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WORKING WITH

Andy Don International Eel Expert

Fellow of the Institute of Fisheries Management (FIFM)

I love estuaries and salt marshes, particularly Steart and the river estuaries passing Burnham on Sea.

Working locally with Andy Don, an international eel expert, I have been educated on the incredible - implausible sometimes! - life of Eels.

This project has been the catalyst for me learning and enjoying so many new things about our fabulous coastline in general, and the important role we all have in managing our rivers, coastline and seas, especially in the light of my new-found understanding of this critically endangered animal.

Did you know for example that there are vast migrations out of, and into, the rivers, lakes, ponds and wetlands around Bridgwater and Burnham on Sea, making Bridgwater Bay an incredibly important and special location?

Or that the majority of Somerset's silver eels swim under the M5 bridges, the railway lines and many pass the pier at Burnham on dark, stormy, wild nights?

Using high river flows and the tides to their advantage in late October and November, they are completely single-minded in their quest to reach the Sargasso Sea, near Bermuda, some 3500 miles away where they breed and die.

There is then the hazardous new journey back towards Europe and transformation of eggs into larvae, then leptocephali and then glass eels.

In their 3500 mile journey these juveniles might succumb to rogue currents, starvation, or fall prey to fish and seabirds. The surviving glass eels teem into Bridgwater Bay in February time.

They use tidal flows to get transported into our river systems in the spring, where they then turn into elvers and subsequently yellow eels. They stay in our Somerset freshwaters for many years, up to 25, before feeling the pull of the sea and heading out on their final migration.

I want to make people from Somerset and further afield aware of what we could be losing, by impediments to their migration such as weirs and other man-made structures, also the mortality caused by being drawn into lethal intakes such as pumping stations, hydropower plants and nuclear power stations.

Other pressures have been man's greed by illegal exploitation (smuggling millions of glass eels to Asia), climate change (the shifting of the currents on which the Leptocephali drift and rely) and invasive parasites introduced from abroad.

I could not believe that this dramatic saga is unfolding annually on our coastal doorstep. The story of our Somerset eels seems to resonate across all species. I felt compelled to capture some of these themes in my relief editioned prints.

Our local wildlife is truly showing its connection to the global world.

THE DECLINE OF EELS

Somerset Eels



75x50 cms Wood, lino cuts, stencils etc Edition of 6

1 YELLOW EELS

The European eel is classified as 'Critically Endangered' by the International Union for Conservation of Nature, it appears on their 'Red List' of threatened species. Since 1970, the numbers of juvenile eels entering European rivers has declined by more than 95%. These Anguillid eels have been around for about 80 million years.

Glass eels come in from the sea and ascend our waterways, once they've been in freshwater for a few weeks they change into elvers. They become pigmented and resemble miniature versions of their pre-adult selves. They continue to grow and seek suitable habitat in which to thrive. At this early stage these elvers and small yellow eels are sexually undifferentiated. They will either stay relatively small and become males in a fairly densely populated part of the river system, normally the lower, downstream areas; or they will move further upstream into less densely populated areas where they will become females and grow much larger. The gender trigger appears to be density dependent.

The many weirs and man-made obstructions that are used to regulate and control river flows may hinder these upstream migrations. Special 'eel passes' have been designed and can be installed to overcome these obstacles.



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2 ESCAPEMENT

European eels must head to the sea in order to breed. We know that yellow eels can remain in our waterways for a very long time - eels have been aged at 85 years in freshwater - before the irresistible urge to migrate is upon them and the cycle starts afresh. They gradually turn into silver eels and start to adapt to a marine life whilst in freshwater. Their eyes and pectoral fins start to enlarge, their bodies become increasingly silver and their behaviour changes. They develop an incredibly strong urge to migrate downstream. These migrations are often less than straightforward because of obstructions. There are other hazards too, they can become vulnerable to predators and water intakes.

Females and males are different sizes at the point of migration, the females being up to one metre long, males seldom being longer than 500mm.



