European sea bass (*Dicentrarchus labrax*)
Ecology, stock status and management update

Devon and Severn Inshore Fisheries and Conservation Authority

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Devon & Severn IFCA
Inshore Fisheries and Conservation Authority

Summary

European sea bass (*Dicentrarchus labrax*) is an important fish species in Northwest Europe to both commercial fishermen and recreational anglers. Its biology, in particular its slow growth rate, temperature dependent recruitment and schooling behaviour at inshore and offshore sites, makes it a particularly vulnerable species to overfishing. Coupled with greatly increased market demand, the natural and anthropogenic pressures on European sea bass have led to a major decline in abundance, leaving stocks at a potentially critical level. Several detailed reviews of the current situation regarding bass, as well as their biology and ecology have already been compiled, and are referenced within this overview document.

The aim of this update is to set the wider context of the bass issue, to detail the current management and management options available at an EU and Member State level and finally to outline how D&S IFCA management fits into this wider picture. It should be noted that the situation regarding European sea bass is currently in a state of flux. Therefore this paper is current as of March 2015 but the situation is rapidly developing.

Crucially, the paper will also briefly highlight the most likely areas that D&S IFCA can implement additional management to contribute to the much greater protection of bass stocks required to ensure a sustainable bass stock and fishery.

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1.0 Introduction to European sea bass biology

1.1 Biogeography

European sea bass (*Dicentrarchus labrax*) is a primarily coastal fish distributed across the European Atlantic coast and the Mediterranean. Its northern limit is found along the coast of Norway and its southern limit along the coast of North West Africa. Ocean warming has led to a northerly range extension of the species but the British Isles still demarcate the north-western limit of the species reproductive range. This makes the species especially sensitive to temperature fluctuations and environmental change (Coscia & Mariani 2011).

Despite a number of tagging and genetic studies, European sea bass stock structure remains uncertain, although increasingly evidence points to separation between southern Irish stocks and those around the rest of the British Isles (Fritsch et al. 2007). ICES therefore splits the stock into four pragmatic management units; i) North Sea, Channel, Celtic Sea and Irish Sea (IVb,c & VIIa,d-h); ii) west of Scotland and west/south of Ireland (Vla, VIIb,j); Bay of Biscay (VIIIa,b) and iv) Iberian coast (VIIIc, IXa). Only the most northerly of these stocks has been subject to an analytical assessment, and it is this stock which will be considered in the following sections.

1.2 Ecology and Biology of sea bass in the UK

The growth rate of European sea bass is temperature dependent, with the species growing slowly in England and northern France which represent the northern reaches of this species' range. Sea bass sexually mature between 4 and 7 years old, with individuals recorded living up to 28 years of age (ICES 2014). Tag-recapture studies have revealed much about the movement of individual bass, with generalised patterns being evident. Adult bass tend to move to offshore locations in the autumn and winter in response to cooling water temperatures, seeking temperatures of greater than 9°C in which to spawn. Spawning occurs between February and May, with adult bass moving to inshore feeding grounds (Coscia & Mariani 2011). It is thought that sea bass show a high degree of fidelity to these sites, returning to the same areas repeatedly (Pawson 2007).

