

**Community-Based Heritage Project CBH04936**

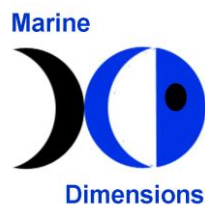
An Chomhairle Oidhreachta  
The Heritage Council



**To Improve Information Available for Management of Ireland's  
Threatened Species of Skate and Ray**



**Final Report  
Marine Dimensions, November 2015**



## Project CBH04936

**Title: To Improve Information Available for Management of Ireland's Threatened Species of Skate and Ray**

### Acknowledgements

We are most grateful to the Heritage Council for funding the Purse Search research and outreach activities this year through a Community-Based Heritage Grant. Project workshops and outreach have also been funded through the Local Agenda 21 Environmental Partnership Fund with support from Cavan County Council and Louth County Council. In addition, project outreach in Kilkenny schools was facilitated by a Litter Grant from Kilkenny County Council.

We would also like to thank the following authorities and organisations for sponsoring Marine Experience workshop events in 2015 which included outreach for the Purse Search project: Laois County Council, Dublin City Council, Fingal County Council, Atlantic Corridor and Galway Atlantaquaria.

We are also indebted to all those wonderfully dedicated volunteer observers who went to the trouble of reporting their sightings of mermaids' purses.

### Summary

*To improve information available for management of Ireland's threatened species of skate and ray* is a community based research project that aims to disseminate and publish archived data gathered through the citizen science project, Purse Search Ireland. This public participation programme encourages people to report their observations of shark and ray eggcases (aka mermaids' purses) washed up on beaches around Ireland's coasts. These sightings can then be used to provide valuable information on the location of nursery areas for Ireland's sharks and rays, some of which are endangered or rare. To date, 666 purse reports have been received from observers over a period of 9 years, with a total of 6985 eggcases from 12 species of shark, skate and ray reported from 283 locations. Analysis of data reported by volunteer observers through 2010-2015 has highlighted several new sites that are likely to serve as nurseries for threatened species, including the endangered Undulate Ray *Raja undulata* and critically endangered White Skate *Rostroraja alba* and Common Skate *Dipturus batis*. New records of eggcases from the Starry Skate *Amblyraja radiata*, Flapper Skate *Dipturus intermedia* and Blue Skate *Dipturus flossada* have also been identified. Improved funding for the project is required as it is currently the only survey that is dedicated to monitoring the presence of nurseries for critically endangered skate species in Ireland.

## Project Background

This project has been prompted by an urgent need to address the lack of information available for conservation management of skate and ray species threatened with extinction in Ireland.

Previous projects funded by the Heritage Council, including the 2010 HC Research Project, *To investigate critical habitats for threatened species of shark and ray* (R00261), have highlighted the importance of funding Purse Search Ireland, the nation's Shark and Ray Eggcase Sightings Scheme. This citizen science project was set up in 2007 with the aim of encouraging the Irish public to report their observations of shark and ray eggcases (aka mermaids' purses) around Ireland's coastline. These purses can often be seen washed up on the seashore, sometimes indicating that there may be a nursery close by.

When the project was set up initially, it was hoped that the public's participation could be used to provide information necessary for fisheries conservation management, whilst at the same time raising public awareness for Ireland's marine wildlife and environment. Since then, thousands of purses from shark, skate and ray species have been reported from locations around Ireland's coastline, including eggcases from four threatened species of skate. The project has been very popular with the public since it allows people to participate in marine conservation whilst also enjoying a nature activity, eg. a family walk on the beach. As a result, a number of beaches around Ireland's coastline have been highlighted as possible indicator sites, including areas that may serve as nurseries for several commercial species of ray, eg. the Thornback Ray *Raja clavata*, Spotted Ray *Raja montagui*, Painted Ray *Raja microocellata* and Blonde Ray *Raja brachura*. Critical habitats associated with rare or vulnerable species have also been identified, including those for the critically endangered White Skate *Rostroraja alba*, Common Skate *Dipturus batis* (now recognised as two species; the Flapper Skate *D. intermedia* and Blue Skate *D. flossada*) and the endangered Undulate Ray, *Raja undulata*.

The Purse Search project received funding from various state agencies and private sponsors from 2007-10. However, unfortunately it was hard by the economic downturn, and although Marine Dimensions continued to run the outreach and administration for the project through years 2011-13 on a voluntary basis, in 2014 the viability of the organisation needed to be prioritised and the project was discontinued. At this point, sightings reported by the public were retained and archived in the hope that funding might at some stage be secured to address the conservation management of several native species that are currently threatened with extinction.

The current Community-Based Heritage Grant represents a ray of hope with regard to funding as it is the first grant in over four years that has been made available to fund the curation of data for the project. A significant amount of data has remained in an unpublished format in the Marine Dimensions offices and there has been a

pressing need to make it available to decision makers, fisheries conservation managers and stakeholders.

## **Methods**

### *Community based education and outreach*

Marine Dimensions runs an extremely active community based education and outreach programme, including workshops, courses and public events. Many Purse Search volunteer observers are recruited through this programme. It also provides an effective platform for communicating results and providing feedback to communities participating in the project. Appendix I lists the schools, venues and festivals visited through the Purse Search outreach programme in 2015.

