ARE THE RAPIDLY INCREASING NUMBER OF GREY SEALS IN THE YTHAN ESTUARY AFFECTING SALMON AND SEA TROUT STOCKS? FULL VERSION.

FIRSTLY, LET US CONSIDER THE NUMBERS OF SEALS, MAINLY GREYS, IN THE YTHAN ESTUARY AT NEWBURGH.

- Control of seal numbers by salmon netting operators at Newburgh stopped in late 1997, when fixed engine netting stations ceased operation there.
- 1998 - we can confidently assume the numbers of seals at Newburgh in 1998 to be very few, probably near zero. (0)
- 2010 – Scottish Natural Heritage, Forvie NNR, reported the number of grey seals present at Newburgh on 22nd April at 369.
- 2015 – during the seal haul out consultation, local estimates of seal numbers, mainly greys, was 1300.
- 2019 – the Scottish Natural Heritage website stated in September 2019 that up to 2000 grey seals haul up on the Newburgh site.
- **We can see therefore that the numbers of seals, mainly greys, have increased from zero to** 2000 in around 10 years.

THE BBC LANDWARD PROGRAMME EPISODE 11 (2014/2015) ABOUT THE YTHAN ESTUARY.

The interviewer, Euan, asked Callan Duck of the Sea Mammal Research Unit (SMRU) if the grey seals on the site ate the salmon and sea trout in the estuary. Callan advised the diet of the seals in the estuary comprised mainly flatfish, also that if they concentrated on salmon and sea trout entering the estuary, there would be none left. Callan also stated that seals were lazy predators and that they would concentrate on fish that were easier to catch.

This led us to consider firstly the available information on swimming speeds of grey seals and salmonids (salmon and sea trout) in the various stages of their life cycle in and passing through the estuary, and secondly the various scientific studies on seal diet in the estuary.

GREY SEAL SWIMMING CAPABILITY. (Smithsonian National Zoo and Conservation Biology Institution)

General burst speed 14 – 23 mph, 23 – 37 km/h = **6.39 m/s – 10.28 m/s**

Cruising speed 6 mph, 10 km/hr = **2.8 m/s**

SWIMMING CAPABILITIES OF FISH (Extracted from the Scotland and Northern Ireland Forum for Environmental Research (SNIFFER) extended field manual.

Firstly, let us look at the life stages of the two species of salmonids in the estuary.

Salmon.

- Kelts: Salmon that have spawned in the river in the period typically in November/December of the previous year, descend through the estuary in early spring – certainly can be caught by seals – regularly seen being devoured in the River Don estuary in spring.

- Smolts: Juvenile fish, typically under **150 mm** long, which pass through the estuary around May each year – the burst swimming speed of smolts is less than **1.7 m/s** for a duration time of **3 – 4 secs.** Clearly if grey seals target salmon smolts they are fast enough to catch them.
- Mature Salmon: Salmon returning to the river pass through the estuary typically in the period August to the end of October – there are a very small number of salmon (spring salmon) that move through the estuary in very late winter/early spring, however these are not common in the Ythan. Mature salmon appear to move quickly through the estuary and grey seals have a limited opportunity to catch them – a small number of seals, both grey and common, do move upstream into fresh water following the mature salmon – are frequently seen in Ellon and slightly further upstream. Most of the mature salmon caught by anglers on the Ythan are in the range of 600 mm – 1000 mm long (1000 mm long salmon are quite rare). If we assume a salmon burst swimming speed of **4.9 m/s**, grey seals are certainly faster.

Sea trout.