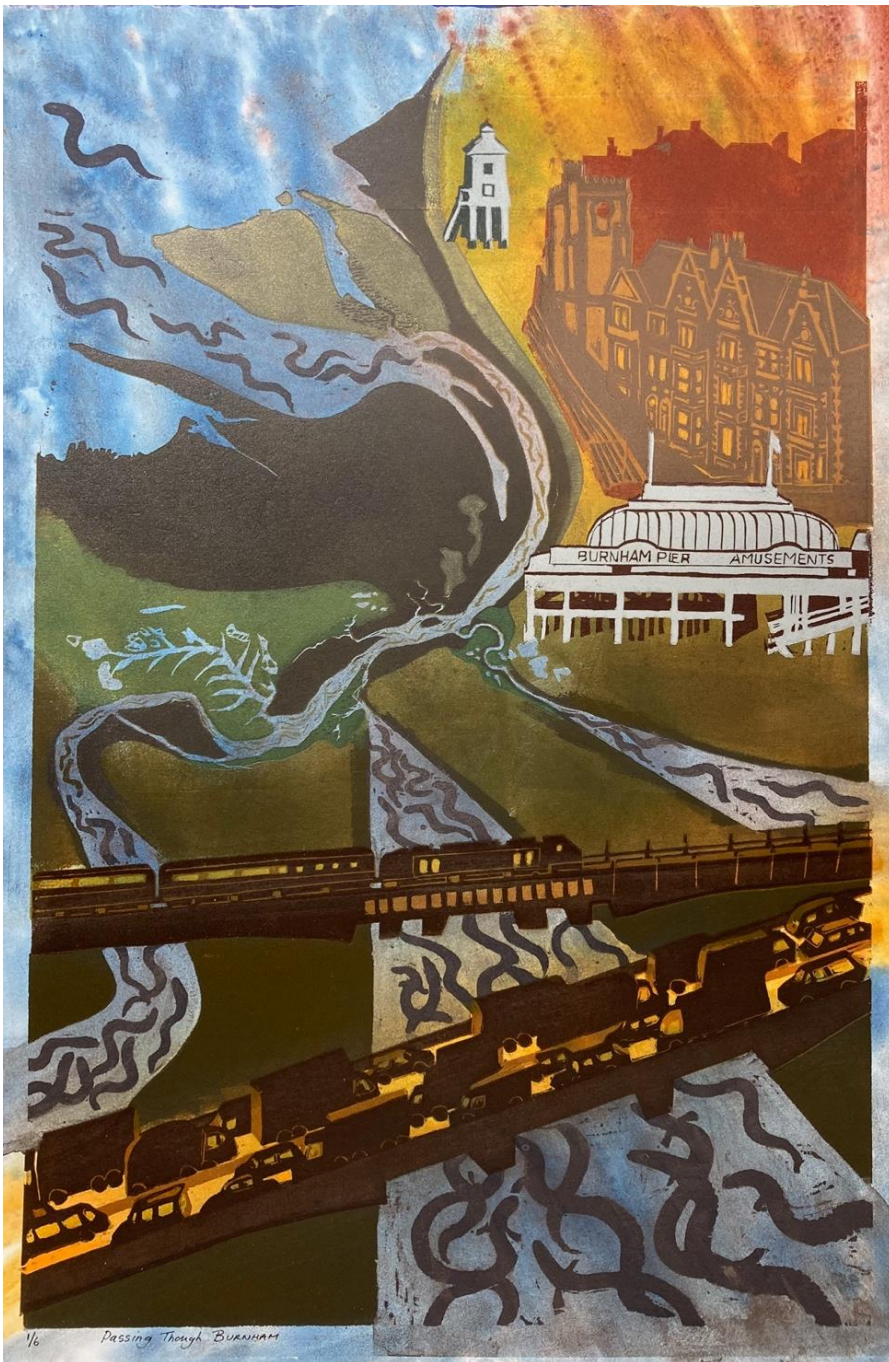
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3 SUSHI SURVIVOR

The eels we find in our Somerset waterways and wetlands may spend more than 25 years in freshwater, on average males spend 8-12 years in freshwater and females 12- 20 years. We can only age eels by examining the otoliths or 'ear stones' in their head which lay down growth rings like the rings of a tree.