Shark and ray citizen science is one of the main biodiversity themes featured in The Marine Experience, which is Marine Dimensions' most popular workshop (Figs 1-3). Designed to introduce all age groups to the wonders of Ireland's marine world, the workshop has been found to be one of the most effective ways of engaging with communities on the ground (it has been tried and tested over a period of five years). All visits include Marine Dimensions' popular travelling touchpool, giving children a chance to engage with live sea creatures, such as baby sharks, starfish, shrimp, anemones, crabs and sea snails. The interactive display also includes authentic marine realia, with props ranging from cockle shells and lobster claws to starfish and shark eggcases. The workshop is also facilitated by two qualified marine biologists, on hand to guide children through the display. The associated mermaid's purse necklace making arts and crafts workshop is also an effective way of engaging families. Outdoor workshops and eggcase hunts also work particularly well, with many schools deciding to include eggcase hunts in their annual nature programmes as a result.



Figure 1: A Lesser Spotted Dogfish embryo in its eggcase (photo credit: Alice Wiegand) and children observing purses and live specimens at a Marine Experience workshop at the Dublin Zoo Native Species Weekend (photo credits: Sarah Varian/Marine Dimensions).

### *Purse reports and eggcase identification*

A consistent reporting process has been followed throughout the course of the project in order to prioritise quality of information, particularly in relation to species identification (Table 1). Although The Shark Trust's eggcase identification charts are available for interested observers, it was considered to be difficult for volunteers to identify species correctly without adequate training and experience. For this reason, the requirement for a project scientist to confirm species identification has been incorporated into the reporting process. This involves the observer either posting a sample of the eggcase to Marine Dimensions or providing a good quality photograph or description of the eggcase. Sighting reports that do not include adequate information are recorded as unconfirmed in the Purse Search database.

The Purse Search programme also encourages observers to report their observations using an online recording form ([http://marinedimensions.ie/Online\\_recording\\_form.869.0.html](http://marinedimensions.ie/Online_recording_form.869.0.html)), which has been designed and customised for use on the project. It is also available for use by observers as a hard copy by request from Marine Dimensions.

Table 1: The three phases of action experienced by volunteer observers participating in the Purse Search Eggcase Sightings Scheme.

| Phase                        | Action  | Outcome   |
|------------------------------|---|---|
| 1. Education and outreach    | <p>Potential volunteer observers are informed about the project through:</p> <ul style="list-style-type: none"> <li>(a) school workshops</li> <li>(b) public outreach events</li> <li>(c) press and media coverage</li> <li>(d) flyers</li> <li>(e) website info</li> <li>(f) social media</li> </ul> <p>Observers are asked to report their observations online through the Purse Search project page at <a href="http://www.marinedimensions.ie">www.marinedimensions.ie</a>. It is also requested that they post a sample or send a photograph of the purse on to the project scientists in order to confirm species identification.</p> | <p>Public awareness is raised. Approximately 7000 people per year are informed through face to face events, with many more informed through press and media coverage.</p>   |
| 2. Exploration and discovery | <p>Volunteers discover purses either</p> <ul style="list-style-type: none"> <li>(a) incidentally on a beach walk or</li> <li>(b) intentionally through a beach survey</li> </ul>  | <p>Learning is consolidated through outdoor exploration and discovery. Observations may or may not be reported to Marine Dimensions at this stage.</p>  |
| 3. Reporting                 | <p>Volunteers report the sighting online through a recording form or via land mail. The observation may be reported in one of three ways:</p> <ul style="list-style-type: none"> <li>(a) with no description, photo or sample of the purse,</li> <li>(b) with a description or photo of the purse, but no sample,</li> <li>(c) with a description and sample of the purse.</li> </ul> <p>Following receipt of the information, the project scientist e-mails the observer to give them the results of their report and to thank them for their participation.</p>   | <p>The sightings are included in the Purse Search database and species identified are classified as either confirmed or unconfirmed, depending on the quality of information provided by the observer through actions (a)-(c):</p> <ul style="list-style-type: none"> <li>(a) is classified as unconfirmed,</li> <li>(b) may be classified as unconfirmed or confirmed, depending on the quality of information provided,</li> <li>(c) is classified as confirmed.</li> </ul> |

## Results

### *Communications, education and outreach*

#### Schools programme and public events

The Marine Experience workshops received an extremely enthusiastic response from all the schools and venues visited by the roadshow, with approximately 6500 members of the public attending the display this year. The highly visual and kinaesthetic nature of the display enhances potential for learning, thus making communication of conservation messages more effective (Figs 2 and 3). However, it is essential that the number of children attending the display is limited in order to (a), ensure a high quality learning experience for each child and (b), manage stress to the animals.

Feedback obtained from schools visited in the past has suggested that children attending workshops go on to educate and inspire their families as result of their experience. Numbers attending the workshop at public events ranged from 30 to 1000, depending on the nature of the event. A notable increase in hits and online purchase reports was observed on the Marine Dimensions website in association with the busier public events. Related social media campaigns, press and media coverage would have also expanded the reach of the programme even further. Thus, it is anticipated that there would have been an indirect educational impact from the roadshow for the wider community, with an estimated 20000 people likely to have been influenced by the project in a positive way.





Figure 2: The Marine Experience workshop visiting Treasures Preschool in Wicklow (top) and Rush Harbour Festival this year. (Photo credits: Sarah Varian/Marine Dimensions).

