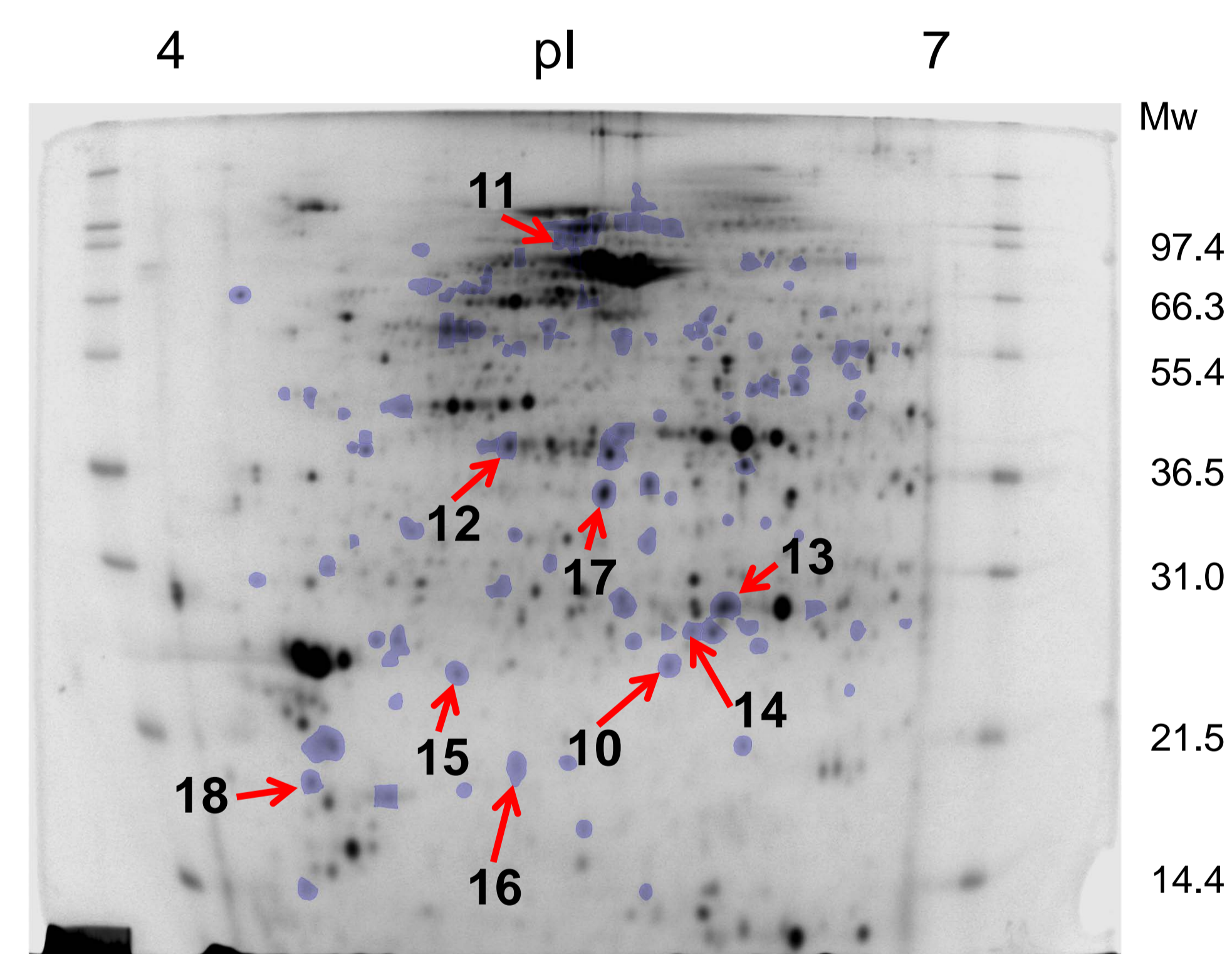
Results

136 protein spots in the epidermis and 120 protein spots in the shell differed ($p < 0.01$) in spot volume comparing the three experimental groups. A low false discovery rate ($q = 0.037$) indicates < 4 spots to be false positives.



Epidermis

Of the 136 highlighted spots (blue), 49 increase and 42 decrease during maturation on ice or in salt. The remaining 45 spots change differently in ice and salt.



Shell

Of the 120 highlighted spots (blue), 58 increase and 50 decrease during maturation on ice or in salt. The remaining 12 spots change differently in ice and salt.

Spot no.	Protein name	Change direction
1	Hemocyanin subunit 1	↓
2	Alpha tubulin Fragment	↓
3	70 kDa heat shock protein form 2	↓
4	Myosin S1 heavy chain Fragment	↑
5	Tropomyosin	↓
6	Skeletal muscle actin 6 Fragment	↑
7	Myosin heavy chain Fragment	↓
8	Alpha actinin Fragment	↑
9	Hemocyanin subunit 1	↓

Spot no.	Protein name	Change direction
10	CYP302 Fragment OS	↓
11	Myosin heavy chain Fragment	↑
12	Skeletal muscle actin 6 Fragment	↑
13	Arginine kinase 1	↑
14	Myosin heavy chain Fragment	↑
15	Sarcoplasmic calcium binding protein	↑
16	Skeletal muscle actin 6 Fragment	↑
17	Arginine kinase 1	↑
18	Sarcoplasmic calcium binding protein	↑

Conclusion: Maturation caused marked changes in the epidermis and shell proteome