On dark nights in autumn and winter, normally with the river in flood, silver eels migrate en masse down our river catchments. They are single-minded in their quest and, surprisingly, will move overland through wet grass to get to a stream or river from an isolated pond. They will even swim into noisy pumps and turbines in order to reach the sea.

In the last few years some pumping stations have been adapted to use 'fish friendly' pumps but many remain as either obstructions to this migration or as outright 'killers'.



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4. PASSING THROUGH BURNHAM

Silver eels move downstream and into the sea in pulses, responding to heavy rainfall or flood events. Often there are large batches of eels leaving at one time and so Somerset may see a large scale exodus if there has been persistent rain across the county affecting all the river systems. The rivers Tone and Yeo flow into the River Parrett and this is a major artery for eels to travel down. The King Sedgemoor Drain, the Brue, the Axe and the Congresbury Yeo all are capable of discharging silver eels out into the Bristol Channel – the first part of the marine leg of their 3500 mile journey towards Bermuda and the Sargasso Sea.



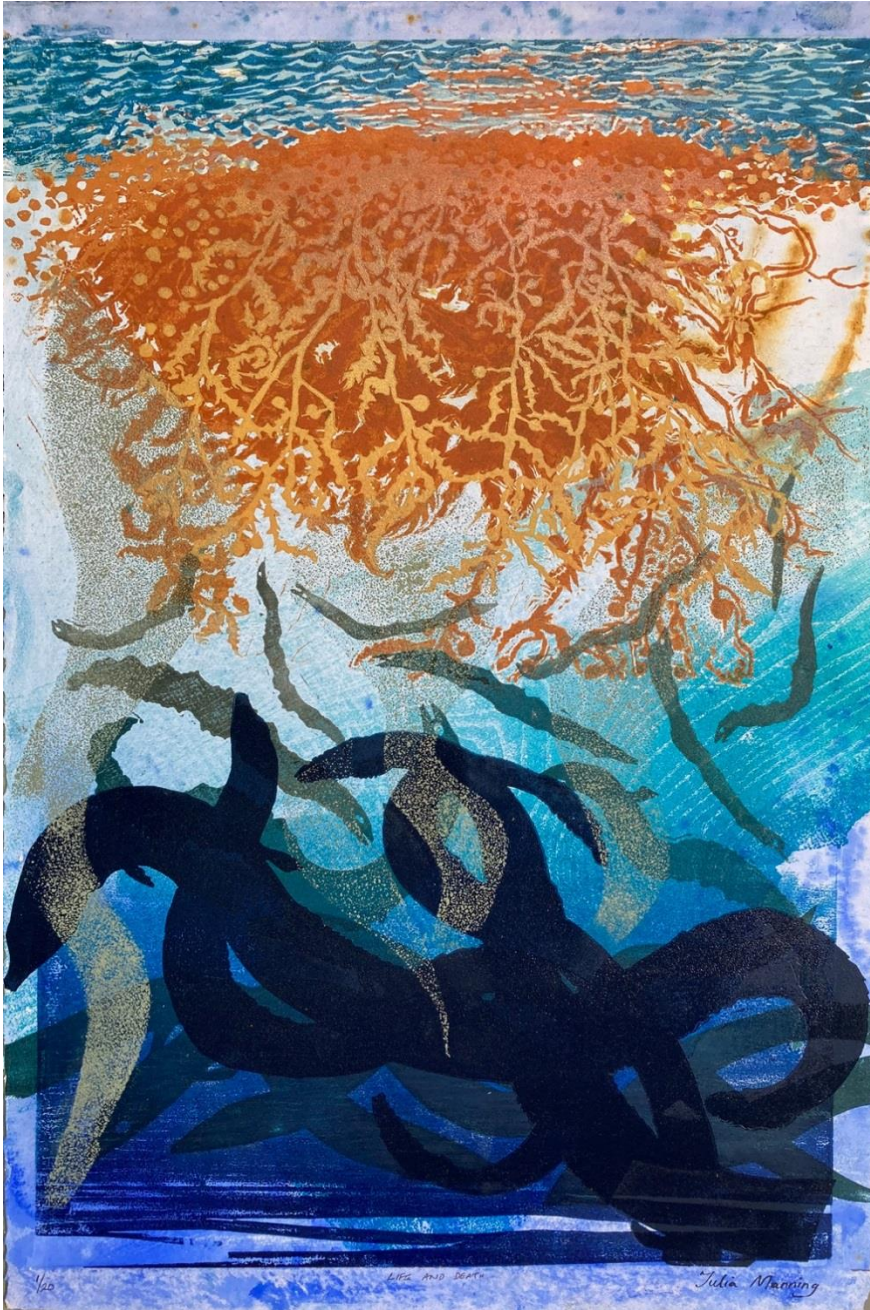
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5 WESTWARD HO!