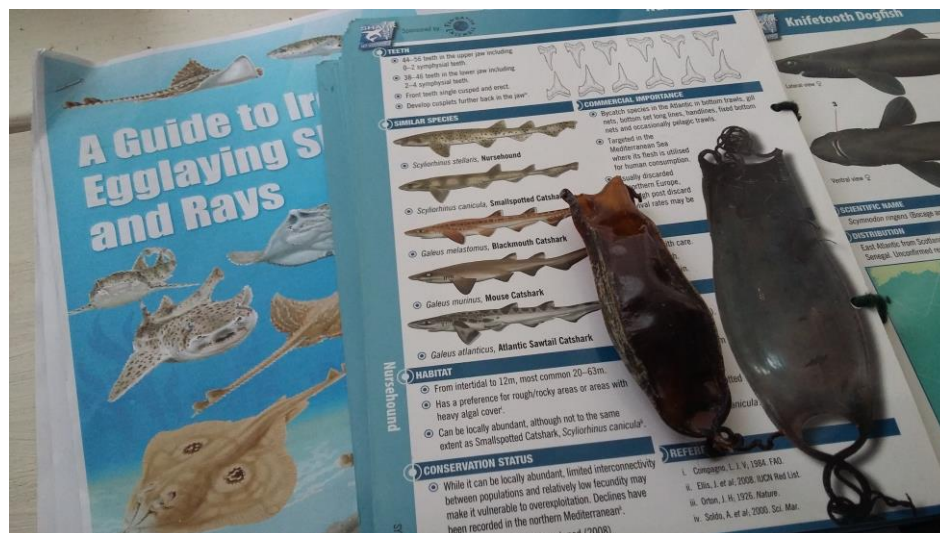


Figure 3: An outdoor Purse Search workshop and shark and ray eggcase hunt, run by Marine Dimensions on Greystones South Beach in Co. Wicklow as part of Heritage Week this year. (Photo credit: Sarah Varian/Marine Dimensions).

## *The reporting process and public participation*

### Purse reports

In all, 666 purse reports have been received from observers since the project began, with a total of 7338 eggcase sightings recorded over a period of nine years from 2007-2015. Of these reports, 76% of observers sent eggcases on to the project scientists for identification, improving quality of information, while 13% provided photographs. A small percentage of eggcases (2%) could also be identified using the description provided by the observer on the purse sightings form. Although there were some sightings of mermaids' purses underwater (with 3% of recording forms submitted by divers), the vast majority of eggcase records represent incidental sightings of discarded eggcases washed up on beaches around Ireland's coastline. A number of sightings were also referred on to Marine Dimensions by the Shark Trust's Great Eggcase Hunt in the UK. Similarly, observations of eggcases in the UK reported to Marine Dimensions were referred back to the Shark Trust.

### Species identification and eggcase distribution

A total of 6985 purses from 12 species of shark, skate and ray were identified from 283 coastal locations. Figures 4-15 show the distribution of eggcases around Ireland's coastline reported by volunteer observers for each species of shark and ray, whilst Table 2 indicates the frequency of eggcase sightings on beaches and numbers of eggcases identified for each species according to volunteer reports.

Of the 12 species of shark and ray eggcase identified, the Lesser Spotted Dogfish was the most frequently sighted and the most widespread; the larger Greater Spotted Dogfish was reported much less frequently (Figs 4 and 5, Table 2). Thornback and Spotted Ray eggcases were common and widespread, whereas other commercial species, such as the Small Eyed Ray, Blonde Ray and Cuckoo Ray, were not as frequently reported (Figs 6-10, Table 2).

There was only one confirmed sighting of a Starry Skate eggcase on Streedagh Back Strand in Co. Sligo which was recorded in 1987 (Fig. 11). We suspect that the unconfirmed observation of a Starry Skate eggcase on Rossbeigh beach in Glenbeigh, Co. Kerry, may have been misidentified, since this species is known to have a more northern distribution, with its southernmost limits extending to the north coast of Ireland (Shark Trust, 2009).

### Threatened species

The vast majority of eggcases from the endangered Undulate Ray were reported from beaches in the Tralee Bay area (Fig. 12), with only one confirmed sighting recorded further north on Ladies Beach in Ballybunion. Unconfirmed sightings were recorded in Dingle Bay and Galway Bay.



There were 25 confirmed reports of eggcases from the critically endangered Common Skate, which is now recognised as two species, the Flapper Skate and the Blue Skate. A total of 24 Flapper Skate purses were recorded at 14 sites along the west coast, including Donegal, Sligo, Galway, Clare, Kerry and Cork (Fig. 13).

Only one Blue Skate eggcase has been identified, with a confirmed sighting in Barley Cove, Co. Cork in 2010 (Fig. 14). This purse could not be identified correctly until 2013 (it was previously thought that it might be a Long Nosed Skate eggcase), when work by the Shark Trust clarified the differences in eggcase morphology between the two Common Skate species (Fig. 16).

A total of 49 eggcases were identified as being from the extremely rare and critically endangered White Skate, with the vast majority (92%) sighted in the Tralee Bay area (Fig. 15). Sightings were also confirmed for Tawin Island in Galway Bay and for Tullaghan Bay in Co. Leitrim. Three live White Skate embryos have been recorded throughout the course of the project, two of which were incidentally sampled during an inshore survey conducted by Tralee Institute of Technology on the Celtic Voyager in 2010; the other embryo was collected from the Galway Bay area by a fisherman in 2004 (exact location unknown). The fish was brought to Galway Atlantaquaria and was subsequently hand reared. This individual, named Valentine, is now a popular attraction at the aquarium. She started laying eggs in her 8<sup>th</sup> year.

