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**CUMULATIVE EFFECTS OF MARINE AGGREGATE
EXTRACTION IN AN AREA EAST OF THE ISLE OF
WIGHT - A FISHING INDUSTRY PERSPECTIVE**

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ABSTRACT

The purpose of this study was to document the nature and distribution of local fisheries and associated effort, and to report the views of the fishing industry in relation to perceived impacts of aggregate dredging on their activities. As such this study does not seek to address questions over the relative impacts of the two industries, merely to provide a perspective from those engaged in fishing in the area, so as to contribute to informed debate and the sustainable use of resources. Relevant information was obtained by interviewing a representative sample of local fishermen, with experience deploying gear in the vicinity of areas of aggregate extraction. This was accompanied by a review of published information, discussions with the Sea Fisheries Inspectorate, Sea Fisheries Committees and CEFAS fisheries scientists. The findings were examined in relation to the known extent of dredging operations in recent years, determined through an analysis of Electronic Monitoring System (EMS) data.

Results indicate a general avoidance of licensed areas by static gear fishermen due to the potential for gear damage. This area avoidance has the effect of increasing fishing pressure in alternative grounds remote from dredging and has led to increasing concerns amongst fishermen over the sustainability of already heavily exploited stocks in these areas. A further issue highlighted by this study concerns vessel safety in relation to the increased distances offshore that some of these relatively small vessels (<14 m) are working and this was attributed by fishermen to be a direct consequence of displacement from extraction areas. Declines in brown crab (*Cancer pagurus*) stocks were also reported by interviewed fishermen to the south of the Isle of Wight and possible factors which may explain this observation are discussed, including over-fishing and the potential interference of dredging operations in the movement of crab populations into fishing grounds.

The study also identified previously fished areas that are now avoided by trawlers due to perceived changes in the nature of the seabed. The hydrographic conditions in the area suggest that these features (e.g. dredged tracks and depressions) may persist for several years. The potential loss of grounds for trawl fisheries may also result in the displacement of vessels into other areas leading to conflicts with other gear types. Finally, this study identified charter angling grounds in which anglers have observed significant declines in catches of smooth hound (*Mustelus mustelus*). A large proportion (75%) of this area was dredged in 2001 and therefore dredging cannot be ruled out as a causative factor.

It is recommended that, in order to ensure the sustainability of local fishing interests, consideration is given to potential repercussions resulting from the exclusion of fishermen from certain areas. A suggested

approach to help with these assessments is through the use of a Geographic Information System (GIS) which can be used to map fishery and fishery resource areas, allowing for a more quantitative assessment of the potential impacts from future dredging licences and other human activities.

1. INTRODUCTION

Fisheries management aims to ensure the sustainable exploitation of stocks. However, in addition to fishing pressure, other factors have the potential to affect the sustainability of fisheries, on various spatial scales. One such concern is that of marine aggregate dredging, an activity which has expanded in recent years as a result of the increasing demands of the construction industry and the tightening of legislation governing the use of land-based resources (Lart, 1991).

Marine aggregate extraction activities are known to impact the marine environment in a variety of ways, some of which have the potential to affect fisheries. These impacts include: restriction of access to fishing grounds; local destruction or damage to benthic organisms as a direct result of the passage of the drag-head (Lees *et al.*, 1992), and the potential for wider area effects due to the re-distribution of finer material. Dredging may also, in time, alter the physical characteristics of sediments and the seabed (Millner *et al.*, 1977 and Dickson and Lee, 1973), with potential longer-term consequences for dependent benthic organisms (Boyd *et al.*, 2003; Boyd *et al.*, 2005), including fish/shellfish populations. As a result, marine aggregate extraction activities have been a cause of concern to the fishing industry, although separating perception from reality can be problematic, as in many other coastal issues involving the potential for conflict between overlapping commercial interests. (See, for example, Fishing News, 1991, 1992, 2000, 2001a, 2001b, 2001c, 2001d, 2001e, 2001f; BBC Wildlife, 1999, as expressions of the high public and political profile of this issue).

The fishing industry has expressed particular concern over the potential for cumulative effects in areas where there are local concentrations of marine aggregate extraction licences. The impacts from one licence may be minor but, when added to the effects of other nearby licences or other man-made activities, they may be more severe.

