

American hard-shelled clam

(*Mercenaria mercenaria*)

Summary

Size	Max 120 mm (Roegner and Mann, 1991)
Lifespan	46 years (Peterson, 1986)
Size of maturity in the SIFCA district (L₅₀)	- North America: 20-35 mm
Fecundity	17 – 60 million eggs (MacKenzie et al., 2002)
Reproductive frequency	Annual
Capture methods	Dredge and hand gathering <i>Dredge fishing:</i>
Fishing Season	May-December (Poole Harbour) November-February (Solent) <i>Hand gathering:</i> Year-round



Description

The American hard-shelled clam (*Mercenaria mercenaria* previously *Venus mercenaria*) is a non-native species with a limited distribution in British waters. It is known by a variety of names including hard clam, quahog, cherry stone clam, northern quahog and littleneck clam. For the purposes of this document hard-shelled clam shall be used hereafter. Native to North America from the Gulf of St. Lawrence in Canada to the northern Gulf of Mexico the hard-shelled clam has been introduced to parts of Asia, the Caribbean and Europe including Britain, Belgium and France (FAO, 2009). Populations exist along the south coast of England, Burnham-on-Crouch in Essex, Pembrokeshire in Wales and Loch Sunart in Scotland (Carter, 2005). Hard-shelled clams were successfully introduced to Southampton Water in 1925. Earlier introductions had been attempted but a self-sustaining population was only established in 1925 (Mitchell, 1974; Williams and Davies, 2018).

The successful colonisation is attributed to the heated industrial discharges from power stations (Southampton (decommissioned), Fawley (decommissioned), and Marchwood) which provide optimum temperatures for the species growth and reproduction. Larval dispersal and deliberate introduction of the species to additional areas in the region such as Poole Harbour and Newtown Creek on the Isle of Wight has contributed to its increase in distribution (Mitchell, 1974; Williams and Davies, 2018).

The hard-shelled clam is found in coastal lagoons and estuaries where it burrows beneath the surface of the seabed, preferring a mixture of sand and mud sediment (Mitchell, 1974; FAO, 2009). At low tide individuals descend as deep as 25 mm into the seabed and return to the surface at high tide where they filter the water to feed on phytoplankton and other suspended particles (Roberts et al., 1989; FAO, 2009).

Reproductive Life history

The hard-shelled clam is a protandrous hermaphrodite beginning life as a male before transforming to a female in later maturity (Roegner and Mann, 1991). Males spawn first and release a pheromone that stimulates the females to release their eggs, fertilization then takes place externally (Nelson and Haskin cited in MacKenzie et al., 2002). The fecundity of hard-shelled clams is extremely high with the number of eggs released by a single female over a spawning season estimated to range between 17 – 60 million. Females spawn multiple times throughout a season and estimates range from 1- 3 million eggs per spawn to highs of 16-24 million eggs per spawn (Bricelj and Malouf, 1980 cited in MacKenzie et al., 2002; Roegner and Mann, 1991).

The spawning season is triggered by water temperature and ranges across the hard-shelled clam's distribution. In South Carolina spawning occurs intermittently from May to October when water temperatures exceed 24°C (MacKenzie et al., 2002). However, populations in the Southern IFCA district have adapted to spawn at temperatures 3-4°C lower than populations in its native range. Mitchell (1974) suggested the critical temperature for spawning is 18 to 19°C in Southampton Water whilst Al-Sayed (1988) concluded gametes were mature in temperatures above 16°C. The spawning season is thought to be similar to the species' native range as two spawning periods have been observed in Southampton Water between May and October (Al-Sayed, 1988).

Water temperature also affects the length of time fertilized eggs take to develop into larvae and metamorphose into miniature hard-shelled clams. At a constant 18°C the process takes from 18 to 24 days (Loosanoff et al., 1951 cited in MacKenzie et al., 2002). Before settlement, the planktonic larvae are carried widely by currents and winds (MacKenzie et al., 2002). Once settled on the seabed the larvae attach to the sediment with a byssal thread and develop a calcified shell within one to two days before burrowing into the substrate (FAO, 2009; MacKenzie et al., 2002).