Table 2: Total number of eggcases identified for each species, reported by volunteer observers from 2007-2015.

| Species name                   | Common name             | No. eggcases<br>(confirmed) | No. eggcases<br>(unconfirmed) |
|--------------------------------|-------------------------|-----------------------------|-------------------------------|
| <i>Scyliorhinus canalicula</i> | Lesser spotted dogfish  | 4338                        | 379                           |
| <i>Scyliorhinus stellaris</i>  | Greater spotted dogfish | 138                         | 58                            |
| <i>Raja clavata</i>            | Thornback ray           | 804                         | 182                           |
| <i>Raja montagui</i>           | Spotted ray             | 322                         | 58                            |
| <i>Raja microocellata</i>      | Small eyed ray          | 88                          | 4                             |
| <i>Raja brachyura</i>          | Blonde ray              | 33                          | 7                             |
| <i>Leucoraja naevus</i>        | Cuckoo ray              | 6                           | 1                             |
| <i>Amblyraja radiata</i>       | Starry skate            | 1                           | 1                             |
| <i>Raja undulata</i>           | Undulate ray            | 316                         | 71                            |
| <i>Dipturus batis</i>          | Common skate            | 25                          | 1                             |
| <i>Dipturus intermedius</i>    | Flapper skate           | 24                          | 1                             |
| <i>Dipturus flossada</i>       | Blue skate              | 1                           | 0                             |
| <i>Rostroraja alba</i>         | White skate             | 49                          | 1                             |

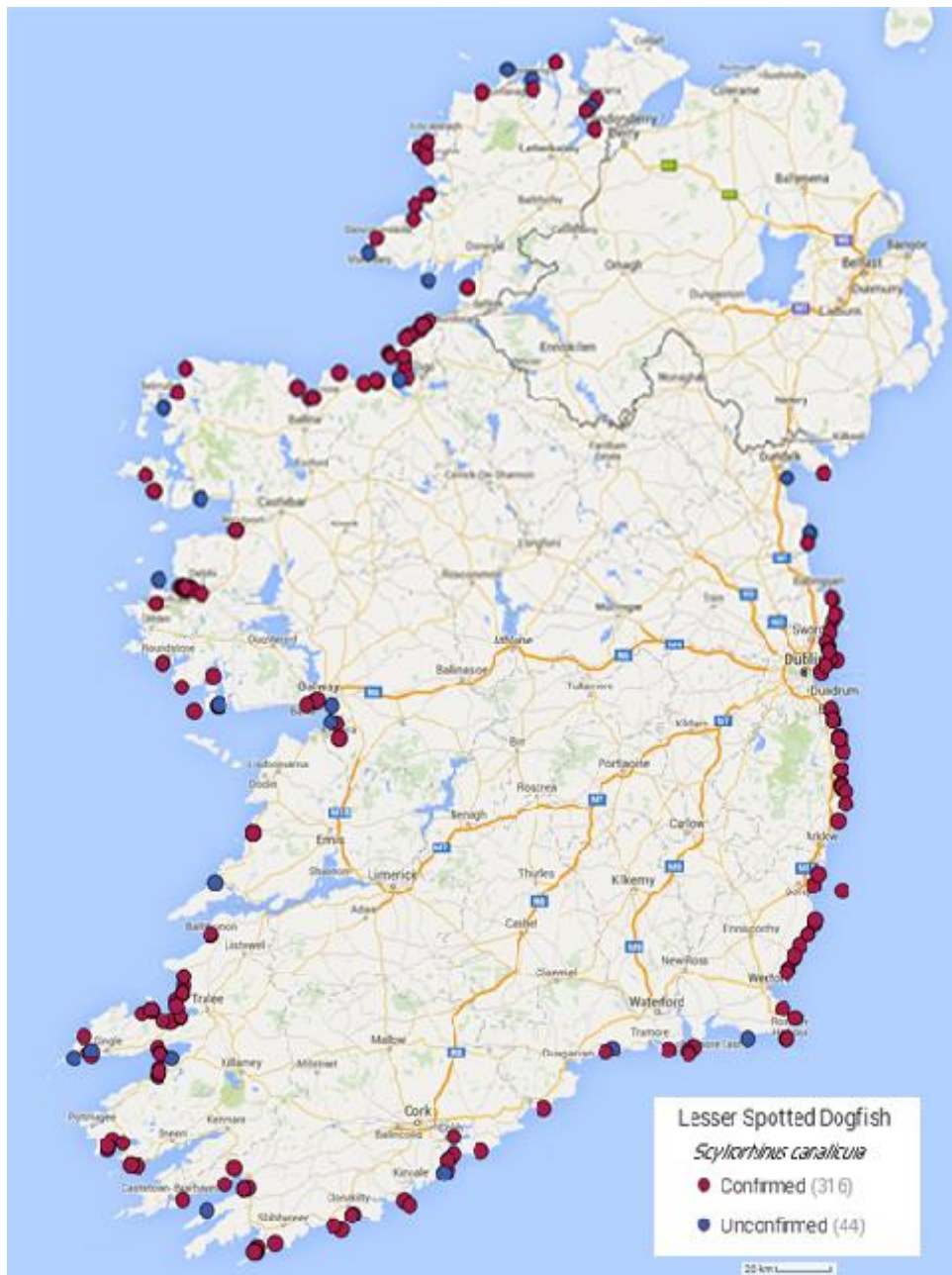


Figure 4: Distribution of Lesser Spotted Dogfish, *Scyliorhinus canalicula*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.