As part of the current licensing process in UK waters, Environmental Statements are prepared in order to identify potential impacts from proposed extraction activities, and to evaluate their acceptability. In order to assess potential impacts on local fisheries, information is often gleaned from interviewing local fishermen, as reliable quantitative information is commonly not available on the localised scales that are associated with licence applications. This source of information has proved valuable, particularly when

observations can be corroborated by available scientific information (Neis *et al.*, 1999). In order to objectively address the concerns of fishermen, it is necessary to have a proper understanding of the extent of both fishing and the impact of dredging operations. The former may be established from a variety of sources (see below) although the outcome is often relatively inconclusive. In contrast, the latter may be precisely determined (at least in recent years) through Electronic Monitoring System (EMS) data, which provide information on the location and intensity of dredging over time.

This study examines an area to the east of the Isle of Wight (Figure 1) where there are a number of dredging licences which coincide with various fishery interests. The aims of the study are to:

1. Identify the location of fishing activity.
2. Identify issues of concern in relation to marine aggregate extraction through interviews with fishermen.
3. Determine the spatial and temporal extent of dredging operations on the seabed using annual Electronic Monitoring System (EMS) data.
4. Assess the relationships between 1-3, above.
5. Draw conclusions regarding the presence and significance of any (cumulative) impacts of aggregate dredging on local fisheries.

Inter-relationships between aims 1-3 were addressed through combining the outcome of interviews with a representative selection of local fishermen, with

existing information on the distribution of commercial species, other relevant historical information and patterns in the exploitation of the marine aggregate resource. The limited resources available for the conduct of the investigation determined that it could not be comprehensive. Thus, for example, it is recognised that attempts to better quantify historical trends in local catches (insofar as information of sufficient accuracy exists), or to initiate log-book schemes for evaluating current performance may, in future, usefully augment the findings of the present study.

2. METHODS

2.1 Location of fishing effort and concerns of fishermen

The location of fishing activity in this area has been investigated, at different times, by various authors (For example, Plumb, 1996; EMU 1998, 1999a, 1999b; METOC, 1997). However, the results of these investigations cannot be taken to be representative of the current situation and hence it was necessary to obtain up-to-date information. The main species targeted and the commercial and charter fishing interests were identified by reference to the literature (Pawson, 1995; Gray, 1995), Defra landing statistics and advice from the local officers of the Sea Fisheries Inspectorate and Sea Fisheries Committees. Within the area of study, there are a very large number of fishermen, many of whom are part time. It was therefore necessary to identify key fishermen from each port and fishery to obtain representative coverage.

Application licence boundary Aggregate licence boundary Disposal ground

Figure 1. Study area and location of current and proposed marine aggregate extraction licences

Interviews were conducted between 7th September and 21st December 2001. Fishermen were invited to give an overview of their activities, including the location, extent and success of fishing operations. They were also invited to offer their views on any relationship between their activities and those of the aggregate extraction industry in the locality. Where possible, individuals were interviewed separately and have not been identified by name, at their request, in order to respect confidentiality. The precise location of certain individual's fishing grounds have also not been identified for reasons of confidentiality. Therefore, maps of fishing grounds shown in Figures 2-8 may comprise contributions from a number of individuals.

2.2 Extent of dredging activity

The extent of the direct impact of dredging activity on the seabed was determined using Electronic Monitoring System (EMS) data collated by the Crown Estate. Maps were prepared from these data for the period 1993-2001 in order to identify the location and intensity of dredging in individual years. These were imported into MAPINFO™, a Geographic Information System (GIS) package. Data from individual years were also combined to produce maps showing the cumulative extent of dredging in the region to the east of the Isle of Wight, since 1993.

2.3 Evaluation of fishery concerns using EMS data

Maps showing the extent of dredging operations were used to calculate the area of seabed potentially affected by dredging and to estimate the overlap between dredging and fishing activity.

3. RESULTS

These are presented by port. Each account is then divided into a 'fleet summary', which attempts to provide an overview of the different fisheries and the number of boats involved, followed by the results of interviews with individuals from each of the fisheries. The main effort was directed at individuals fishing either within or in close proximity to marine aggregate extraction areas. At ports where it was considered that fishermen were unlikely to fish in or around the extraction areas, no interviews were conducted.