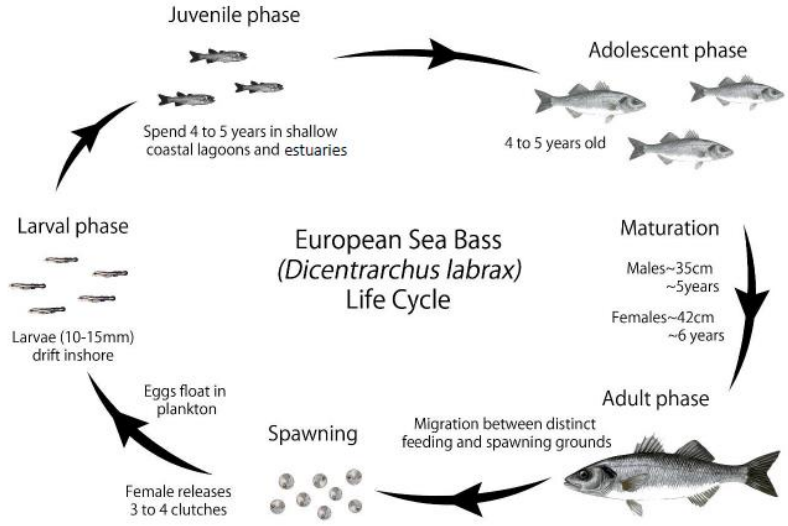

Figure 1. European sea bass life cycle, from Carroll 2014

Post spawning the larvae will remain in the plankton for 2-3 months (Pickett and Pawson 1994) (Figure 1). The sea bass larvae move steadily inshore as they grow, aggregating in inshore waters. At around 15mm the larvae respond to environmental cues and actively swim into estuary and inshore nursery habitats (Pawson 1995). Young-of-the-year bass are found actively feeding in creeks, estuaries, backwaters and shallow bays which border the channel (Laffaille et al. 2001, Colclough et al. 2005), often in much lower salinity areas than those tolerated by adult bass. It is thought that young sea bass remain in the nursery areas for 1-2 years before beginning the overwintering migrations of larger fish. Juvenile bass may return in summer to larger estuaries (those greater than 4km^2 at low tide) until their 5th year, when they attain maturity and adopt the migratory behaviour of adult fish (Pawson 2005). Warmer sea temperatures are thought to increase the survival rates of young bass in estuaries, resulting in strong recruitment from the early 1990's to early 2000's. Recent colder winters (2008-2012) are thought to have contributed to particularly poor recruitment.

On the south coast migration of sea tagged bass between inshore and offshore grounds has differed depending on their geographical location. Sea bass tagged in the eastern English Channel and southern North Sea generally aggregate in winter spawning grounds in the western Channel. Those originating in the western area may spend summers in feeding grounds off North Devon and South Wales, moving to spawning sites off Trevose Head in Cornwall in the winter months. Pawson (1995) gave Start Point in South Devon as the approximate area of delineation between the eastern and western sea bass stocks, meaning adult bass within Devon & Severn IFCA district may display a range of migratory behaviours (Pawson 1995, Pawson et al. 2007) (Figure 2).

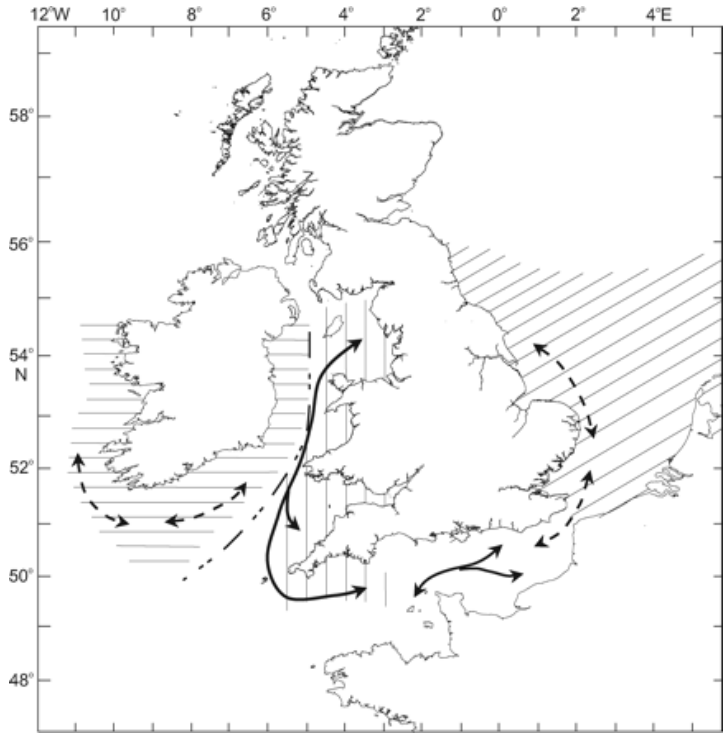

Figure 2. Main population movements and putative stock assessment units (hatched) for sea bass in ICES Subareas IV and VII from Pawson et al. 2007, showing the position of Start Point in south Devon as being a potential biogeographic boundary between eastern and western channel bass stocks

2.0 Commercial and recreational fisheries and current management regimes

The aggregating nature of sea bass at both offshore spawning sites and inshore feeding grounds makes them susceptible to capture at a variety of life-history stages by a variety of commercial methods. Targeted pair trawling of sea bass on offshore spawning grounds takes place from December to April. Bass and are also caught by a range of methods by the inshore fleet, included targeted net and line fisheries and as bycatch in inshore trawl fisheries.

Sea bass are an extremely valuable species to recreational sea anglers fishing from the shore and from private and charter boats throughout Europe. Whilst much of the catch is released, significant numbers are kept and overall recreational angling may account for a significant proportion of fishing mortality (Sea Angling 2012, ICES 2014).

2.1 EU and Member state – commercial fisheries

The majority of effort on European sea bass in the North Sea, Channel, Celtic Sea and Irish Sea stock comes from English and French vessels which comprise around 86% of commercial landings in Europe (ICES 2014, STECF 2014, Table 1). Landings by English and French vessels are dominated by targeted pelagic pair trawls (37%). Bottom trawlers, where sea bass is often a landed bycatch as part of a mixed fishery accounts for 21% of English and French landings. 12% of catch is from fixed and drift nets, often operated close inshore, and 12 % by longline or commercial rod and line fishing. Some discarding also takes place but is difficult to quantify. Landings have increased dramatically since the early 1980's (Figure 1) from around 1000t to a peak of about 5000t in 2011 due to increasing consumer demand for the species and the high market price that sea bass commands (Pawson et al. 2005).