Figure 5: Distribution of Greater Spotted Dogfish, *Scyliorhinus stellaris*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.

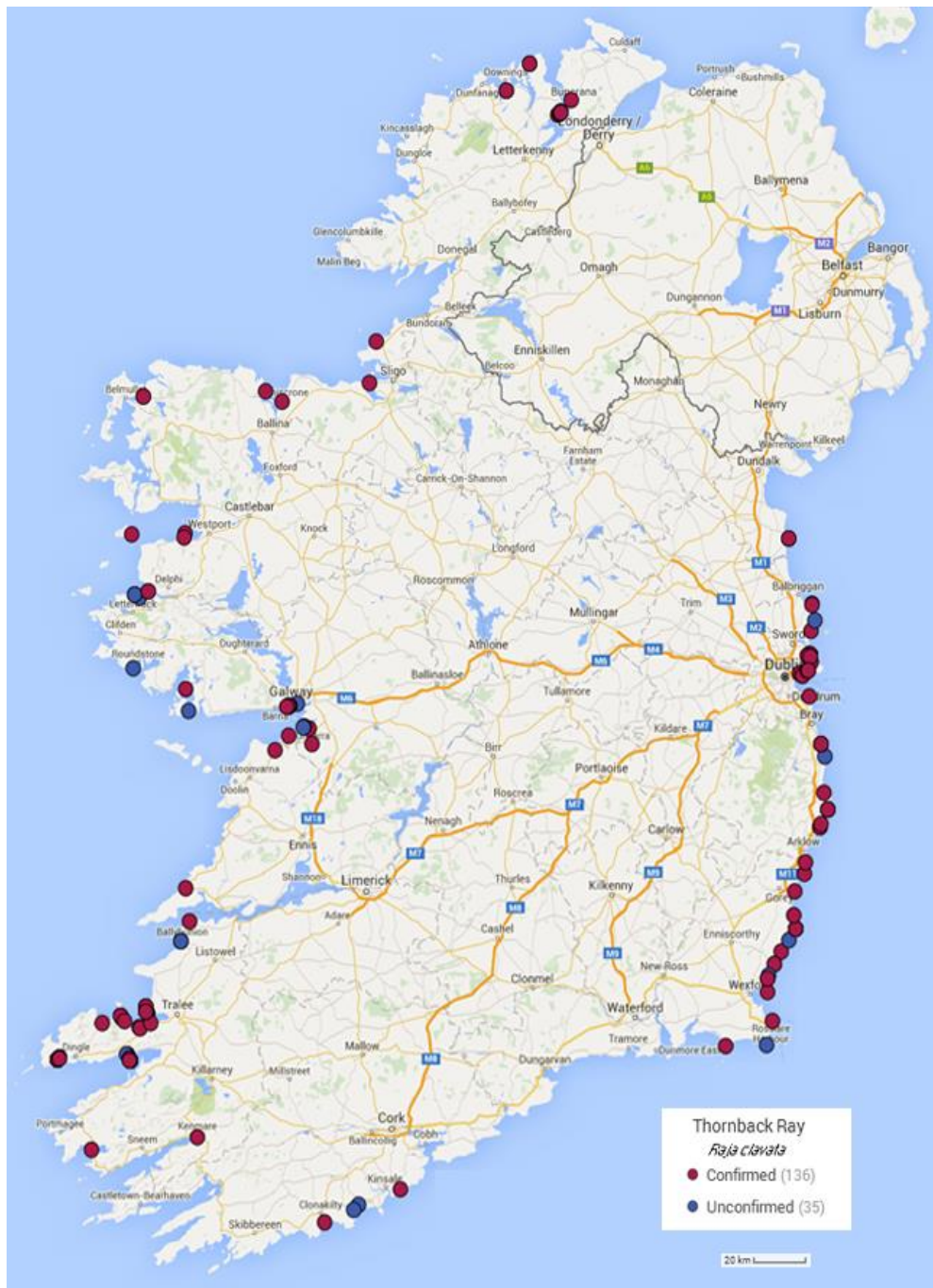


Figure 6: Distribution of Thornback Ray, *Raja clavata*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.





Figure 7: Distribution of Spotted Ray, *Raja montagui*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.





Figure 8: Distribution of Small Eyed Ray, *Raja microocellata*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.