3.1 Location of fishing effort and concerns of fishermen

3.1.1 Bembridge

Fleet Summary

Most of the vessels fishing from Bembridge are dedicated potters targeting brown crab (*Cancer pagurus*) and lobster (*Hommarus gammarus*). Presently, one vessel also mainly uses set nets to target

various seasonally abundant species including dover sole (*Solea solea*), plaice (*Pleuronectes platessa*), brill (*Scophthalmus rhombus*) turbot (*Psetta maxima*) and bass (*Dicentrarchus labrax*). Local fishermen report that the number of full-time vessels fishing from Bembridge has fallen from thirteen to six in the last ten years, a decline which they attribute to the general decline in the brown crab stock. Interviews were conducted with seven potters (six based in Bembridge and one from Ventnor) and one netter (also based in Bembridge).

Potters

The main potting grounds used by Bembridge vessels are to the south of the Isle of Wight and are subdivided, with individual fishermen occupying a specific area (see Figure 2). Pots are laid across the tide in a north-south direction and a ¼ mile is left between strings to prevent entanglement. This arrangement is agreed between the fishermen from this port and ensures an equitable distribution across the grounds. The arrangement is also important for vessel safety as it reduces the risk of pot strings set by different vessels becoming tangled. This is of particular concern to local fishermen as vessels of different sizes are able to set different length strings. The majority of these fishermen work alone and are therefore keen to avoid dangerous situations as far as possible. However, instances have arisen where strings have become tangled, particularly at the eastern end of the grounds where a larger vessel from the mainland has moved into this area, reportedly as a result of losing grounds within the cluster of marine aggregate extraction licences. The arrival of this individual has also had the inevitable effect of decreasing the space available for the fishing activities of others.

Bembridge potters have expressed concern over what they view as a 'massive decline' of the crab fishery in the area. This decline is held responsible for a number of boats leaving the fishery in recent years. Despite the decline, fishermen report that the total number of pots deployed now is greater than that deployed historically. Fishermen explained that the increase in the quantity of pots used by individuals is due to the decline in catches of brown crab. For example, one interviewee suggested that a good haul used to yield around 150 kg of brown crab from 50 pots, whereas currently hauls are more likely to yield 50 kg from 200 pots. Fishermen have also noticed a decline in the lobster fishery which they consider an effect of overfishing. However, they were also of the opinion that this was not the cause of the decline in the crab fishery. The consensus amongst fishermen is that the numbers of crab moving into their grounds from the east has 'drastically declined'. They have also noticed a decline in the number of juvenile crabs. Their concern is that dredging to the east may be affecting their crab fishery. Additionally, it is considered that the food source (benthic organisms) is being removed from the shingle upon which hen crabs are found, as a direct result of dredging in the licensed areas.

Crab/lobster potting
Netting
Deep water anchorage
Application area
Aggregate licence boundary

Figure 2. Location of fishing effort, using different types of gear, for vessels fishing from Bembridge in 2001 in relation to the boundaries of current and proposed dredging licences. The map also shows the location of effort from other ports (shaded grey)

Netters

Potting accounts for most of the fishing effort from Bembridge. However, a set net fishery is also exploited by one individual in pursuit of a variety of species. The main grounds are shown in Figure 2, to the east of Bembridge. Some of this area overlaps with a number of extraction licences. Nets are set with the tide and species targeted include sole, plaice, brill, turbot and bass. This individual reported that the one hour notice given prior to the commencement of dredging operations commencing did not give sufficient time to allow nets to be moved out of an extraction site. For this reason, nets are unlikely to be set in areas known to be actively dredged, based on previous experience.

3.1.2 Portsmouth/Gosport

Fleet Summary

Portsmouth Harbour is home to an inshore fleet of around 30 boats of length 6-12 m. Vessels use a variety of fishing methods including trawling, netting, long-lining, dredging (for oysters, *Ostrea edulis*), potting for whelks (4 vessels), potting for lobster and crab (1 full-time) and rod and line fishing (charter and one commercial bass angler). Some vessels from Portsmouth will also target the scallop (*Pecten maximus*) fishery located in the vicinity of the Owes Bank (see Figure 8). Many of the vessels are capable

of using a variety of gears and may switch according to local abundance and market prices. There has been a trend for an increase in the number of <10 m vessels and a fall in the number of >10 m vessels. Interviews were carried out with a commercial bass angler, two trawler fishermen and four netters.