In the native range of the hard-shelled clam, juveniles grow to approximately 10-155 mm in year 0 and reach 25-30 mm by the end of year 1 (Hadley and Coen, 2005). However, like reproduction, growth is dependent on water temperature resulting in large variability in growth across the species range. In Chesapeake Bay, a warm temperate area, growth is greatest in spring and autumn and decreases in summer. In winter when temperatures fall below 9°C growth stops altogether and the hard-shelled clam becomes dormant (Roegner and Mann, 1991). In general, hard-shelled clams grow in water temperatures between 10-30°C but most growth occurs between 18-25°C. Clams become dormant in waters below 5°C (FAO, 2009). Other factors that affect growth include salinity and age. Individuals can tolerate salinities to 12 ppt (parts per thousand) but do not grow in these conditions in the species native range (Roegner and Mann, 1991). As hard-shelled clams increase in age their growth rate decreases because shells start to become thicker rather than increase in shell length (Roegner and Mann, 1991). Hard-shelled clams can grow to a maximum length of 120 mm and may live up to 46 years (Roegner and Mann, 1991; Peterson, 1986). Due to their size, large, mature hard-shelled clams have few predators (FAO, 2009).

Size of maturity (SOM)

Size of maturity (SOM) is often used to help establish an appropriate Minimum Conservation Reference Size (MCRS) to ensure individuals can reproduce at least once before capture. The SOM of hard-shelled clams is commonly accepted as the total shell length at which 50% of a population are mature and is referred to as the L_{50} .

There is very limited SOM data for the hard-shelled clam outside of its native range of North America. One study that assessed the population dynamics of the hard-shelled clam in Southampton Water classed juveniles at 10-35 mm and brood individuals at 35-50 mm (Al-Sayed, 1988). All individuals greater than 50 mm were thought to be mature. Size at 50% maturity was not provided. Eversole (2001) reviewed sexual maturity of the hard-shelled clam across its native distribution and minimum shell length ranged from 20 to 35 mm. In the northern parts of the hard-shelled clams' distribution, it takes up to three years to reach these sizes whereas in the southern extremes it can take as little as one year (Eversole, 2001). Sexual maturity is a function of size rather than age in hard-shelled clams; therefore, maturity is affected by environmental conditions that influence the length of the growing season such as water temperature (Roegner and Mann, 1991).

The Minimum Conservation Reference Size (MCRS) for hard-shelled clams caught within the Southern IFCA district is 63 mm. Based on Eversole's review and the assumption that specimens larger than 50 mm in Southampton Water are all mature the current minimum size is much greater than the largest size at which hard-shelled clams reach maturity. Therefore, the MCRS is sufficient in protecting juveniles from being removed from the fishery before having the opportunity to reproduce.

Southern IFCA Fishery

Fishing activity

Due to the limited distribution of the hard-shelled clam in the UK it is only targeted in a handful of locations. In the Southern IFC District the main fisheries take place in Southampton Water and Poole Harbour where dredges are used to harvest the clams from the seabed. In Southampton Water a toothed box dredge is typically used and towed from the stern of the boat, with one or two dredges used per vessel, whereas in the shallower water of Poole Harbour pump-scoop dredges are utilised. A pump-scoop dredge consists of a small metal basket that penetrates the first few centimetres of the seabed. The pump-scoop dredge is towed alongside the vessel and water is pumped into the basket to rinse sediment off the shellfish as it is caught. The dredge is powered by an auxiliary pump and is a unique technique developed by fishers in Poole Harbour.

Previous to the pump-scoop dredge, clams were dredged by hand using a hand-held "scoop". This activity only takes place on small vessels 10 m or less in length. In 2015 a permit scheme was introduced in Poole Harbour under the 'Poole Harbour Dredge Permit Byelaw' to help manage the clam and cockle fishery and ensure its sustainability. The fishery currently supports 45 permits. In Poole Harbour the clam and cockle fishery achieved a global first in 2018 by being certified under the Marine Stewardship Council and Fisheries Standard as a well-managed and sustainable fishery and, at the same time, having a number of skippers in the fishery certified under the Seafish Responsible Fishing Scheme.