As the eels pass Porlock they pass from the sediment rich, turbid waters of Bridgwater Bay and the Bristol Channel to the clear waters of the Celtic Sea then into the deep Atlantic proper.

When they reach the continental shelf they not only migrate along a line towards the Sargasso Sea, but migrate up and down in the water column, diving and rising many hundreds of metres in the course of a day. Scientists think this behaviour may be linked to navigation and be a predator avoidance strategy by ascending to shallower water at night time only. Most European eels now carry a non-native swim bladder parasite which may affect this carefully evolved behaviour and therefore their successful migration across the ocean.

During this marine migration phase, the eel does not eat at all, relying on burning the fat reserves it has accumulated over the years spent feeding in freshwater. Gradually the digestive system is absorbed and energy is transferred into making reproductive organs and either sperm or eggs.



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6 LIFE AND DEATH

Nobody has ever witnessed European eels spawning in the Sargasso Sea. No post-spawning eel has ever been captured in the Sargasso nor at any position outside of it. No dead eel has ever been retrieved in or near the Sargasso Sea. To say the act of spawning is a mystery is to understate it. Scientists believe that due to the effort required in making the migration, the fact that apparently irreversible physiological changes have occurred and the stress and damage that the act of spawning may involve, the eels die after spawning and their bodies remain on the sea bed.

We do know that a single large female eel can liberate many millions of eggs and so in a mass spawning event – if that is what happens - the sea must be opaque with eggs and milt. The fertilized eggs float to the surface and drift with the currents, heading towards Europe.



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7 EGGS AND LARVAE

Once the fertilized eggs have started drifting on the sea currents, the larvae inside start to develop. They hatch from the egg but retain the yolk sac for a time which provides nutrition before the larvae start actively feeding on plankton. They have incredibly large teeth with which to snag food particles. After a while these larvae turn into pre-leptocephali and then leptocephali.



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8. CHANGING CLIMATE, DISRUPTED GYRES

Leptocephali are classically described as being willow-leaf shaped. This shape is ideally suited to being caught in marine currents to be transported over large distances. Climate change may be having a direct effect on the way the currents or gyres convey the eels; the currents have been changing in strength and direction which could mean that the leptocephali are not being delivered to where they can thrive – they are missing their target; the warming waters may also be affecting production of the specific plankton, or the detritus from those plankton types, that the leptocephali feed on.



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9. PASSING THE AZORES

On the outward journey the Azores may be a convergent point for silver eels leaving different parts of Europe before reaching the Sargasso Sea.

On the larval journey oceanic currents wash the leptocephali past the Azores archipelago in order to reach European shores. These animals may be drifting for up to three years on currents like the Gulf Stream.