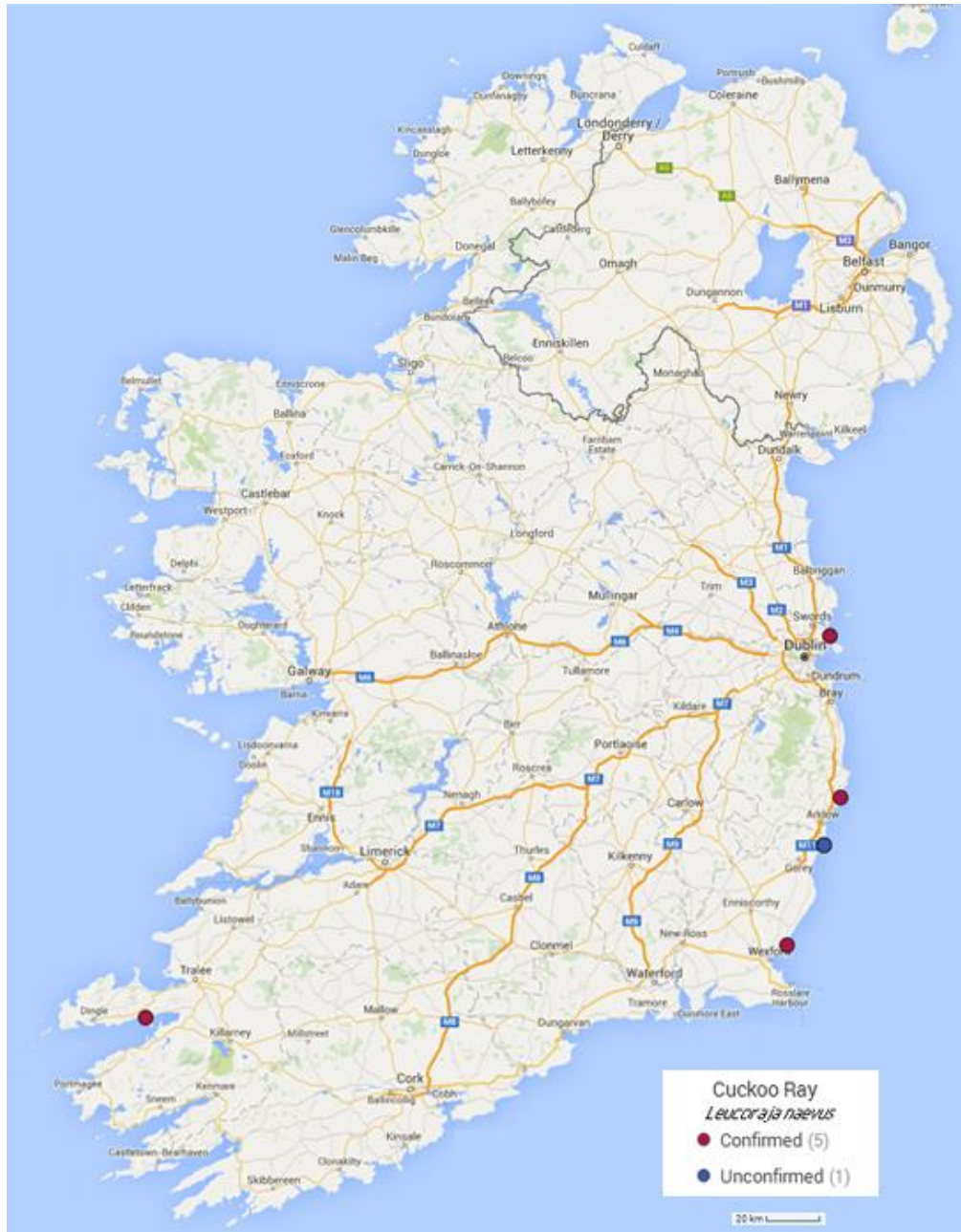


Figure 10: Distribution of Cuckoo Ray, *Leucoraja naevus*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.