There is no Total Allowable Catch set for sea bass in Europe but in England there is a weekly catch quota of 5t of sea bass per vessel, a measure which has been in place since 2000 and a similar measure also exists in France (Pawson et al. 2005). Despite advice from ICES to cap effort (ICES, 2002) there is no limit on the number of vessels taking this weekly catch quota.

Sea bass fisheries are primarily managed using technical measures which were implemented in 1990 to protect juvenile and adolescent sea bass. Fishing mortality for sea bass increased from the mid-1970's due to rapidly emerging markets and by the early 1980's growth-overfishing linked to unstable recruitment patterns and fisheries targeting inshore aggregations of juvenile fish had caused a rapid decline in the stock. Therefore in the late 1980's a package of technical measures was proposed to protect juvenile fish. A minimum landing size (MLS) of 36cm, complementary mesh size regulations for enmeshing nets and seasonal closures of 34 inshore nursery areas were adopted following an extensive consultation. The measures were deemed to have been relatively successful and fishing mortality was thought to be at a sustainable level (Pawson et al. 2005). However the reversion to cool temperature regimes in the late 2000's have undermined these measures as detailed in later sections.

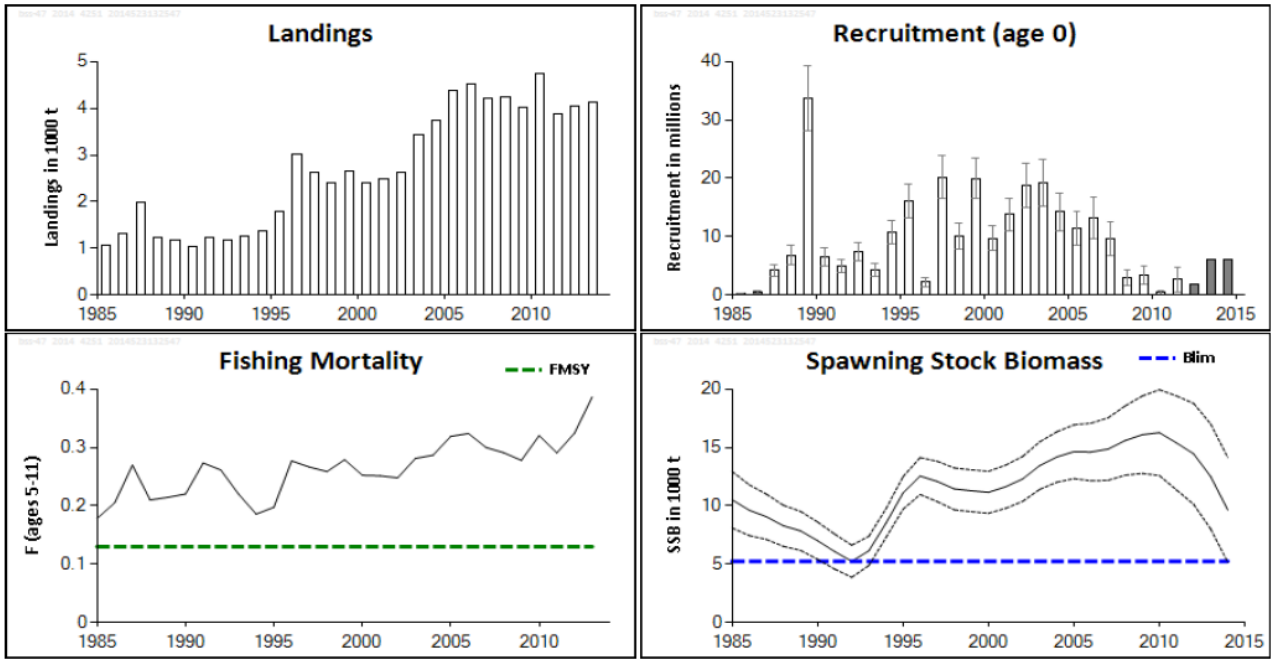

Figure 3. Summary of stock assessment for European sea bass in ICES Divisions IVb,c and VIId-h using Fishing Mortality derived from commercial and recreational landings. Shaded areas are predicted recruitment (source; ICES (2014) Advice for *Dicentrarchus labrax*, North Sea, Channel, Celtic Sea and Irish Sea stock).

Table 1. Average annual available commercial fishery landings by country and gear group 2010 – 2013 (source: Southern IFCA 2015; adapted from STECF 2014, Armstrong & Drogue 2014).