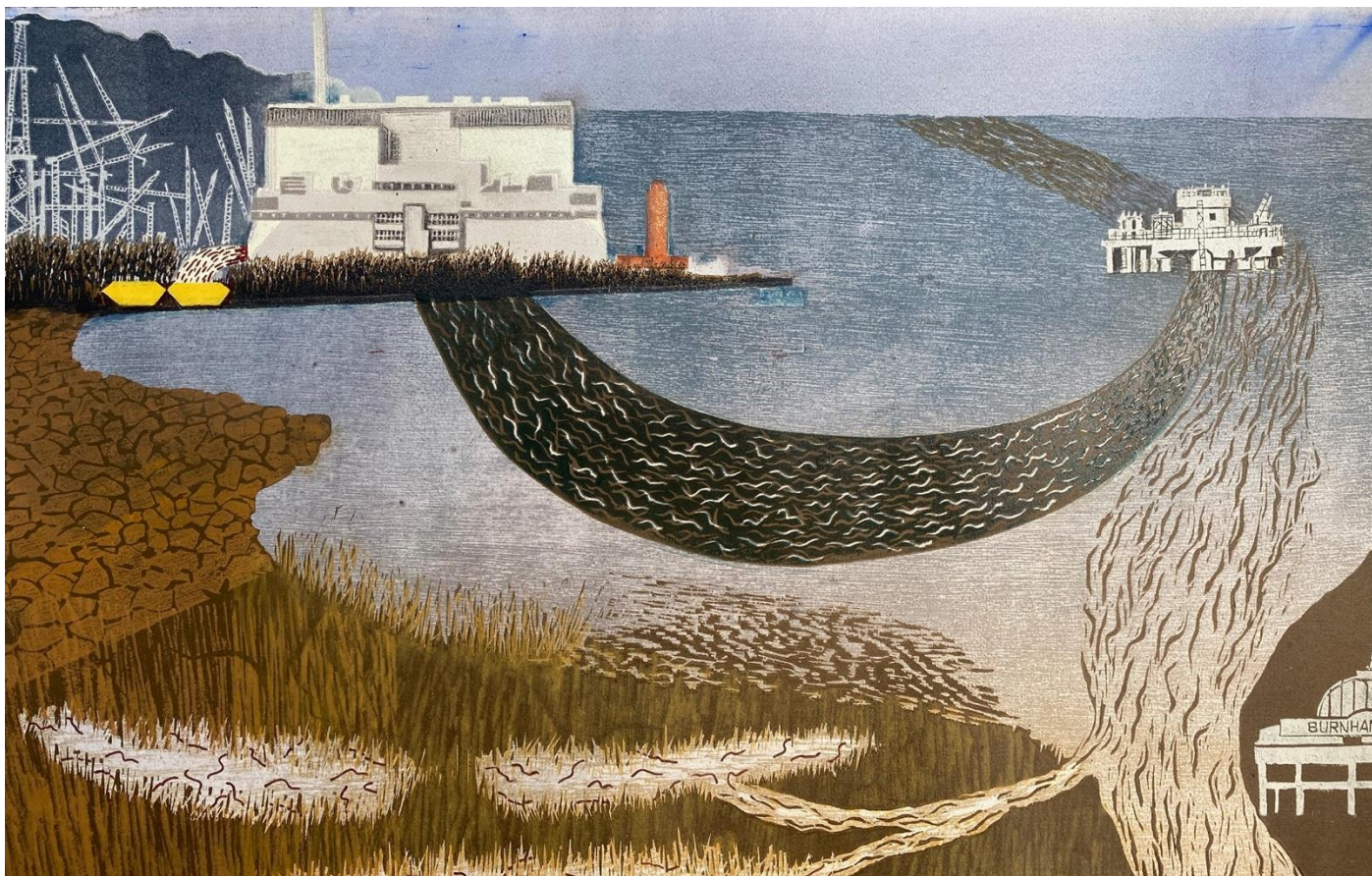
Scientists have recently used the Azores as a base in order to better understand the migration of silver eels from these islands, the most Western point of Europe that have populations of European eels.



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10 RHEOTAXIS

As the young eels near completion of their 3500 mile odyssey, they undergo yet another metamorphosis, on reaching the European continental shelf, they start to lose their willow-leaf shape and become much more the shape of the animal we recognize in our rivers. They become glass eels. These transparent animals come into our estuaries and bays in their millions, homing in on the smell and flow of freshwater. Their eyes and spine are clearly discernable and they have an innate drive to move upstream. Around January and February time they are in Bridgwater Bay waiting to move into freshwater.