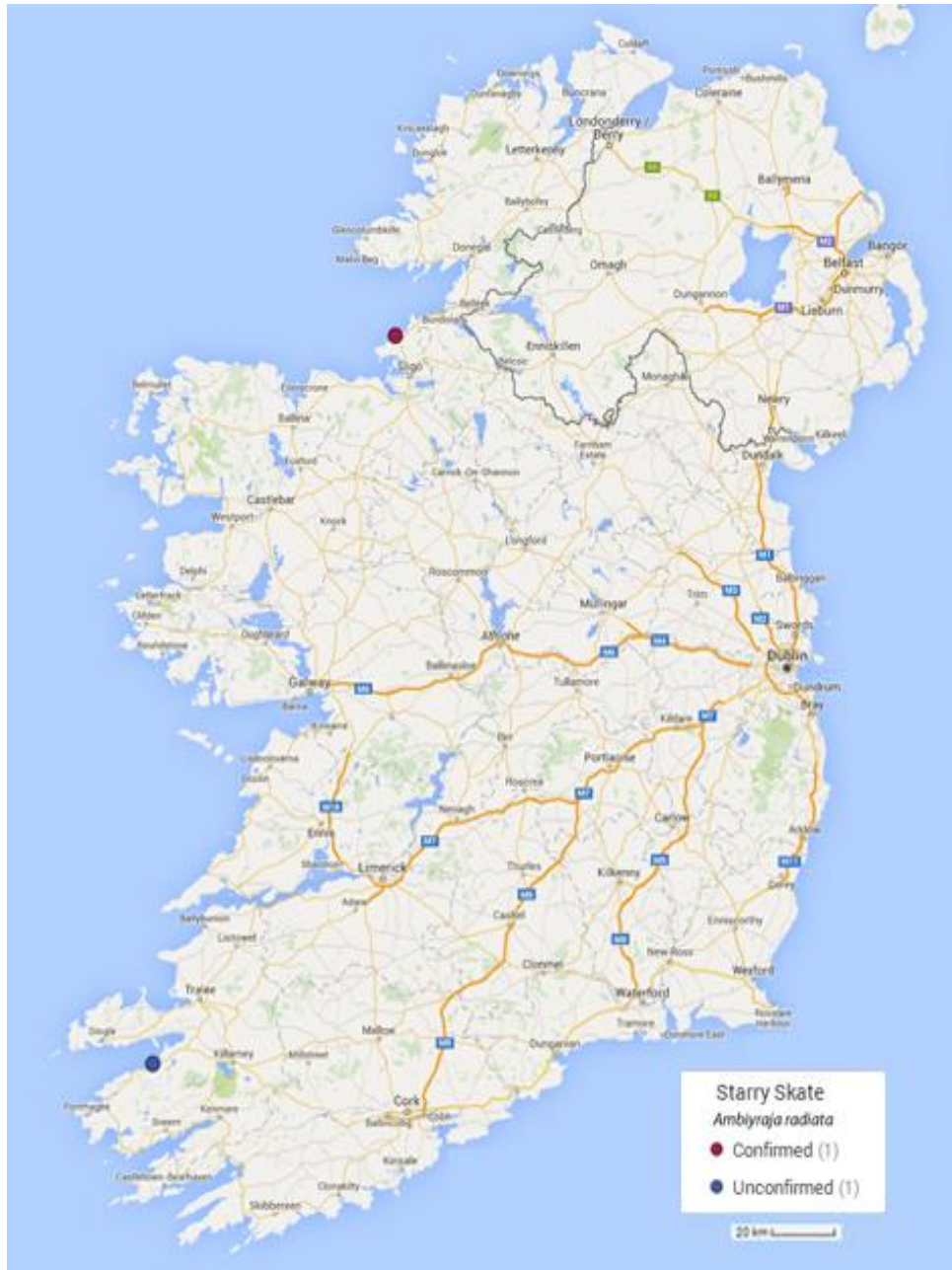


Figure 11: Distribution of Starry Skate, *Amblyraja radiata*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.



Figure 12: Distribution of Undulate Ray, *Raja undulata*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.

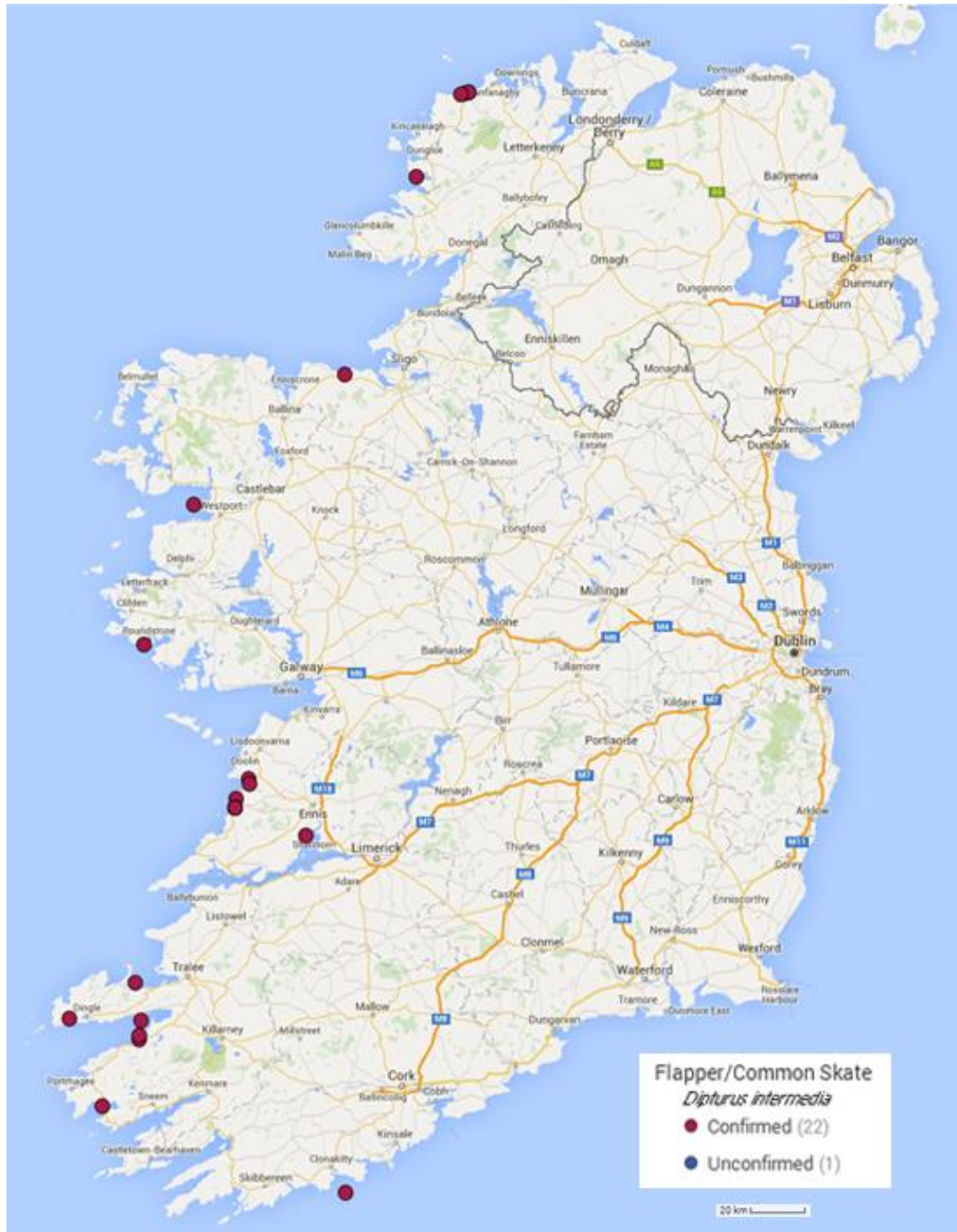


Figure 13: Distribution of Flapper Skate, *Dipturus intermedia*, (aka Common Skate, *Dipturus batis*) eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.