Fishery	**Landings (t)**	**Percentage (%)**
France trawls	793	14
France mid-water trawls	1,408	25
France nets	139	3
France lines	305	5
France other	142	3
Recreational France 2009-2011	940	17
France Subtotal	**3,727**	**66**
UK (England & Wales) trawls	147	3
UK (England & Wales) mid-water trawls	57	1
UK (England & Wales) nets	361	6
UK (England & Wales) lines	175	3
UK (England & Wales) other	65	1
Recreational England 2012	335	6
UK (E&W) Subtotal	**1,140**	**20**
Netherland Commercial	384	7
Recreational Netherlands 2010-11	138	2
Netherlands Subtotal	**522**	**9**
Belgium Commercial	165	3
Recreational Belgium 2013	60	1
Belgium Subtotal	**225**	**4**
Channel Isles Commercial Subtotal	**54**	**1**
TOTAL	**5,668**	**100**

2.2 EU and Member state - recreational fisheries

Recreational catch in Europe is known to be significant but is extremely difficult to quantify. Some Member States have commissioned studies into the scale of recreational fisheries in recent years and results indicate total annual removals by France, UK (England), Netherlands and Belgium are of the order of 1500 t per year in the last few years (Table 3). In England sea bass catch by recreational anglers was thought to make up about 10% of all fish caught (by number) equating to between 380-690t of which 230-440t was kept (Table 1). Sea Angling 2012 showed that return rates for sea bass are higher than for other species which are also considered excellent eating (such as cod), possibly due to the significance of sea bass as a sport fish and the work of organisations such as the Bass Anglers Sportfishing Association to encourage catch and release (Table 2).

Legislation for Bass Nursery Areas(BNAs) only extends to anglers fishing from a boat. Anglers fishing from the shore are effectively unrestricted, although when first implemented, there was a voluntary expectation that shore anglers would practice catch and release in of sea bass in nursery areas (MAFF 1990).

Table 1. Estimated catch and retained weight of bass by recreational sea anglers from both boat and shore in England in 2012 (source; Sea Angling 2012)

Annual catch weights (tonnes)		**Shore**	**Private and rental boats**	**Charter boats**	**Total**
Bass	Total	98 t - **143 t**	**194 t** - 546 t	44 t	**380 t** - 690 t
	Kept	38 t - **56 t**	**142 t** - 367 t	31 t	**230 t** - 440 t
Cod	Total	95 t - **138 t**	**172 t** - 595 t	175 t	**480 t** - 870 t
	Kept	75 t - **109 t**	**158 t** - 582 t	159t	**430 t** - 820 t

Table 2. Release rates (by number) for bass, cod and all species combined (source Sea Angling 2012)

	Shore	Private / rental boat
Bass	82%	57%
Cod	56%	27%
All spp	76%	51%

Table 3. Catch rates of bass for three EU countries from recreational and commercial fisheries (source; Sea Angling 2012)

Country	Recreational fishery (kept fish)	Commercial fishery 2012
England	230t – 440t	897t (UK total)[5]
France	940t	2,492t
Netherlands	128t	372t
TOTAL	1,298 – 1,508t	4,060t (all countries)

2.3 Devon and Severn IFCA district – commercial fisheries

Sea bass is an extremely important target species in the Devon and Severn IFCA district. The species is taken by both fixed and drift net, by longline and rod and line fishing. Netting for sea bass takes place in all Devon estuaries outside the BNA closure dates (Table 1) .Whilst the majority of netting outside of estuaries occurs in the summer, local observations suggest that adult bass don't seem to be moving offshore so much and the period has extended from late spring through to Christmas time. The boats involved operate from all ports within South Devon. Rod and line boats target the inshore wrecks in the summer and the East banks south of the Mew Stone. Additional hotspots for commercial rod and line targeting of sea bass occur at Berry Head, outside the River Dart, Eddystone and Start Point. Rod and line fishing for sea bass from kayaks seems to have increased significantly and not being a powered vessel means they can sell the catch taken without a fishing licence.

The estuaries in south Devon are of critical importance as Bass Nursery Areas and were therefore designated as such by The Bass (Specified Sea Areas) (Prohibition of Fishing) Order 1990: SI 1990 No. 1156. The rivers Taw and Torridge in the north of the District are also designated bass areas, although the shared estuary of these two rivers is not a designated Bass Nursery Areas and a net fishery occurs here. Table 4 outlines the restrictions on fishing activities in each bass nursery are in the Devon and Severn IFCA district . Although not designated under the legislation cited above, the Severn Estuary is also an important bass nursery area (Claridge and Potter 1983).

No specific landings or effort data is available for fisheries operating entirely in the Devon and Severn IFCA district. Figures 5 and 6 show landings in terms of live weight and value respectively (MMO 2015), with both showing a decline from a peak in 2011. Landings by both live weight and value have decreased by over 50% between 2011 and 2014. However interpretation of these results is difficult and any inferences drawn must be treated with caution without the corresponding effort data. This will be added to the report once provided by the MMO (pending, March 2015).