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11. HINKLEY AND STEART MARSHES

Glass eels will use the tides to migrate into river systems and marshes, trying to expend as little energy as possible. Big Spring tides in March, April and May will deliver many millions of young eels to our estuaries and rivers under cover of darkness. These eels use the tidal cycle to leap-frog upstream; hugging the bed and the banks on the ebb so they don't get washed back downstream, but moving further up into the water column on the flood to be transported upstream.

Because the Sargasso Sea receives adult eels from a whole mixture of European countries, the eels that ascend our estuaries, brooks and rivers in the UK may be the progeny of parents from Sweden, Germany, Italy or any other eel-generating European country. This 'mixed stock' is great in terms of the eel 'not putting all its eggs in one basket', but also means that in order to make a meaningful impact on improving eel stocks, all European States must act in concert with their management actions.

As with the elver, yellow eel and silver eel life stages, the glass eel is vulnerable to a range of man-made and natural hazards which considerably reduce the numbers that actually arrive and settle in our river systems.



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12 THE GREED OF MAN

There are dip net fisheries for glass eels in estuaries draining into the Bristol Channel, in particular from the Rivers Severn and Parrett. The rivers draining out of Western France have similar fisheries.

The apparent contradiction in retaining a fishery for a critically endangered species seems obvious, however the majority of the English glass eel catch is stocked into rivers around Europe to fulfil Eel Management Plan stocking objectives. This is a conservation management measure which takes advantage of the large numbers of glass eels arriving into the funnel of the Bristol Channel, to be re-distributed into countries with poorer glass eel runs.

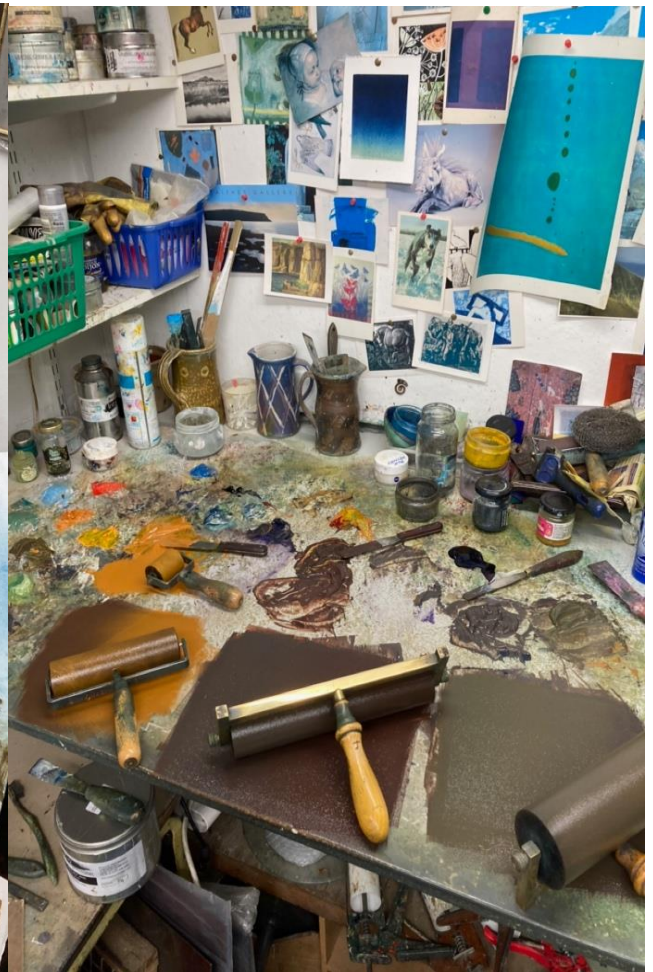
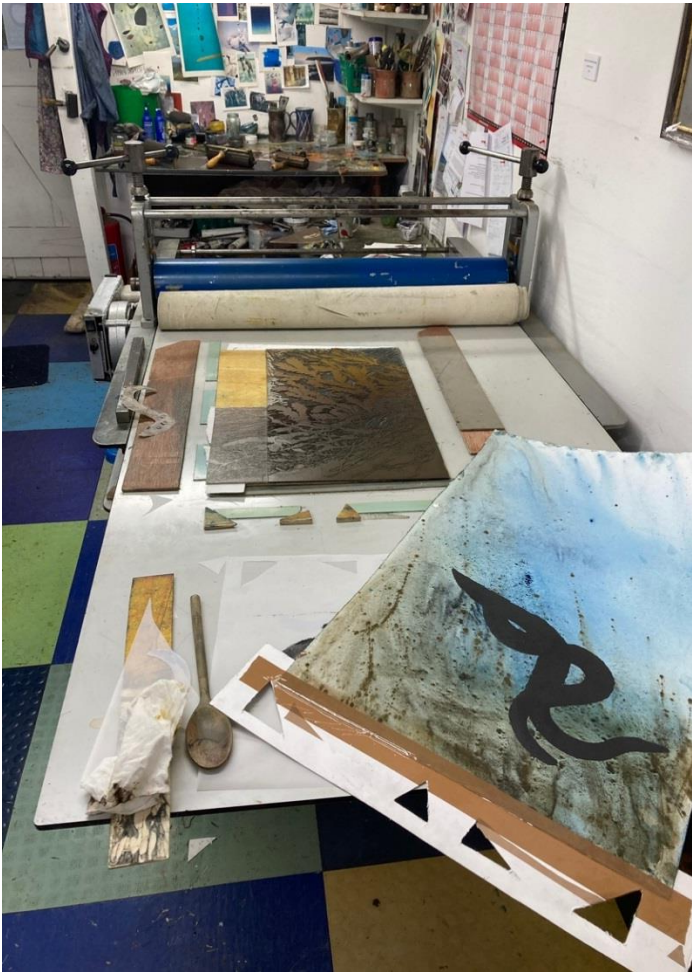
This highly regulated fishery also contributes valuable catch data to help monitor the stock and has a high heritage value, being a traditional capture method.

