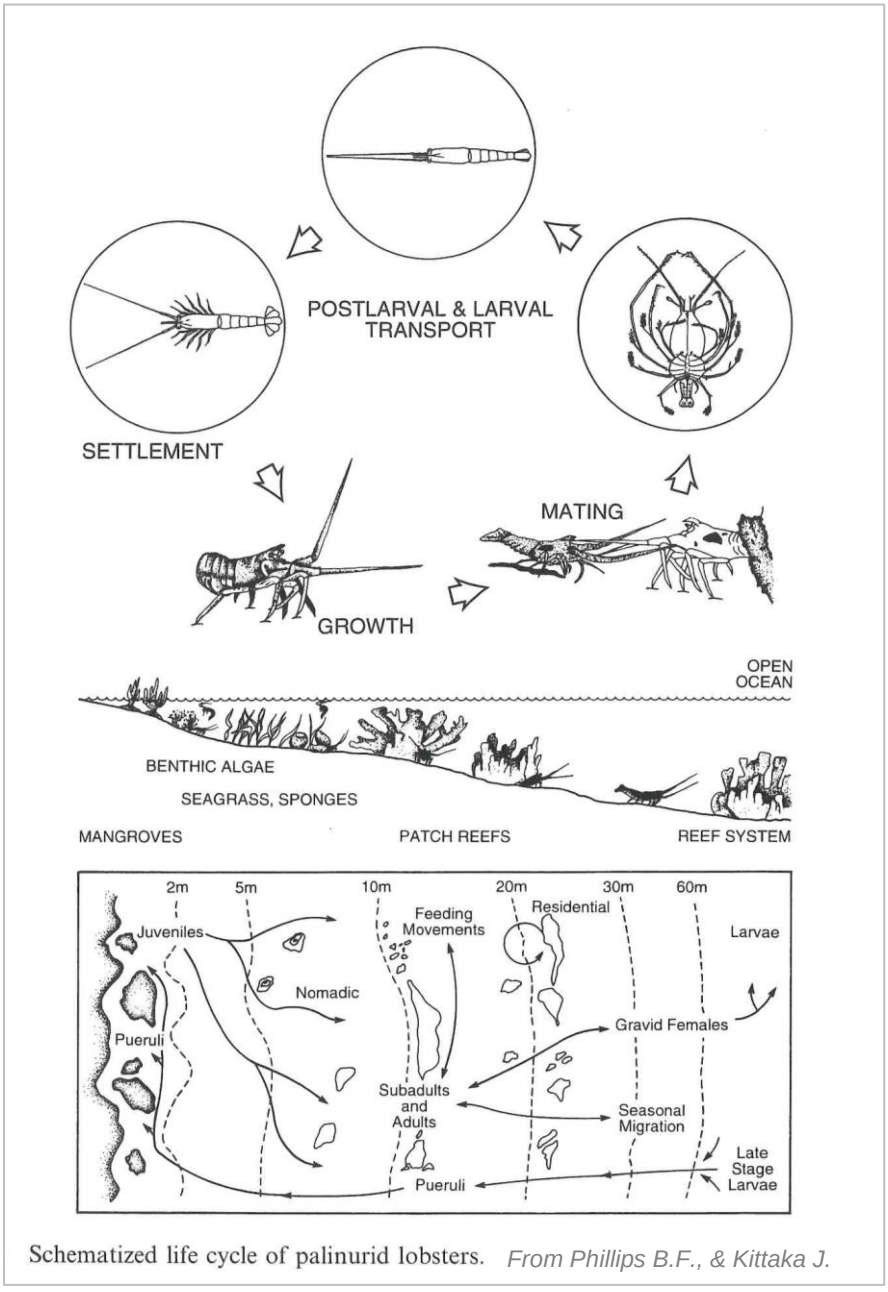
European Spiny Lobster or Crawfish – *Palinurus elephas*