Table 4. Restrictions on fishing for bass in the nursery areas in the Devon and Severn IFCA district

Estuary	Bass nursery area restrictions
Exe	Fishing for Bass from any vessel is prohibited from the 1st May to the 31st October inclusive in all tidal waters enclosed by a line drawn 068° true from Langstone Point to Orcombe Point. Fishing for Bass, or fishing for any species of sea-fish using sand–eels as bait, by any fishing boat within any part of the above area is prohibited between 30th April and 1st November.
River Teign	Fishing for Bass from any vessel is prohibited from the 1st May to the 31st October inclusive in all tidal waters enclosed by a line drawn 000° True from the Ness to the southernmost leading light. Fishing for Bass, or fishing for any species of sea-fish using sand–eels as bait, by any fishing boat within any part of the above area is also prohibited between 1st May and 31st October inclusive each year.
River Dart	Fishing for Bass from any vessel is prohibited from the 1st May to the 31st December in all tidal waters enclosed by a line drawn 064° true from Coombe Point to Inner Froward Point. Fishing for Bass, or fishing for any species of sea-fish using sand–eels as bait, by any fishing boat within any part of the above area is prohibited.
Salcombe	Fishing for Bass from any vessel is prohibited from the 1st May to the 31st of December inclusive each year in all tidal waters enclosed by a line drawn 090°true from Splat Point to Limebury Point. Fishing for Bass, or fishing for any species of sea-fish using sand–eels as bait, by any fishing boat within any part of the above area is also prohibited between 1st May and the 31st of December inclusive each year
Avon	Fishing for Bass from any vessel is prohibited from the 1st May to the 31st December in all tidal waters enclosed by a line drawn 206° true from Warren Point at Bigbury on Sea to Burgh Island, and a line drawn 090° true from the Southern tip of Burgh Island to the coast. Fishing for Bass, or fishing for any species of sea-fish using sand–eels as bait, by any fishing boat within any part of the above area is prohibited.
Yealm	Fishing for Bass from any vessel is prohibited between 1st May and the 31st December inclusive in all tidal waters enclosed by a line drawn 205° true from Season Point to Mouthstone Point.
Plymouth	Fishing for Bass from any vessel is prohibited all year in all tidal waters enclosed by a line drawn from the Western end of Mountbatten Pier 268° true to the landing beacon at Wilderness Point in the River Tamar. Fishing for Bass, or fishing for any species of sea-fish using sand–eels as bait, by any fishing boat within any part of the above area is prohibited all year.
River Taw	All tidal waters enclosed by a line drawn 190º true from the western end of Braunton pill to the site of the former power station at Yelland from 1st May to the 31st October.
River Torridge	All tidal waters enclosed by a line drawn 190º true from the western end of Braunton pill to the site of the former power station at Yelland from 1st May to the 31st October.