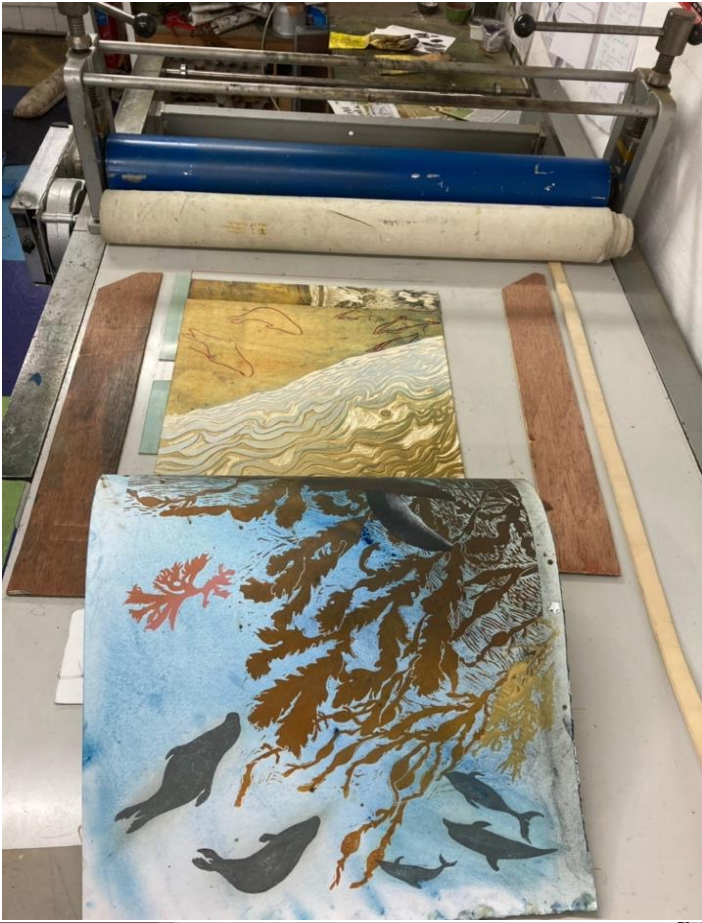
However in the late 90s into the 2000s there was a surge in demand for glass eels which drove the price that the fishermen received to more than £500/kilo. This demand was driven by large eel farms in the Far East.