Trawler (<10 m)

One individual trawler employs mainly stern and beam trawls, but will also deploy nets, long-lines and whelk pots. He reported that traditional trawling grounds have been damaged or lost in a number of areas, both as a result of aggregate extraction and other activities. A number of examples were given including the creation of a sewage outfall discharging to the main channel to the east of Portsmouth Harbour (see Figure 3). This he considers to have resulted in damage to an area of mussel bed, a habitat that is viewed to be responsible for the abundance of plaice which previously frequented this area. He has also damaged fishing gear in areas where there had previously been good tows within the boundaries of aggregate extraction licences. Damage has resulted from the cod end filling with large cobbles and the skipper attributes this to exposure and then rejection of oversized material by the draghead of dredgers. As a result of such experiences, this individual believes that many trawler fishermen avoid fishing within marine aggregate extraction areas.

Trawl
 Bass (rod and line)
 Netting
 Sandeel
 Aggregate licence boundary
 Application area
 Deep water approach

Figure 3. Location of fishing effort, using different types of gear, for vessels fishing from Portsmouth in 2001 in relation to the boundaries of current and proposed dredging licences (LL indicates areas where long-lining takes place). The map also shows the location of effort from other ports (shaded grey)

A reported decline in the accumulation of sole in the vicinity of Area 122/2 was also attributed to the effects of dredging.

This individual also highlighted the problem of ‘first sale’ fish prices, with the price for sole having remained the same for the last 10 years and plaice having remained largely unchanged for 25 years. Furthermore, problems associated with vessel anchorages (e.g. St Helens Roads), ferry traffic across the Solent, yacht mooring buoys at Wootten placed on a trawling ground and yachting traffic were all highlighted as contributing to interference with fishing or causing the loss of fishing grounds.

Potters

One trawler skipper was of the opinion that potters were being displaced further offshore as a result of losing grounds within the extraction areas. Due to the small size of these vessels, he considered that working further offshore raised some important safety concerns.

Netter

Of the four netters interviewed, three were unwilling to give details of the location of their netting grounds. The fourth individual has recently abandoned this method of fishing. He stated that the risk of damage to nets from marine aggregate dredgers or trawling vessels

were major contributory factors. The locations of these netting areas are shown in Figure 3. This individual used to set nets on an area known as the Overfalls which can only be fished, using nets, on neap tides (5 days in every 2 weeks). For the remaining time, these nets were moved to an area known as the Nab Hole, but the presence of aggregate dredgers and trawlers meant that this was no longer feasible due to the risk of losing gear. He did attempt to move to an area off Littlehampton but the presence of local fishermen made this very difficult, particularly as this area overlaps with whelk grounds where pots are set across the tide. Static nets are laid with the tide and hence the two gear types are incompatible within the same area.

Bass Fishing

This interviewee targets bass, using rod and line on a commercial basis. He explained that he does have spots within and around the licensed areas, but that when the dredging operations are taking place he is unlikely to catch any fish. He also stated that these fish are unlikely to return until between 12-18 hours after the dredger has left. He has invested in a fast boat and tries to avoid dredgers by moving to alternative sites. The skipper of this vessel did not wish to reveal the exact location of his angling sites for fear that this information may be used by other anglers as, in his experience, the chances of catching bass rapidly decline

at a site after the arrival of additional boats. However, he fishes in spots in the area indicated in Figure 3. This individual expressed concern about the damage caused to the seabed from trawling and aggregate extraction activities and considered that the impacts of these activities may be making the ground less attractive to bass. An example was given of the trawl grounds around Beachy Head which have been intensively trawled and are no longer productive for bass. He expressed concern that dredgers may be adversely affecting the physical and biological characteristics of the seabed, which he considers are important for attracting commercially fishable numbers of bass. Sandeels are used for bait for this fishery and the area used to catch these fish is shown in Figure 3.

3.1.3 Langstone Harbour

Fleet Summary

There are around 60 vessels fishing from Langstone Harbour, although only ten operate on a full time basis. The majority of vessels are involved with charter angling although there are two full-time potters and a number of vessels that use set nets and trawls. A large percentage of these vessels are known to work in and around licensed extraction areas. There is also a sandeel fishery within the harbour, which is exploited for bait. A representative of the Langstone Harbour Licensed Boatmen Association, which represents the interests of charter anglers, was interviewed.