- Kelts: Sea trout that have spawned in the river in the period typically in late September to November of the previous year, descend to the estuary in early spring – usually plentiful in the estuary by late March/early April. Some will hang about in estuarial waters, others will pass on through to the ocean.
- Smolts: Smolts, typical length around **200 mm or slightly larger,** drop down to the estuary from late April to early June, unlike salmon, many will stay in the estuary many months growing steadily to become finnock (whitling), some will leave for the ocean, travel up and down the coast and also to other river estuaries. Their slow burst swimming speed of **1.6 m/s** for a duration time of **3 – 4 secs.** is such that if targeted by grey seals they could be caught.
- Finnock (whitling): by definition, this life stage of a sea trout that begins when they first show growth after downstream migration as smolts - as the year progresses their size increases, typically in the Ythan, up to **275mm/300mm long**. Finnock are present in the estuary throughout the year, some having grown in the estuary, arrived from up and down the coast with visitors from other rivers. Finnock, let us say **300 mm long**, have a burst swimming speed of around **3 m/s** for a duration time of **9 secs**. - two to three times slower than grey seals.
- Adult sea trout: (finnock that have at least spent one winter at sea) and others that have spent more than one winter at sea, begin to appear in the estuary in May and are generally present as late as August/September, although many will have dispersed up river or to other rivers by the latter months. Adult sea trout are variable in length, depending how long they have spent at sea before returning – the longer time spent at sea the greater length and weight. Typically, the sea trout range from **380 mm – 450 mm** long, although there are some larger trout present. Even if we choose the highest burst swimming speed for trout at **4.18 m/s** for a duration of say **20 secs.** they are still considerably slower than grey seals.

From the above information we have determined that grey seals are fast enough to catch salmonids at every stage in their life cycle.

THE MORAY FIRTH SEAL MANAGEMENT PLAN SURVEY OF SALMON FISHERY STAKEHOLDERS PERCEPTIONS OF SEAL PREDATION IMPACTS 2006.

In 2006 a questionnaire survey of the 95 salmon rod fisheries in seven major Moray Firth rivers was undertaken, and all 20 active salmon netting stations in the Firth. Forty-five fishery owners, 39 ghillies, 120 anglers and 11 netsmen (representing 17 netting stations) responded. The majority (81%) believed that seals had a significant or moderate impact on stocks and catches, 77% believed that all seals were responsible. at that time, this would have been a quite common view.

STUDIES OF SEAL DIET IN THE DEE/DON AND YTHAN ESTUARY.

Scientific study methods on seal predation on various species of fish have generally been as follows.

- Visual observation of seals eating fish near or on the surface – salmon and sea trout by observation of the colour of the flesh, usually pinkish/red in colour, other fish generally have white flesh.
- Collecting seal scats (poo), extracting hard fish parts in the scats and identifying the species of fish consumed. Perhaps the most important fish parts found in scats for identification of species, are otoliths, structures in the inner ear cavity that serve as a balance organ and aid in hearing. The shape of otoliths vary between species, therefore can be used for identification purposes.
- Use of DNA from seal scats – where identification of otoliths is not possible (it has been suggested that otoliths from mature salmon may not be found because it is alleged that seals frequently do not eat mature salmon heads. There is also concern that delicate otoliths from juvenile salmon and sea trout may not survive the digestive process to be contained in scats.)
- **DNA techniques for fish identification have been little used – certainty not at all in the Ythan, as far as we are aware.**

Fisheries Management and Ecology, 2001, 8, 207±225

Predation by seals on salmonids in two Scottish estuaries (Dee and Don) 1993 – 1996.

Extracts – the full document can be found on the internet.

- Visual observation - most of the information on seal predation was derived from visual observation. Most observed feeding events were of seals (mainly harbour seals) eating salmonids and flounders. **Predation on salmonids was observed more frequently on the Dee than the Don.** Except on two occasions predation was by harbour seals.
- Seal scats - Very few seal scats were examined, the eight collected at the mouth of the Don in November and December 1996 contained otoliths from whiting, sandeels, cod, haddock and one each from plaice and lemon sole – **no salmonid otoliths found**.

Diet composition and seasonal variation in diet of grey seals (Halichoerus grypus) in the Ythan estuary, northeast Scotland. University of St Andrews Senior Honours Research Project BL4201 2012-2013 Natalie Greenland Matriculation number: 080010739

Extracts, – the full document can be found on the internet.