There is now a ban on exporting European glass eels outside of Europe but smuggling this precious cargo has become a multi-million pound industry. Organized gangs use 'safe' routes to pass from country to country across Europe. These criminals distribute the eels into plastic bags which are then placed in hold luggage and flown by air to Asia.

Europol has had many high profile convictions for this crime but estimated that in 2017/18 as much as 100 tonnes of European glass eels (some 350,000,000 animals) were being illegally trafficked to Asia from Europe.

Production Photos



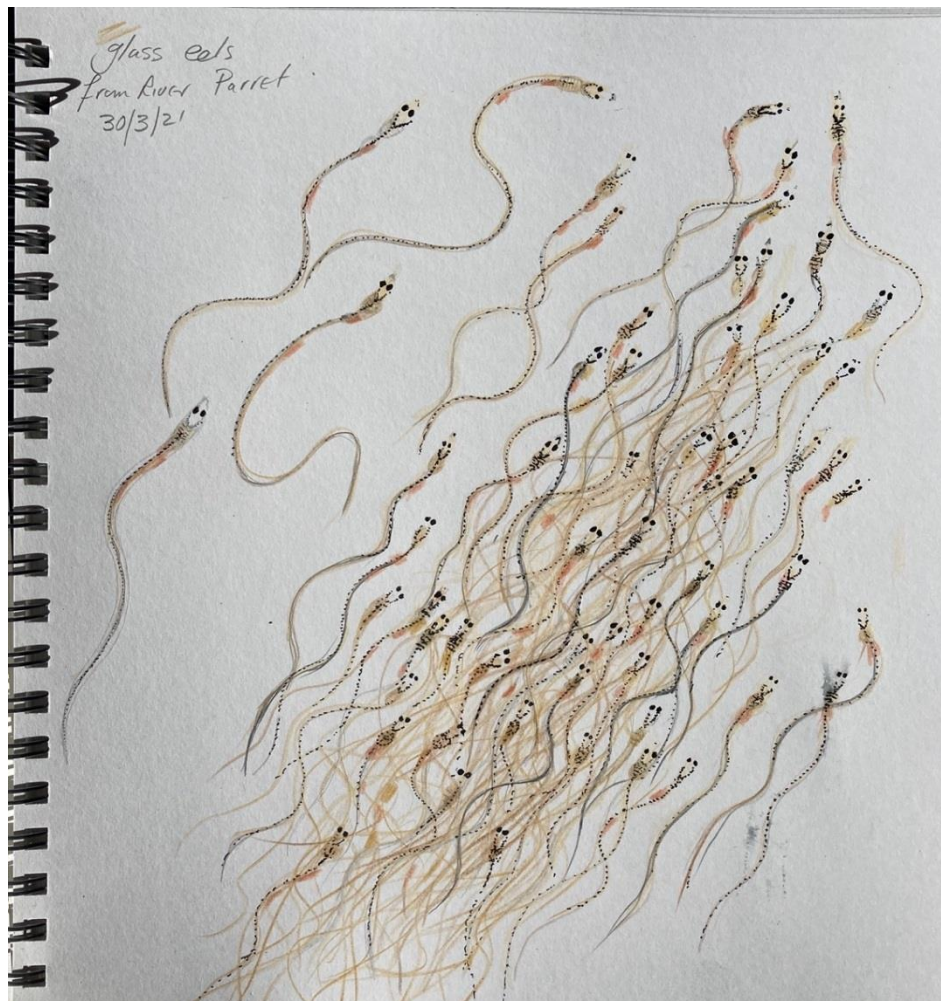






A frozen Eel from Lough Neagh in Northern Ireland was kindly lent to me in lockdown, by Michael Brown - Who later smoked it





Glass Eels delivered by Andy to my Studio, from the river Parrett, later released under Langport Bridge