Charter Anglers

There are approximately 40 charter vessels working from Portsmouth, Langstone and Chichester. The interviewee estimated that these vessels take an average of eight paying passengers each and will undertake trips on around 160-170 days per year. Many of the people on these charters come from outside the local region and provide an important source of income to the local economy. In addition to the charter anglers, there are a significant number of privately-owned boats used by sport anglers. The number of these vessels in the region of study was estimated at around four hundred. Indeed, a local Sea Fisheries Committee officer estimates more finfish are caught by anglers than commercial fishermen. Anglers will fish in a variety of localities but the most important areas are detailed below and are shown in Figure 4.

Smooth hound (*Mustelus mustelus*)

Smooth hound is targeted from mid April to the end of August/beginning of September. Area 1 in Figure 4 was previously an important area for Smooth hound. Catches of this species have reportedly fallen since dredging commenced in this area and, as a consequence, anglers have been displaced to an alternative location to the east (see Figure 4, area 2). This has particularly affected anglers from Portsmouth who have to travel further to reach these grounds, resulting in a slight increase in fuel costs and results in marginally less time available for fishing.

Charter angling grounds
 Aggregate licence boundary
 Application licence boundary
 Deep water approach

Figure 4. Location of important fishing grounds for charter and hobby angling vessels fishing from Langstone Harbour in 2001 in relation to the boundaries of current and proposed dredging licences. The map also shows the location of fishing effort from other ports (shaded grey)

Tope (Galeorhinus galeus)

Area 3 in Figure 4 is an important angling area for tope. Fishing for this species takes place in May and June when large fish come inshore to give birth, after which time they disperse. It is thought by the interviewee that this area may coincide with a spawning ground for this species.

Rays (Raja spp.)

Rays are caught by anglers, all year round, in Areas 5, 6 (Medmery Bank, an area of sand), 7 and 8.

Whiting (Merlangius merlangus)

Cod and Whiting are caught in Area 4, an area of gravel, from November to January. This area was considered particularly important as, unlike many of the other locations used by anglers, it offers some protection from strong south-westerly winds.

Black Bream (Spondylionosoma cantharus)

Areas 9 (Bullock Patch) and 10 (Nab Rock) are both targeted by anglers for black bream in May and June.

Bass

Area 11 (known locally as the Overfalls) is the location of angling for bass from March to November.

3.1.4 Chichester

Fleet Summary

The majority of the 18 vessels based at Chichester target oysters in Chichester Harbour and in the Solent,

between November and April. Only six of these vessels are full-time. After the end of the oyster fishery, some fishermen will switch to other gears. These include trawls and nets, used to target white fish and cuttlefish in Bracklesham Bay, and potting for brown crab, lobster, whelks (*Buccinum undatum*) and cuttlefish (*Sepia officinalis*). As a high value non-quota species, cuttlefish provides an important source of income. Fishing for bass also occurs within the Harbour using a variety of fishing gears. One full-time potter was interviewed from Chichester.

Potter

In common with other crab fishermen in the region, this skipper reported a decline in the brown crab fishery. Due to the density of potting off Selsey, this individual mainly fishes the potting grounds located to the south of the Isle of Wight and targets both edible crab and lobster. This necessitates a 2½-hour journey to and from the grounds. Although, by potting standards, his 40-foot vessel is large, he did express concern about working so far offshore, particularly in marginal weather. He also fishes between Chichester and his main grounds to the south of the Isle of Wight (see Figure 5). These grounds are particularly important when weather conditions prevent him reaching the grounds to the south of the Isle of Wight. The areas fished by this individual to the south of the Isle of Wight overlap with areas given by two potters from Bembridge. Furthermore, this individual has lost some potting ground in the north of Area 407 and is

Crab/lobster potting
Whelk potting
Cuttlefish
Aggregate licence boundary
Application area
Deep water approach
Deep water anchorage

Figure 5. Location of effort for a vessel fishing from Chichester Harbour in 2001 in relation to the boundaries of current and proposed dredging licences. The map also shows the location of fishing effort from other ports (shaded grey)

