

Fish in Intertidal Habitats Past, Present & Future Reach Conference July 2019



Original watercolour by Simon Reid

Steve Colclough

Director - 

IFM - Chair Estuarine and Marine Specialist Section

Hon Sec. Greater London & S.E. Branch

Just build the site and the fish will come... not as well as they might!!!

Saltmarshes - A UK Based Historical Perspective

- Valuable
- Breeding & feeding ground for birds, insects etc: Dissipate tidal wave energy
- Diminishing
- 95% of UK coastline has been substantially modified (cannot achieve GES under WFD)
- Historic flood defences and encroachment pressures (Thames)
- UK CIP 3mm sea level rise : 2% English saltmarsh is lost pa through coastal squeeze (hard defences + sea level rise)
- UK Saltmarsh Habitat Action Plan
- Ensure no net loss- create 100ha/yr
- Managed realignment - began in UK in 1994 - historical pressure via Natura 2000
- Isostatic rebound (3mm) means 6mm in South East
- By 2002 recognition that MR would be needed to counter sea-level rise as a sustainable and effective FRM treatment in its own right, in the South East at least.
- Refugia, food & nursery grounds for fish?

Fish and Saltmarsh - US “quotes”

- **Reise 1985** “ inter-tidal feeding can be crucial to survival and abundance of estuarine fish, particularly nursery stock.”
- **Boesch & Turner 1984** “ Key to successful management of estuary dependant fish species is coastal habitat protection and enhancement”.
- **Mc Hugh 1966** “2/3 of the catch of commercially important fish is dependant on the inter-tidal estuarine habitat for the growth of young fish”.
- **Shenker 1979** “Saltmarsh provides important refuge habitat for fish larvae and early fry”.

“[Coastal] Wetlands are Important Contributors to Commercial Fisheries Harvests...”
... US Congress (1987)

The North American Wetlands Conservation Act “Is an Excellent First Step in Reaching the National Goal of ‘No Net Loss’ of Wetlands”
..... President Bush (1989)

“The Economic Importance of Wetlands to Commercial and Recreational Fishing is also Enormous...the Effect of Wetland Loss is Reflected in Declining Populations of Fish...”
.....President Clinton (1993)

Michael P. Weinstein
Montclare University 2011



European Experiences

- **Elliott & Taylor 1989** “Food availability in inter-tidal areas exceeds that in sub-tidal areas”.
- **McLusky 1990** “ Much of the historic fish production in the Forth Estuary has been lost over the past two hundred years as a result of land claim”.
- **Lafaille et al., 2001,2002** “In Europe, it has been assumed that the major nursery grounds are subtidal, this evidence suggests that they may be in the intertidal and saltmarsh areas.”
- **5-7m tidal range rather than 1-2m on the Eastern seaboard of the US**

WFD - Fish sampling in transitional waters

- ⇒ Tidal Thames Fisheries Survey started in 1992
- ⇒ EC Fair Programme:-

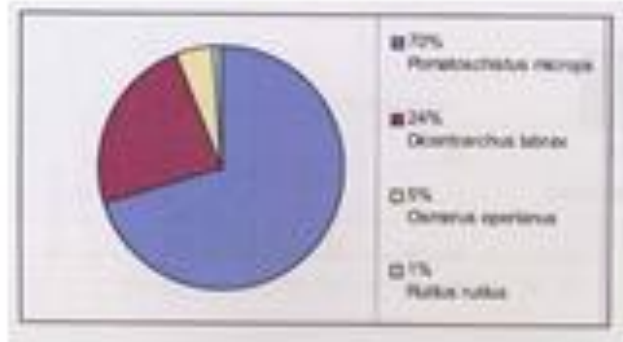
‘Commercial Fish and European Estuaries- Priorities for Management & Research’
- ⇒ ‘Best Practice’ example of a multiple method fish sampling technique in any European estuary



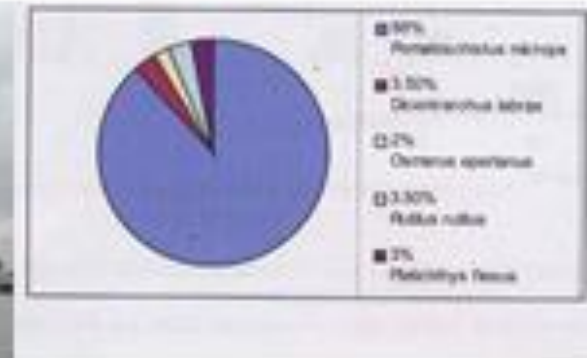
Managed Realignment

Greenwich Millennium Terraces

On Terrace



In Front of Terrace



Abbotts Hall, 2003

Abbotts Hall Farm, Salcott Creek



Fish Sampling Methods

After Lafaille *et al*, 2001

Tidal Thames Multiple Methods - EU Best Practice

Seine nets:

Small 10m x 1m (5mm knotless mesh)

Large 35m x 2m (5mm knotless mesh & 10 mm wings)

Kick sample: 1mm polyester mesh, 1 min



Passive samplers: 1mm knotless mesh

Baited plastic minnow traps:

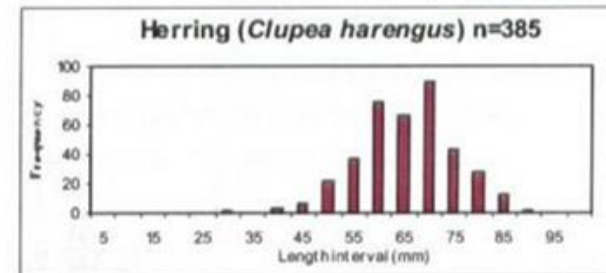
Push net: 3m x 1m 4mm knotless mesh

Visual observation: Streamcraft

Species Captured in the Summer Months



Herring captured in permanent pond adjacent to Breach B



Comcoast UK Pilot Sites & Programme

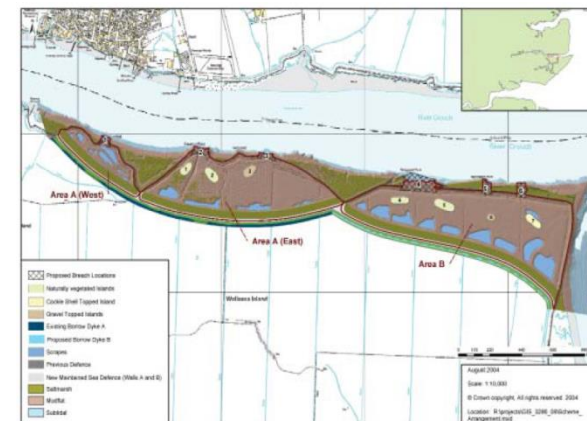
Abbotts Hall



Horseley Island



Wallasea Island



Final Design Plan.

Project ran from May 2004-December 2007

3 PhD's ran over same time period (Fisheries, Nutrients and Economics)

Foreshore recharge pilot at Horseley Island took place in Nov 2005

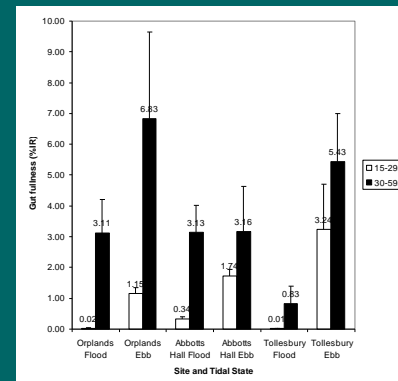
Wallasea Island breach took place in July 2006.....

Nursery Seasonal Occurrence

Species & Size	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Nov	Dec
<i>S.sprattus</i> <45mm											
<i>A.acus</i> <85mm											
<i>D.labrax</i> <25											
<i>D.labrax</i> 25-80mm											
<i>D.labrax</i> 80-230mm											
<i>P.flesus</i> <20mm											
<i>A.anguilla</i> <170mm											
<i>P.microps</i> <20mm											
<i>P.microps</i> >20mm											
<i>C.harengus</i> 40-80mm											
<i>A.presbyter</i> <30mm											
<i>A.presbyter</i> 30-140mm											
<i>G.niger</i> >70mm											
<i>C.labrosus</i> 15-55mm											

Saltmarshes & MR mainly utilised May-Aug, exception: larger individuals
 Bass indicator: economically important and abundant in saltmarshes

Bass Gut Fullness



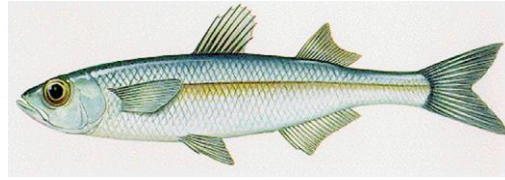
Small bass gut fullness significantly greater on ebbing than flooding tide
 Feed actively during the flooding period –Successful nursery function



Colclough *et al*, 2005; Fonseca *et al.*, 2011

D-G Mare EFF 2005

Lessons Learnt



Habitat Issues



Beyond Comcoast

Fish not considered in design.....