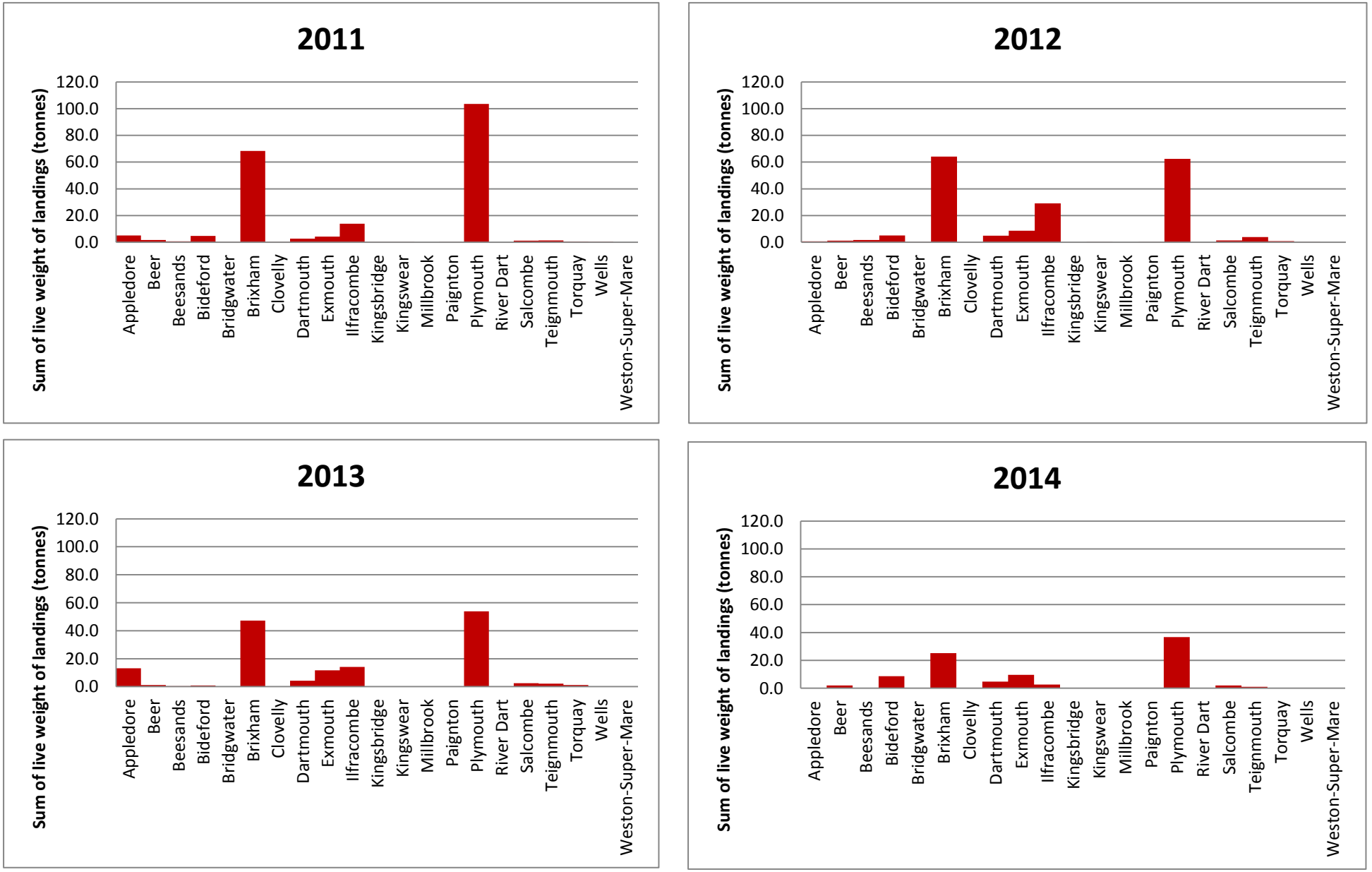

Figure 5. Live weight landings of European sea bass into ports in the Devon & Severn IFCA district. It should be highlighted that bass landed within the district may not have been caught within the district.