- Visual observation - regarding visual identification, of the nine predation events recorded during the study. none were on salmonids.
- Seal scats - scat samples analysed in this study cover all months from July 2011 to June 2012, except October and November 2011, where only few seals were observed hauling out and no scats were obtained. Diet composition Overall diet composition was dominated by **flatfish,** which made up 54% of the diet over the whole year. A further 41.5% of the overall diet was made up of **sandeels and gadoids**, each accounting for approximately one fifth. The most **important gadoid species were haddock and cod** (7.1% and 5.6% by weight, respectively. The five most prominent prey; **plaice-flounder, sandeels, lemon sole, haddock, and cod, made up over 80% of the overall diet - no salmonid otoliths found**.
- Use of DNA from seal scats – this study did not use DNA techniques, however the study did make a note - **A key potential source of bias lies in fact that otoliths of different species are digested at different rates and species with small or fragile otoliths (e.g. salmonids) may be underrepresented in scat samples due to complete digestion.**

The Foraging Patterns and Diet Choice of Grey seals (Halichoerus grypus) on the Ythan Estuary University of Aberdeen by Alexandra Dzurek. A thesis presented for the MSc degree of Ecology and Environmental Sustainability at the University of Aberdeen School of Biological Sciences University of Aberdeen 2014.

Extracts, – the full document can be found on the internet.

- During the study, many anglers raised a significant interest in seal predation on salmonids because the increased number of seals in the mouth of the Ythan estuary. They believe that the seals destroying the livelihood of sea trout and threatening the local economy. Furthermore, some fishermen are afraid that they will be attacked by aggressive seals.
- Visual observation – during field observations grey seals consuming salmonids were not detected.
- Seal scats – otoliths in scats in March, April, and May 2014 found that the vast majority were from Gadidae 66.29% (cod and haddock) and Pleuronectidae 26.40% (flounder) families. The remaining small % was from several species but **no salmonid otoliths were found**. These results **show that in contrast with the angler's beliefs, seals were consuming mainly Gadidae and Pleuronectidae species instead of salmonids.**
- Although, many debate, revealed amongst researchers whether scat analysis is a reliable method to prove the presence of salmonids in the seals diet. First of all, apparently, the seals may avoid eating the head of larger fish species (like salmonid, trout) so the otoliths are not be in the scat samples (Härkönen, 1986; Hammond, 1994). Secondly, a feeding trial that tested the presence of the North Atlantic salmon (Salmo salar) in the seals diet found out, that from the

salmonid intake of the seals, a maximum of 38 otoliths could have been recovered from the samples, but only one otolith was found and it was seriously damaged (Boyle et al., 1990). So even if the seals consumed the head of the salmonid it is possible that the otolith will not be recognisable after digestion**.**

- Use of DNA from seal scats – DNA techniques were not used in this study. As mentioned above, seals may avoid the consumption of the head of large prey items or the otolith became so eroded that it could not be recognised after digestion. DNA analysis would help in the second case. DNA analysis of seal scats is a recent method to detect the DNA of those prey items that cannot be seen during scat analysis. This method is technically difficult and relatively costly, especially if the DNA needs to be quantified from multiple potential prey species. **To summarise, the detection of salmonid consumption by grey seals would be more effective with underwater camera trapping and DNA analysis. With these methods, we could present clear evidence on possible salmonid predations**.

OUR SUMMARY.

- **The Ythan Estuary:** Based on the scientific studies above, there is **currently** no scientific evidence that grey seals predate on salmonids within the estuary, **however both of the Ythan studies have recognised that the use of DNA techniques on seal scats could help further future studies and provide greater clarification in this matter.**
- **The River Upstream of the Estuary:** Although we have no visual reports of grey or harbour seals predating on salmonids, as is the case on the river Dee**, both species are present in the Ellon area on a regular basis in late summer and autumn, when both salmon and sea trout are present** – commonly appear at dusk and descend around first light.