Two Sides to Every Flatfish

By Declan T. Quigley

MORE than 600 species of flatfish (Order: Pleuronectiformes) have been described. The group has been remarkably successful in colonising a wide range of habitats, from Arctic seas to the tropics, and from shallow estuarine waters (including freshwater) down to considerable ocean depths (≥1830m). However, they appear to be absent from the deeper abyssal and hadal zones.

Only 22 species of flatfish have been recorded from Irish waters (Table 1). The Irish group includes several species which are exploited by both the sea fishing industry (10) and anglers (8) e.g. megrim, turbot, brill, witch, halibut, dab, lemon sole, flounder, plaice and black sole. However, very little is known about the biology and distribution of the remaining (12) species in Irish waters. Indeed, most of them are considered rare or uncommon, probably because they have (as yet) no commercial or recreational value.

In most respects the early pelagic larvae of flatfish are similar to those of symmetrical fishes. However, during metamorphosis in the later stages of larval life the typical asymmetry becomes obvious. The eye on one side of the larva migrates over the head and comes to rest close to its opposite number. At this stage the pelagic life ceases and the young fish assume a primarily bottom-living (benthic) existence.

The most noticeable feature of adult flatfishes is the asymmetry of the head, in which, depending on the species, both eyes are sited on either the left (sinistral = left-sided) or right (dextral = right-sided) side of the body. The side on which the eyes are placed (ocular side) is usually coloured, while the opposite side (blind side) is usually unpigmented.

In general, the percentage of congenital abnormalities occurring in fish is considered to be highest among the Pleuronectiformes, possibly due to the complex morphological changes which occur during larval metamorphosis. However, it should be noted that several other factors can give rise to abnormalities e.g. disease, nutritional deficiencies, injury and pollution.

Some species of flatfish appear to exhibit a greater frequency of abnormalities than others (Table 2). However, this may only be a reflection of recording effort. All of the species exhibiting abnormalities in Irish waters were commercially important and therefore the chances of abnormalities being observed are greater in these species. It seems reasonable to assume that abnormalities would also be discovered in non-commercial species if greater numbers were examined. Some international studies have found that the frequency of abnormalities in specific species varied geographically and this has sometimes been linked to variations in water quality due to pollution. However, it may also be simply a reflection of recording effort. For example, more than 75% of the Irish records were reported from Co Kerry where recording effort is known to have been consistently high since the early 1960's. Indeed, the first recorded abnormalities were reported from this area as far back as 1850. The remaining records came from Co's Waterford (1); Wexford (3); Dublin (2) and Antrim (1). It is clear that there have been no records of abnormalities from a significant area of Irish coastal waters.

Albinism, which appears to be relatively uncommon, is usually incomplete (partial albinism); part of the ocular side retaining its normal colour. The condition appears to occur most frequently in black sole (Figure 1) in Irish waters. Albinism, and particularly partial albinism (13.6%), has accounted for about 16% of all the anomalous flatfish known to have been recorded in Irish waters to date (44).

More commonly, the blind side (which is normally white or unpigmented) may be completely coloured or bear patches of colour. This abnormality, which is termed ambicolouration, is more common in some species than in others; it appears to occur more frequently in brill, turbot (Figure 2) and flounder (Figure 3) in Irish waters. In the turbot ambicolouration is usually accompanied by other abnormalities, the most noticeable being the development of a 'hook' or 'notch' at the origin of the dorsal fin, which does not join the head in the usual way. 'Notched' turbot were noted by naturalists during the l800's and some were of the opinion that they constituted a separate species: *Platessa melanogaster*. Ambicoloured turbot may also exhibit bony excrescences or nodules on both the ocular and blind side; these nodules are only found on the ocular side of normal turbot. Ambicolouration (50%), including partial ambicolouration (Figure 4), has accounted for nearly 60% of all the anomalous flatfish recorded in Irish waters to date.

Some specimens of flatfish have also been found lacking the characteristic spotting pattern for the species (e.g. red spots on the ocular side of plaice); while other specimens have exhibited spots which are normally absent on these species e.g. brill (Figure 5). The condition where spots were either present or absent, has accounted for 13.6% of all the anomalous flatfish recorded in Irish waters to date.

Finally, an even more interesting abnormality is the phenomenon of reversal. Occasionally in flatfishes individuals occur with the eyes and colour on the side which is usually eyeless (blind side) and unpigmented. During metamorphosis the eye from the 'wrong' side of the head (for the species concerned) migrates and the fish ends up having both eyes on what would be the blind side in a normal fish. In sinistral forms, the right eye migrates to the left side; in dextral forms, the left eye migrates to the right side. Colouration follows the position of the eyes with the result that the fish is the 'wrong way around'. This phenomenon is very difficult to notice unless normal specimens are available for comparison. Reversal is more common in some species than others; studies have shown it to be extremely rare in dabs and four-spot megrim. It has only been recorded in megrim (Figure 6), flounder (Figure 7) and black sole in Irish waters, representing 13.6% of all abnormalities.