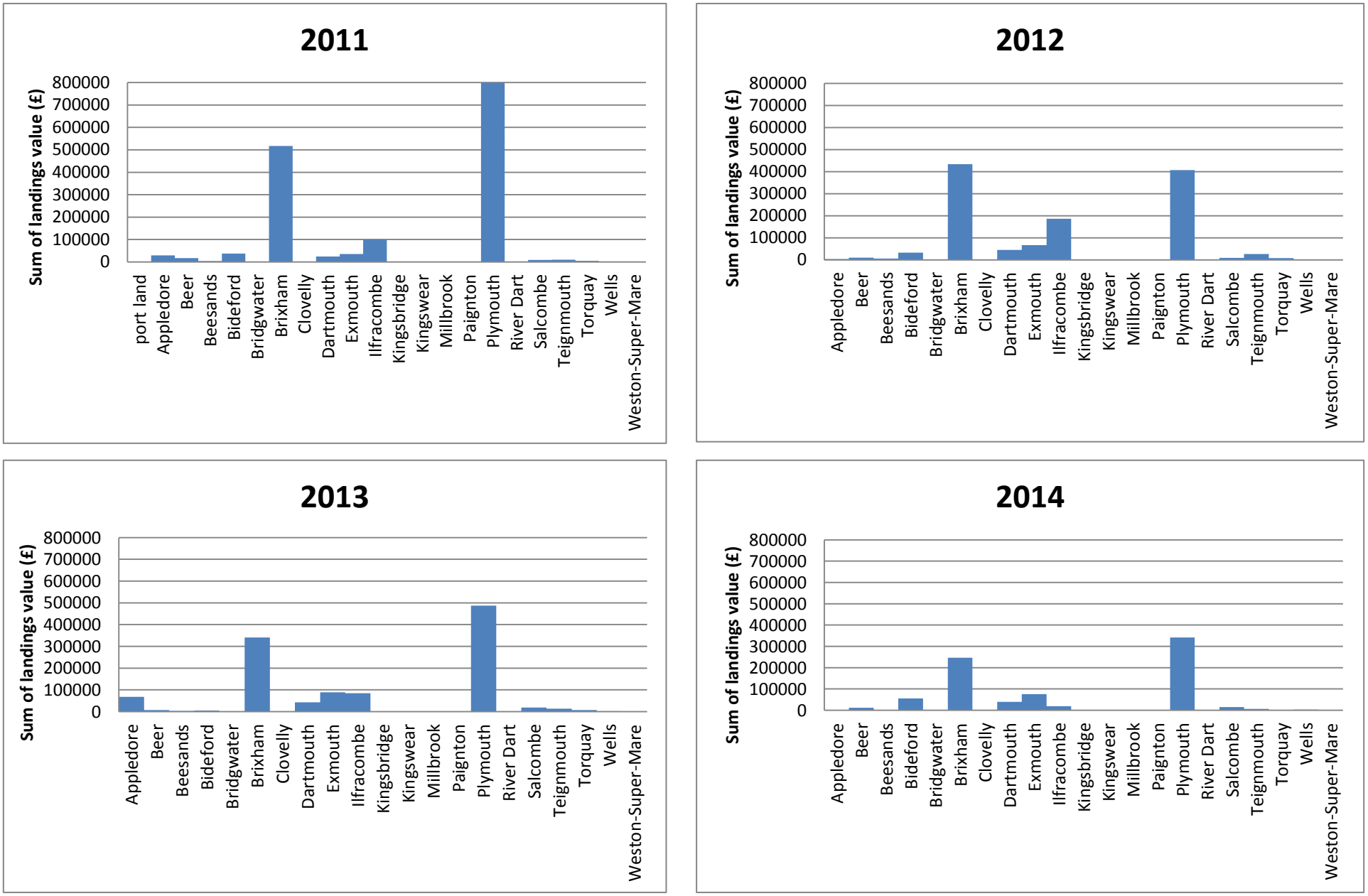

Figure 6. Value (£) of landings of European sea bass into ports in the Devon & Severn IFCA district. It should be highlighted that bass landed within the district may not have been caught within the district.

2.4 Devon and Severn IFCA district – recreational fisheries

European sea bass is of great importance to recreational anglers throughout the south and south west of England. It is targeted from both the shore and private boats and is also an important species for the charter boats operating on the south and north coasts of the district. In 2012 D&S IFCA identified 73 angling charter boats operating out of ports on the south coast of Devon and 38 boats operating out of North Devon and the Severn Estuary. It is extremely difficult to quantify the importance of one species to recreational angling as a whole, but the existence of the extremely active and engaged organisation dedicated to the conservation of the species; Bass Anglers Sportfishing Society (B.A.S.S) goes some way to determining the importance of the fish to the recreational sector. Recreational anglers have been campaigning for an increased MLS applicable to all sectors for some time now, and minimum club sizes for sea bass far exceed the legal MLS, for example the bass MLS for the Bristol Channel Federation of Sea Anglers is 55cm.

3.0 Current crisis

Technical measures brought in 1990 were deemed to be successful (Pawson 2005) However, this was in part because technical measures were introduced at the same time as the UK experienced a series of mild winters which resulted in exceptional recruitment of juvenile sea bass, so that despite increased fishing effort, catches remained constant and exploitation was thought to be sustainable (Pawson 2005). However, a series of cold winters (2008-2012) combined with a failure to control targeting of offshore spawning aggregations have resulted in a large decrease in the stock, as predicted by Pawson (2005). Fishing mortality now far exceeds the Maximum Sustainable Yield and ICES has stated that urgent action must be taken to significantly reduce fishing mortality for bass. A recommended 80% reduction in landings, to a total of 1155t was suggested.

4.0 New management

4.1 EU

In order to achieve the 80% reduction in fishing mortality called for by ICES (2014), new management is required which will reduce fishing effort proportionally across the offshore, inshore and recreational sectors.

Negotiations on the introduction of technical measures to further protect bass stocks have been ongoing in the European Commission since 2012. In January 2015 the European Commission announced emergency measures to avert the collapse of the declining sea bass stock. A ban on targeted trawling for offshore spawning aggregations of sea bass was introduced between January and April 2015; a measure which affects the offshore (primarily French) pair-trawl fishery.

The announcement by the commission also stated that the emergency ban on trawling would be complemented by further measures to ensure that all those who fish sea bass make a balanced and fair contribution to saving the stock. Two further packages have been announced which have been put forward by the UK, but are still to be agreed by the European Commission. The second package suggests a three bass per person per day bag limit for recreational sea anglers. The third package is a combination of technical measure targeting elements of the commercial fleet not affected by package 1. Whilst draft forms of packages 2 and 3 have been circulated, a formal version has not yet been released, but will be added to the D&S IFCA Member's page when it becomes available.

4.2 Member state

Following interactions between individual IFCAs and the recreational sea angling sector, the Association of IFCAs wrote to the then Fisheries Minister, Richard Benyon, in November 2012 asking him to consider increasing the MLS of sea bass to 40cm in the first instance, and then 45cm thereafter at a UK and EU level. The letter highlighted the need for a UK wide increase in the bass MLS due to the offshore migrations of adult bass in winter spawning seasons and the discriminatory issues of having a higher MLS inshore compared to offshore. The precedent for this principle was set by the use of a national order to designate Bass Nursery Areas in order to ensure equality of treatment in all regions and immediacy of implementation (Pawson et al. 2005). Likewise, in the opinion of the IFCAs any technical measures brought in via package 3 should be brought in at a Member State level, not via local management regimes.

