

## SUMMARY

Scallops have great commercial value all over the world and in Europe the scallop *Pecten maximus* has been of considerable interest for the aquaculture industry. Due to inferior performance in suspended culture, seabed culture has been regarded as the most suitable method of *P. maximus* cultivation. The development of seabed culture has been hampered by great losses due to predation by the crab *Cancer pagurus*. This study was carried out to investigate the defence capabilities in *P. maximus* of cultured and wild origin to better understand predator-prey interactions between crabs and scallops in culture.

Results from predation experiments showed that when the size of cultured *P. maximus* increased, *C. pagurus* predation behaviour changed in terms of increasing handling time and shift in shell breaking techniques. The crabs were offered cultured scallops of three size groups within a range of 50-75 mm shell height. Median handling time and the variability in handling time distribution increased from the small group to the two larger groups. The increase in handling time was explained by a shift in shell breaking techniques from smashing the small scallops to using more time consuming techniques on the larger scallops. Comparison of crab predation on cultured and wild scallops showed that *C. pagurus* clearly preferred cultured scallops to wild. While the crabs preyed upon cultured scallops of 43-92 mm shell height, no wild scallops larger than 50 mm shell height were eaten. When offered cultured and wild scallops of the same shell strength, the crabs preyed upon cultured scallops in all strength groups, while only wild scallops from weakest group were eaten. These results indicate that both shell height and shell strength are important constraints in crab predation on wild scallops, while no such clear relationships are found when crabs prey upon cultured scallops. The comparison of shell strength in cultured and wild scallops of the same age (2-5 years old) showed that the wild scallops had larger, thicker and stronger shells than the cultured scallops in all year classes. In wild scallops, shell height, shell thickness and age accounted for more than twice as much of the variation in shell strength compared to cultured scallops. While shell strength in wild scallops increased with increasing age, shell strength in cultured scallops levelled out in scallops of age three and older. The low explanation rate of the variations in shell strength and the lack of correlation between shell strength, size and thickness in cultured scallops

indicated that there are probably other factors that influence the strength of *P. maximus* shells. Weaker shells in cultured than in wild scallops grown at the same site indicated that suspended culture negatively affects scallop shell strength development. In preliminary studies of shell structure in cultured and wild *P. maximus*, modifications of microstructure in shells of four-year-old cultured scallops supported the assumption that suspended culture affects shell formation in *P. maximus*. Results from experimental seeding showed that cultured scallops released in a fenced area to prevent intrusion by crabs, gave high scallop survival compared to seeding in an unprotected site. This demonstrates that removing crabs from the seeding site is a highly effective method to ensure reliable recapture rates in seabed culture. Still, a better understanding of interactions between scallops and crabs and the processes controlling the development of defence mechanisms in scallops is of major importance in future development of seabed culture.