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Figure 1: Partial albinism in Black Sole (ocular side)

Figure 2: Ambicoloured Turbot

Figure 3: Ambicoloured flounder, blind side above and ocular side below

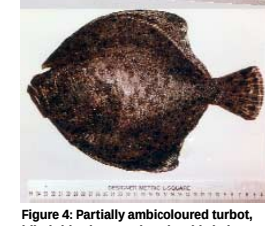

Figure 4: Partially ambicoloured turbot, blind side above and ocular side below

Figure 5: Brill with unusual black spots on ventral side

Figure 6: Reversed Megrim

Figure 7: Reversed Flounder (above) and normal (below)

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Left-Eyed Flatfish (Sinistral)	Species	Habitat	Distribution	*ISFC Record Weight	**BRFC Record Weight	***Catch Figures (2001) Live Weight	Value €
Scophthalmidae				(kg)	(kg)	(tonnes)	(x 1000)
Megrim	*Lepidorhombus wiffiagonis* (Walbaum, 1792)	offshore waters	common	1.850	1.715	3705	8783
Four-spot Megrim	*L. boscii* (Risso, 1810)	deep water	?				
Norwegian Topknot	*Phrynorhombus norvegicus* (Gunther, 1862)	inshore-offshore	rare ?				
Eckstrom's Topknot	*P. regius* (Bonnaterre, 1788)	offshore waters	moderately common ?				
Turbot	*Scophthalmus maximus* (L.)	inshore	common	15.436	15.308	186	1724
Brill	*S. rhombus* (L.)	inshore	common	4.313	7.257	96	712
Topknot	*Zeugopterus punctatus* (Bloch, 1787)	inshore	uncommon/local ?		0.382		
Bothidae							
Imperial Scaldfish	*Arnoglossus imperialis* (Rafinesque, 1810)	inshore/offshore	scarce ?				
Scaldfish	*A. laterna* (Walbaum, 1782)	inshore	common ?				
Thor's Scaldfish	*A. thori* Kyle, 1913	inshore	rare ?				
Right-Eyed Flatfish (Dextral)							
Pleuronectidae							
Witch	*Glyptocephalus cynoglossus* (L.)	moderately deep water	common		0.533	865	1469
Long Rough Dab	*Hippoglossoides platessoides* (Fabricus, 1780)	moderately deep water	common		0.155		
Halibut	*Hippoglossus hippoglossus* (L.)	deep water	uncommon	70.824	106.136		
Dab	*Limanda limanda* (L.)	inshore	common	1.064	1.254		
Lemon Sole	*Microstomus kitt* (Walbaum, 1792)	inshore/offshore	locally common			443	1070
Flounder	*Pleuronectes flesus* L.	inshore	common	2.229	2.593		
Plaice	*P. platessa* L.	inshore	common	3.736	4.635	824	2074
Greenland Halibut	*Reinhardtius hippoglossoides* (Walbaum, 1792)	deep water	rare				
Soleidae							
Solenette	*Buglossidium luteum* (Risso, 1810)	inshore/offshore	common				
Thickback Sole	*Microchirus variegatus* (Donovan, 1808)	offshore/deep water	rare ?				
Sand Sole	*Solea lascaris* (Risso, 1810)	inshore/offshore	rare ?				
Black Sole	*S. solea* (L.)	inshore	common	2.869	2.966	356	3678

*Data Sources: * Annual Report of the Irish Specimen Fish Committee (2002) ** British Record (Rod Caught) Fish Committee (1995-2003) *** Central Statistics Office: Fishery Statistics (2001)*

Table 1. Flatfish species in Irish waters, with notes on habitat, distribution, angling records and commercial catches

	Ambicolouration		Albinism		Spots		Reversal		Total	%
	Full	Partial	Full	Partial	Present	Absent	Sinistral	Dextral		
Megrim								3	3	**6.8**
Turbot	5	1		1					7	**15.9**
Brill	9				1				10	**22.7**
Dab	1								1	**2.3**
Lemon Sole		1							1	**2.3**
Flounder	6			1			1		8	**18.2**
Plaice		1		1	1	4			7	**15.9**
Black Sole	1		1	3			2		7	**15.9**
Total	**22**	**3**	**1**	**6**	**2**	**4**	**3**	**3**	**44**	
%	**50.0**	**6.8**	**2.3**	**13.6**	**4.5**	**9.1**	**6.8**	**6.8**		

Table 2. Frequency of abnormalities in Irish flatfish species