4.3 IFCA management

Over the coming months Devon and Severn IFCA will formally identify the opportunities for local management which will complement the International and National measures brought in to address the recent decline in bass stocks. It is thought that these measures will relate to:

- A review of current Bass Nursery Areas and identification of possible ways of strengthening protection inside these areas
- A review of other areas in the district where bass are known to aggregate and may be particularly vulnerable to exploitation

Devon and Severn IFCA are working closely with Southern and Cornwall IFCAs to align management as closely as possible. Details of documents provided by the other IFCAs can be found on their websites or, where available, are in the Useful Documents section of this update.

5.0 Displacement considerations

The potential of new restrictions on the inshore fishing fleet targeting bass may result in displacement of effort to other areas or species. Part of the reason for considering the need for protection of non-estuarine aggregation areas for bass is to protect those fish if more restrictive measures come in for estuaries. Further consideration may need to be given to the potential displacement of fishing effort on to mullet stocks. Like bass, mullet exhibit slow growth and aggregating behaviour and may be vulnerable to increases in fishing pressure following greater restrictions on bass fishing.

6.0 References

Armstrong M. and Drogue M. (2014) Request for Services - Sea bass. Commitment No. SI2.680348. Sea bass fisheries in Europe and their management, Paper for STECF, July 2014.

Armstrong M., Brown A., Hargreaves J., Hyder K., Pilgrim-Morrison S., Munday M., Proctor S., Roberts A. and Williamson K. (2013) Sea Angling 2012 – a survey of recreational fishing activity and economic value in England, Department for Environment, Food and Rural Affairs, London, England.

Carroll A. (2014) Population dynamics of European sea bass (*Dicentrarchus labrax*) in Welsh Waters, Unpublished thesis, University of Bangor, Wales.

Claridge P.N and Potter I.C. (1983) Movements, abundance, age composition and growth of bass, Dicentrarchus labrax, in the Severn Estuary and inner Bristol Channel, Journal of the Marine Biological Association of the United Kingdom, 63 (04): 871-879.

Colclough S., Fonseca L., Astley T., Thomas K. and Watts. W.(2005) Fish utilisation of managed realignments, Journal of Fisheries Management and Ecology, 12: 351-360.

Coscia I. and Mariani S. (2011) Phylogeography and population structure of European sea bass in the north-east Atlantic, Biological Journal of the Linnean Society, 104: 364-377

Fritsch M., Morizur Y., Lambert E., Bonhomme F. and Guinand B. (2014) Assessment of sea bass (*Dicentrarchus labrax*) stock delimitation in the Bay of Biscay and the English Channel based on mark-recapture and genetic data, Fisheries Research 83 (2-3): 123-132.

ICES (2002) Report of the Study Group on Bass, Lowestoft, England, ICES CM2002/ACFM: 11 Ref G, 59pp.

ICES (2013) Report of the Working Group for Celtic Seas Ecoregion (WGCSE), ICES CM 2013/ACOM: 12.

Laffaille P., Lefeuvre J.C., Schricke M.T. and Feunteun E. (2001) Feeding Ecology of 0-Group Sea Bass, *Dicentrarchus labrax* in Salt Marshes of Mont Saint Michel Bay (France), Estuaries, 24: 116-125.

Pawson M.G. (1995) Biogeographical identification of English Channel fish and shellfish stocks, Fisheries Research Technical Report Number 99, Ministry of Agriculture, Fisheries and Food, Directorate of Fisheries Research, Lowestoft, England.

Pawson M.G., Pickett G.D. and Smith M.T. (2005) The role of technical measures in the recovery of the UK European sea bass (*Dicentrarchus labrax*) fishery 1980-2002, Fisheries Research, 76: 91-105.

Pickett G.D. and Pawson M.G. (1994) The sea bass, biology, exploitation and conservation. Fish and Fisheries Series. Chapman and Hall.

7.0 Useful documents

Marine Conservation Society:
http://www.mcsuk.org/downloads/fisheries/MCSBassAsks_Dec2014.pdf

New Economics Foundation: Seven steps to bass recovery:
http://www.neweconomics.org/blog/entry/seven-key-steps-to-bass-stock-recovery

Institute of Fisheries Management (IFM) Position Statement and Technical Appendix:
http://www.ifm.org.uk/node/293

Bass Nursery Legislation:
http://www.cefas.defra.gov.uk/publications/techrep/Bass.pdf

Angling Trust:
http://anglingtrust.net/page.asp?section=841&sectionTitle=Campaigning+For+More+And+Bigger+Bass

National Federation of Fishermen's Organisation:
http://nffo.org.uk/news/bass-management.html