The fishery in the Solent (Southampton Water, Portsmouth Harbour and Langstone Harbour) is currently regulated under the Solent Dredge Fishing Byelaw 2016. A permit scheme is due to be introduced for dredging in the Solent in 2021. Both regulations in Poole Harbour and the Solent set a fishing season for dredging for clams and cockles. The fishing season takes place between 25th May and 23rd December in Poole Harbour and 1st November to end of February (inclusive) in Southampton Water, Langstone Harbour and Portsmouth Harbour. This, along with other measures under the regulations, ensure that the fisheries are compatible with conservation requirements.

Commercial hand gathering for hard-shelled clams also takes place.

Recreational

Hard-shelled clams are gathered by recreational hand gatherers at low tide, particularly in Poole Harbour and Langstone Harbour. When hand-gathering in the Southern IFC District clams may only be removed from the sediment by hand picking. Tool use such as forks and hand rakes is prohibited. Hand gathering takes place throughout the year, but temporal and permanent closures do apply to certain areas within the District.

Landings & Value of Fishery

In 2019, around 14 tonnes of hard-shelled clam worth £51,600 was landed into ports across the Southern IFC District (fig 1*). Between 2005 and 2019 the majority of annual landings fell between 10 to 15 tonnes per year. In 2007 and 2014 hard-shelled clam total landings were notably high at 34 and 46 tonnes, respectively. The value of hard-shelled clams has remained around £3,000 per tonne over the last three years (2017-2019). Previous to 2017, price per tonne ranged between £1,500 - £2,000.

*these figures represent vessels that land into ports in the Southern IFC District, some of which would have fished outside the district and be >12 metres in length.



Figure 2. Landings of hard-shelled clam (*Mercenaria mercenaria*) into the Southern IFC district from 2005 to 2019. Data received from the Marine Management Organisation (MMO).

Associated management

There are a number of measures within the Southern IFC district that contribute to the sustainable management of the hard-shelled clam. A MCRS of 63 mm (measured across the longest part of the shell) prohibits the removal of any specimen that measures less than 63 mm. This prevents immature specimens from being removed from the fishery. Southern IFCA is the only IFCA that enforces a minimum size for the hard-shelled clam and there is no national or European MCRS, most likely due to the species limited distribution.

Table 1 summarises additional byelaws that apply to the management of hard-shelled clam within the Southern IFC district.

Table 1. Southern IFCA byelaws that contribute to the sustainable management of the hard-shelled clam (*Mercenaria mercenaria*).

Management Measure	Summary of Measure
Solent Dredge Fishing Byelaw 2016	<ul style="list-style-type: none"> • Spatial and temporal restrictions for using a dredge in Southampton Water, Portsmouth Harbour and Langstone Harbour • Closed season 1st March – 31st October • Byelaw to be replaced by the Solent Dredge Permit byelaw from 1st November 2021
Poole Harbour Dredge Permit Byelaw	<ul style="list-style-type: none"> • Permit required to dredge fish in Poole Harbour • incl. gear specifications, mandatory 18 mm riddle bar, spatial and temporal restrictions, catching restrictions and reporting. • Fishery open between 25th May and 23rd December
Fishing for Oyster, Mussels and Clams Byelaw	<ul style="list-style-type: none"> • Clams, oysters and mussels in the district can only be harvested by dredge towed from a vessel or hand-picked. No tools can be used when hand gathering e.g. hand rake or fork
Poole Harbour Shellfish Hand Gathering byelaw	<ul style="list-style-type: none"> • Hand gathering within certain areas in Poole Harbour is prohibited between 1st November and 31st March
Bottom Towed Fishing Gear Byelaw	<ul style="list-style-type: none"> • Bottom towed gear including dredges are permanently prohibited from certain areas within the Southern IFCA district to protect sensitive marine protected area features such as reef and seagrass
Prohibition of Gathering (Sea Fisheries Resources) in Seagrass Beds Byelaw	<ul style="list-style-type: none"> • No hand gathering or digging in prohibited areas of seagrass beds in the District

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