Paull Holme Strays, July 2003 & November 2006



Fish use is not just in saline conditions.....

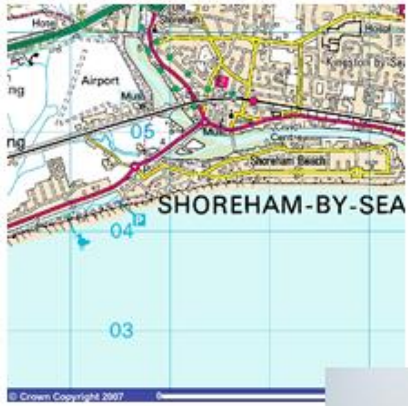
Tidal Thames Teddington 1998 & Syon Park 2008



Alkborough on the Humber - 2007



Shoreham, Adur Estuary 2006

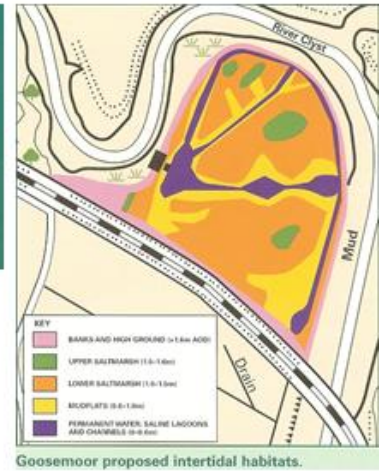
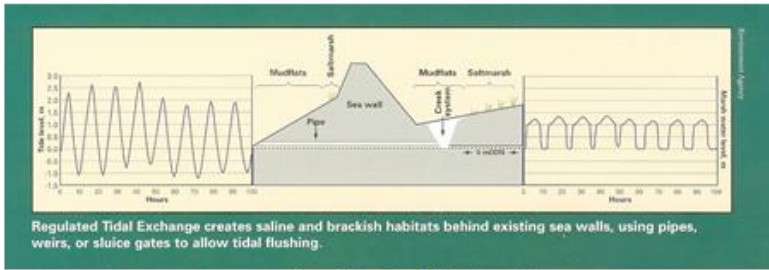


And here.....

Sutton Marsh - Deben Estuary 2007



Regulated Tidal Exchange - Goosemoor(6ha.)- 2007



Goosemoor - 2007



200 plus tidal flap valves on the Humber estuary alone

Lippenbroek – Scheldte Estuary 2006



Alkborough - Nutrient Stripping





Some Early Conclusions & Recommendations



Multiple method sampling strategy - is essential to satisfactorily describe fish usage of such dynamic environments.

Gradual lateral site slope, shallow vertical creek slope & dendritic creek systems - are necessary to maximise access.

Semi-permanent water bodies provide important microhabitats.

Warm, sheltered, unpolluted, productive habitats.

Optimal breach timing for seed establishment & low invertebrate presence (Hughes, 2001).

Proximity to nursery & spawning sites, improves

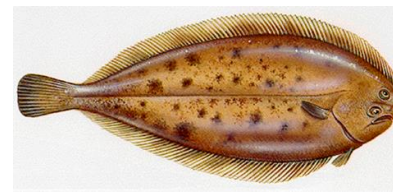
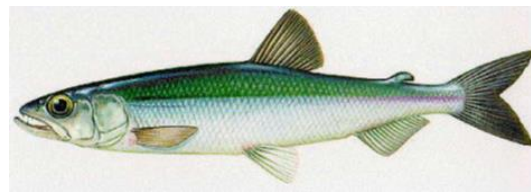
Colclough *et al.*, 2005; Dixon *et al.*, 2007

Colclough & Coates



Aquatic Consultants

www.colcloughcoates.co.uk



Institute of Fisheries Management

London Gateway Port Development and Planning Inquiry



New precedent set- going beyond the Habitats Directive - WFD & Sustainable Development Agenda

25 yr plan and Environmental Net Gain



Power Stations Intakes

Impingement &



Cooling Water Options for the New Generation of Nuclear Power Stations in the UK. SC070015/SR3 – **Habitat Production Foregone**

Nixon and Oviatt (1973) Bissel Cove, New England each square metre of saltmarsh would support 56 g y⁻¹ in fish production.

Turnpenny (2002) in the context of Fawley power station (Hampshire) estimated that the annual catch of impinged fish at a CW flow of 32 m³ s⁻¹, expressed in equivalent adult terms, was 424 kg y⁻¹. Using production figures for the Forth Estuary given by Elliott and Taylor (1989), this is the equivalent to lost production of 9.9 ha.

