

Rigor mortis (General)

- Rigor Mortis as a phenomenon is the stiffness of the muscles of an animal following the death
- After the death of an animal, the oxygen supply ceases. However, glycogen reserve in the muscle before death is converted -through enzymatic activity- into lactic acid accompanied by a fall in the pH. The amount of lactic acid depends on the glycogen reserves.
- The stiffening of muscles is attributed to the dynamics of adenosine triphosphate (ATP) and adenosine diphosphate (ADP) within the muscles accompanied lactic acid accumulation and the fall of pH
- Immediately after death in the pre-rigor phase, the muscles of an animal are soft. After several hours (depending on several factors), muscles begin to stiffen and harden
- Stiffness continues reaching its maximum and last for hours or days before muscles start to relax again

Rigor mortis in fish (1)

- Rigor Mortis in fish is not different in principles from that in other animals However, there are fish-specific issues
- In general, fish muscles are characterized by its low contents of glycogen and hence the drop in the pH is small

The time a fish takes to go into, and pass through rigor depends on the following factors:

- **Fish species:** Some species take longer than others to go into full rigor. The difference is attributed to differences in their chemical composition. Whiting goes into rigor very quickly and may be completely stiff in one hour after death. Several other species may require much longer time. In general, the onset of RM in fish may vary from about 10 min to several hours after death (1-7 hours is a good estimate)
- **Fish size:** Small fish usually go into rigor faster than large fish of the same species



Rigor mortis in fish (2)

The time a fish takes to go into, and pass through rigor depends on the following factors, Cont:

- **Physical condition of the fish:** The less a fish is nourished before capture, the shorter will be the time it takes to go into rigor; this is because there is little glycogen reserve in the muscle. The same is for spent females after spawning as well as for starved fish whereas glycogen reserves may be depleted
- **Handling stress:** The greater the stress fish has experienced through handling prior to capture and death, the lesser are its muscle reserves of glycogen and the onset of rigor merits becomes rapid and so the duration of rigor. This leads to meat of poor texture and a shorter shelf life. On the other hand, the later rigor mortis begins and the longer it lasts, the longer are the storage life of the fish
- Temperature at which fish is kept is perhaps the most important factor that determines the onset and duration of rigor. The higher the temperature, the sooner rigor begins the faster it ceases, and the greater will be the toughness of fish when it is cooked and eaten



Rigor mortis in fish (3)

Rigor mortis in regard to fish processing and consumption

- Filleting fish that are in the mortis will be often difficult and may give a slightly lower yield compared to fish that are soft and flexible
- In order to produce firm meat of lobsters, crabs and crayfish that may be kept alive after catching in water or damp conditions, they should preferably be cooked alive or before rigor mortis sets



Better handling of fish throughout all phases and keeping them at as low temperature as possible will eliminate undesirable effects of rigor mortis and ensure an optimum onset and duration of rigor period towards a fishery product of higher quality and longer shelf life