A Summary of its Biology and Ecology

Characteristics	Information
Size at sexual maturity	In Brittany the main size of functional maturity (ability to mate and lay eggs) was estimated at 95mm CL (the smallest berried females was 92mm CL). In Ireland this was estimated at a smaller size, where the size of 50% maturity of females (presence /absence of hairs on swimmerets that hold eggs), was found to be 82mm CL and for males it was 84.5mm CL (Mercer, 1973). In the Atlantic males are able to reproduce at 90mm CL at ~500g weight.
Reproduction	Spiny lobsters make loud rasping sounds underwater by rubbing the bases of their antennae - stridulation. A female makes a specific 'stridulating sound' to attract males to mate with. This noise stops as soon as a male touches her with his antennae so other males cease to be attracted. Copulation occurs sternum to sternum between intermoult individuals a few weeks after the female moult (Mercer, 1973). The male deposits two spermatophores of a milky white gelatinous texture on the two sides of the female's sternum below the genital openings. In the Atlantic mating occurs between June and October (Hunter et al, 1996). Oviposition (egg laying) takes place shortly after mating, between 2- 10 days, and eggs are shed across the spermatophoric masses while the female scratches them with her 5th walking leg and eggs are fertilised (Goñi et al, 2005). Egg extrusion may take place in less than 2 hours (Mercer, 1973). Egg-laying peaks in September – October in the Atlantic.
Period of egg bearing	Females remain berried from mid-autumn to late spring prior to mating. Egg incubation is between 6-10 months in the Atlantic (Mercer, 1973), often seen at 9 months. Hatching occurs March to June in the Atlantic (Mercer, 1973; Hunter et al., 1996). Hatching may be complete in 24 hours.
Fecundity	The number of eggs depends on the female's size: 120,000 for a 1kg females; 250,000 for a 3kg females. About 10-30% of the eggs die during incubation. *Palinurus elephas* is 3-5 times less fecund than other members of the Palinurid family and only one clutch is incubated annually (Hunter, 1999). Fecundity increases with size up to the maximum size. Studies have shown where there is protection of larger males the individual fecundity was higher. Larger males have a potential greater contribution to reproduction relative to small males (MacDiarmid & Butler 1999).
Moulting	Several days before moulting, feeding ceases. Lobsters often move to deeper water. Moulting takes 15-20 minutes to complete. No feeding takes place until shell is hard 7-19 days later (Karlovac, 1965). Time between moults is 6 months for spiny lobsters <85mm and 1 year in larger specimens. Males moult through the year peaking at the time of the female moult. Females moult in UK from June/July to August/September (Ireland spring to early summer) prior to mating (Mercer 1973).

Larval Development	There are 10 planktonic larval stages. Pelagic Larval life is 10-12 months in the Atlantic (Mercer, 1973). The larva is a leaf-like transparent planktonic zoea called a phyllosoma (Goñi et al, 2005) which is adapted to along shore drifting life and is a poor horizontal swimmer, more competent at vertical movements, *P. elephas* larva measure 2-3mm total length at hatching (Mercer 1973). Eggs apparently hatch inshore, where larval stages are common (Mercer 1973).
Growth	Spiny lobsters are amongst the largest of crustaceans, the total length sometimes attains 60cm (Lipcius at al, 2000*). Palinurus elephas* has an estimated life span of 15 years (Marin, 1987). There is uncertainty in the growth increments per moult (Goñi et al, 2005). In 1970s research off Cornwall showed mean moult increments of <2 mm CL. Other studies off Ireland showed larger growth increments of about 12mm Cl for males and females. Estimates of size at age: 2-3years Males: 87mm – 0.455kg Females: 86mm – 0.510 kg 5-6 years Males: 123mm - 1.245 kg Females: 122mm - 1.225kg 8-9 years Males: 160mm - 2.680 kg Females:158mm – 2.350 kg Biometrics relationship have also been studied looking at the relationship between total length and carapace length, and carapace length and weight, but much of this work has been done outside the UK.
Ecology & habitat	Spiny lobsters live between inshore and 200m depth in rocky substrates within crevices and holes (Ceccaldi & Latrouite, 2000). When larvae settles and become juveniles they often remain in areas of algal cover until they are larger enough to move into crevices. Juveniles inhabit crevices often in groups. Maximal abundance has been observed between 50-100m. Adult spiny lobsters are often solitary or live in pairs or small groups at the base of rock or boulder over gravel beds ((Ceccaldi & Latrouite, 2000). The survival of early life stages (due to the length of time in pelagic form) and their dispersal is strongly influenced by meteorological and oceanographic processes. Other problems arise in the suitable habitat for early and late benthic phases of juveniles.
Activity	Spiny lobster activity is mostly at night. Movement is limited and motivated by foraging and reproduction. Most animals move less than 5km, but some larger animals can be more nomadic moving up to 20km after 1-8 years at large (Hepper, 1967 & 1970; Marin, 1987; Goñi at al., 20001b; Cuccu et al,1999) Juveniles tend to live <5m depth. As they increase in size they start to get nomadic moving out to 10m and greater depths. Sub adults and adults tend to live between 10m and 20m and make feeding movements (Lipcius et al, 2000.)

	They move off shore during periodic migrations. Shortly before adulthood many spiny lobsters move from nursery habitats to deeper reef habitats. Gravid females make offshore migrations to deeper water while embryos mature. Larger adults may also migrate to 30m + depth. (see schematic diagram).
Food	Spiny lobsters are highly omnivorous and prey on hard – shelled bottom dwelling organism, mostly molluscs, echinoderms, and crustaceans. It is a generalist and opportunist and changes its food preferences. Spiny lobsters have been implicated as key predators in a variety of benthic habitats and their selective predation is apparently responsible for profound effects on species composition and size frequency distributions of invertebrates such as sea urchins, mussels, and gastropods (Griffths & Seiderer, 1985; Joll & Phillips, 1984).



Schematized life cycle of palinurid lobsters. *From Phillips B.F., & Kittaka J.*

Data uncertainties	Areas of concern
Size of sexual maturity in SW population	Large males as greatest reproductive potential
Growth Increments in SW population	Larger females produce much more eggs
Are there distinct populations in SW?	Impacts of environmental and oceanographic changes e.g. AMO on larval dispersal and survival
Biometric relationships in SW populations – CL/TL; CL/WT	
Understanding movements and migration	

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