One Early Attempt at Quantification (After Lafaille *et al* 2001)



Tollesbury August 2006



Medmerry Realignment, Sussex 2015



Sussex IFCA
Sussex WT
RSPB
EA

Bass Nursery

Hazelwood Marshes July & September 2016



Sea level rise and unmanaged breaches

Hazelwood Marshes Fish Survey 2016

Waldringfield Marsh Restoration October 2016



Some Other Realignment Sites in England & Wales

Stearth Realignment Severn Estuary October 2016
Saltmarsh Beef –Jamie Oliver



Fingringhoe Realignment Colne Estuary August 2018



RSPB Wallasea Island Wild Coast Project
Roach & Crouch Estuary 2017



Estuary Edges 2019 Fish Survey Programme 2017



TEP Citizen Science Programme
2019 onwards

Estuary Edges Fish Survey Report 2017

Recommendations on Design Options to Optimise Fish Utilisation

Heidi Burgess, School of Environment and Technology, University of Brighton; **Kathryn Nelson**, Sussex Inshore Fisheries and Conservation Authority, Shoreham; **Steve Colclough**, Colclough and Coates -SC² Aquatic Consultants, Chatham, **Jonathan Dale**, School of Energy, Construction and Environment, Coventry University.

Develop a gradient across the site if at all possible.

Create a mosaic of habitat types.

Avoid design features where throttles create very fast tidal flows.

Lagoons (>50cm) will attract fish which might remain at low water, but these may be short term features .

The drainage system in the habitat should be in continuity with the drainage channels on the seaward side of the breach.

Where creek systems are constructed, these should have shallow profile and a naturalistic sinuosity.

Freshwater drainage outputs need to allow for effective passage of migratory species such as eel. Adjustable tidal flaps improve access for other species such as gobies and stickleback.

Encourage colonisation by vegetation as fast as possible. Breaching in early autumn will help. More seeds will be carried in on the tide.

Other actions to consider -

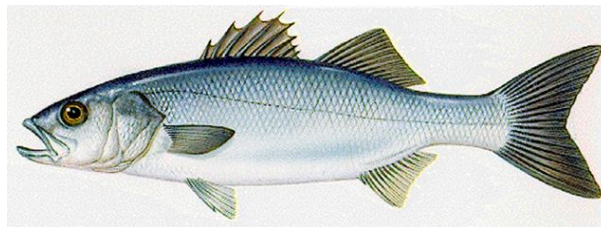
- **Since each MR treatment is unique, studies of fish utilisation should be conducted in all future projects as part of an integrated post-project monitoring approach to inform future site design.**
- **Long term data is vitally important. We need to know how fish utilisation changes as the site evolves. We need to be able to develop robust production per unit area of saltmarsh. Data will stimulate robust offsetting arrangements and aid the development of contributory funding streams operating via the Natural Capital Approach.**
- **Essential Fish Habitats work can influence location and design of future MR projects to optimise local fish production.**

Where do we go from here....

More evaluation of ecosystem services

- Long term data and quantitative data – citizen science potential
- Improved linkage with drivers eg HD, WFD, MSFD.
- Better links with potential funding streams eg EMFF, carbon offsetting, nutrient stripping
- New work on stable isotopes.....Green et al, 2012
- Importance of active promotion and education – public response still negative (Coastal Future Conference 2012)
- EA Coastal Futures Conference 2019 – 80% loss, plan to renew
- 25 year Plan- Natural Capital outcome- Marine Pioneer projects

Develop outcomes other than nature reserves eg shellfish culture and RSA



Finally, a plea for a more holistic approach and some lateral thinking!

Landowners and other interests have an emotive link with productive land claimed from the sea. Common Law dictates that newly flooded land reverts to the Crown Estate. Riparian interests can be maintained through adequate pre-planning, thus providing an attractive alternative scenario where the riparian interest moves from conventional agriculture to some form of brackish water agriculture/mariculture and yet the site still functions for FRM, as a fish nursery, for carbon sequestration and nutrient stripping etc.

Early studies have demonstrated shellfish can be grown in association with realignments. *Salicornia* is a re-emerging 19th Century salad crop. Salt-marsh lamb finds a premium price given the nature of the grazing area. There are no extant examples of a “demonstration” realignment of this type. Every realignment to date mature into what is perceived as, and often managed as, a conservation area largely for birds. The persistence of only one exemplar is part of the resistance seen with many landowners to further managed realignment.



Thank You!