Figure 14: Distribution of Blue Skate, *Dipturus flossada*, (aka Common Skate, *Dipturus batis*), eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.



Figure 15: Distribution of White Skate, *Rostroraja alba*, eggcases around Ireland's coastline reported by volunteer observers from 2007 to 2015.





**Flapper Skate**



**White Skate**



**Blue Skate**

Figure 16: Eggcases from the three critically endangered skate species, sent in to Marine Dimensions by Purse Search volunteer observers. (Photo credits: Sarah Varian/Marine Dimensions).

## Discussion

The Purse Search project has been a great success, with an eggcase sightings scheme that has been set up to maximise public participation whilst also ensuring quality of information collated. The three phased approach, which incorporates education and outreach, discovery and exploration and a scientific reporting process, has been a highly effective way of combining promotion of public understanding and enjoyment of marine science with fisheries research and management objectives.

The qualitative data collated through the Purse Search reporting system was found to support and compliment current scientific knowledge. For example, there have been no sightings of Common Skate eggcases from the east coast, supporting information that this species is commercially extinct in the Irish Sea (Went 1978; Gallagher et al, 2005a, 2005b). These results suggest that discarded shark and ray eggcases may not be travelling considerable distances from the juveniles' nursery area, supporting the idea that mermaids' purses may indeed be used as indicators for shark and ray nursery areas. However, it is clear that the oceanography and topography of an area would need to be explored in more detail before the precise location of a nursery area could be determined. The discarded purses are considered to be useful as a means of flagging areas that may warrant further investigation.

Although it was difficult to obtain true quantitative estimates for species due to difficulties associated with standardising surveys, some results were found to support current scientific knowledge. For example, Lesser Spotted Dogfish and Thornback Ray eggcases were the most frequently reported species, reflecting the abundance of these species around Ireland's coasts (Ellis et al., 2005; ICES, 2005, 2006). Other species, however, such as Blonde Ray, Small Eyed Ray and Cuckoo Ray were not as common as expected. These results may be related to variation between species in the likelihood of discarded eggcases being washed ashore. For example, some species may lay their eggs further offshore than others, or in areas that are less likely to be affected by variation in oceanographic conditions. There are a whole range of physical parameters that may influence the transport of discarded eggcases that need to be explored further before observations of purses on beaches may be used effectively to estimate abundance and recruitment in shark and ray populations.

There is currently serious concern both at the national and international level over the conservation status of the Flapper Skate, Blue Skate (aka the Common Skate), White Skate and the Undulate Ray. All four species exhibit typical elasmobranch life history traits that make them more susceptible to overfishing, ie. slow growth and late reproductive maturity (eg. the Common Skate matures at 11 years of age), producing very few offspring (laying about 40 eggs per year). Consequently, these species have been extirpated from much of their former range (Shark Trust, 2009). Ireland is now one of the few places in the world where they can now be studied. In fact, the data collected through the Purse Search project for the critically

endangered White Skate represents the only time series of presence (and absence) for this species (Maurice Clarke, pers comm.). The nursery areas in Tralee Bay and Galway Bay may well represent some of the only remaining coastal refuges for a fish species at serious risk of extinction (Varian et al., 2010).

In 2009, these species finally received protection from the European Council in ICES areas where populations are known to have been severely depleted, meaning that the fish cannot be retained or targeted if taken as bycatch. The EU Plan of Action for the Conservation and Management of Sharks has also outlined a series of actions that need to be addressed at the regional level by member states. It is now imperative that Ireland responds to this direction by improving conservation management of endangered sharks and rays at the local level. Although the Irish Specimen Fish Committee has removed the Common Skate from listings, encouraging recreational fishers to return specimens to sea, there are still no Species Action Plans available for the above species and other critically endangered elasmobranchs in Ireland. Considering that Ireland is now one of the few countries where these fish survive, it is essential that information be improved in order to facilitate and provide impetus for appropriate conservation measures.

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Appendix I: List of schools, venues and festivals visited through the Purse Search outreach programme in 2015.

Co. Kilkenny

St John of God NS, Piltown  
St Kierans NS, Johnstown  
Father McGrath Family Resource Centre, Kilkenny  
Treasures Montessori, Wicklow  
CBS Primary, Kilkenny  
Dunamaggin NS, Kilkenny  
Presentation Primary, Kilkenny

Co. Laois

Mountrath Library

Co. Westmeath

Gaelscoil Athlone, Midlands Science Festival, Athlone  
St Pauls NS , Midlands Science Festival, Athlone

Co. Louth

Rathcor NS, Templetown  
Walshestown NS, Grangebellue  
Callystown NS, Clogherhead

Co. Cavan

Scoil Naomh Brid, Ballyconnell  
Knocktemple NS, Virginia  
Bruskey NS

Co. Dublin

Rush Harbour Festival, Rush

Flavours of Fingal Festival, Donabate  
Battle of the Bay Kitesurfing Festival, North Bull Island Nature Reserve

Co. Wicklow

Marian Preschool, Bray  
Marine Dimensions Kids Sea Star Camp, Bray  
Marine Dimensions Kids Marine Explorer Camp, Bray  
Marine Dimensions Introduction to Marine Biology for Teens course, Bray  
Heritage Week event, Greystones South Beach

Co. Galway

World Oceans Festival, Galway Atlantaquaria, Galway