

Tuna farms - a seasonal supplementary food source for storm petrels *Hydrobates pelagicus melitensis*

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Abstract – The area investigated is located about 9 km east from the nearest shoreline at Marsascala (Malta), ca. 30 km from the main breeding colony of Filfla, situated 5 km off the south coast of Malta. The use of raw, unwashed fish food is fundamental in attracting storm petrels closer to these tuna pens. The same food supply has attracted a constant presence of small fish around the pens which in-turn attract gulls and terns, especially the black tern. Observations have shown that the majority of storm petrels frequenting the area are adult birds undergoing primary wing moult, suggesting breeders, probably not venturing far away from the colonies during the chick rearing period. While adult storm petrels regularly fall prey to yellow-legged gulls on Filfla, no interactions between gulls and storm petrels were ever noted near the tuna pens.

Key words: tuna farm, food supply, seabirds.

INTRODUCTION

Blue Fin Tuna *Thunnus thynnus* farming was introduced in the Maltese Islands (Central Mediterranean) in 2000. Their effects on birds (positive and/or negative), were hardly ever taken in consideration by scientist and developers alike, except for two cases; Ta' Cenc cliffs in Gozo in 1999 and Benghisa, S.E. Malta in 2001 when the areas beneath these two sites were identified to hold two such farms. Both sites hold breeding colonies of Cory's Shearwater *Calonectris diomedea* (ca. 1,000 pairs at Ta' Cenc and ca. 100 pairs at Benghisa) and smaller numbers of Yelkouan Shearwaters *Puffinus yelkouan* (150-300 pairs at Ta' Cenc and 30-50 pairs at Benghisa). Ta' Cenc cliffs also host a small colony of storm petrels *Hydrobates pelagicus melitensis* estimated at over 25 pairs. In both cases, the projects were rejected by the Malta Environment and Planning Authority

In Maltese waters we currently find two areas designated for keeping caged tuna; one is situated at the north-east coast of Malta, off St.Paul's Bay (A) and holds eight (+ one experimental) pens and another one situated 6-9km off Marsascala (B), off the south-east coast of Malta holding six pens as well as two pens closer to shore (Figs. 1, 2).

Tuna penning involves the capture of live tuna from the high seas by purse seiners and their transfer to large holding pens for fattening. The harvested fish is fattened by a mixture of bait-fish usually consisting of mackerel, an-

chovies, sardines, squids and shrimps. During feeding time the oily content from this bait-fish forms a long and concentrated slick sometimes extending for several kilometres over the surface. This dense oil-slick was noted to attract considerable numbers of storm petrels while other seabird species such as terns and gull were attracted by the large shoals of small fry which form large shoals around these pens. During the fattening period, the tuna are fed baitfish to gain body weight, mainly in the form of fat. In view of the proximity of Malta to the tuna catching grounds, local farms are stocked around mid-July. Harvesting typically commences around October and is completed by December/January. Therefore, operations at the farm last for 4 to 7 months, with a substantial period of time when the site is allowed to recover following the season in a form of "falling" period. In order to avoid wastage frozen baitfish is placed in a small cage floating in the centre of the main tuna cage. Once these have thawed and feeding time has arrived, the baitfish is released into the tuna cage by opening the central cage net (Adi Associates 2005).

The Mediterranean storm petrel is a localised common breeding visitor with two known colonies in the Maltese Islands; Filfla islet holding 5,000 to 8,000 breeding pairs, and a small cave at Ta' Cenc cliffs in Gozo (> 25bp) (Borg & Sultana 1992-94, 2002, Raine *et al.* 2009, Sultana *et al.* 2011).

Before the introduction of Tuna pens in Maltese wa-

ters, there has been only one sighting of Storm petrel in inshore waters; a storm driven bird appeared in the Grand Harbour on 18 November (Roberts 1954).

Since the installation of the tuna penning farm off Marsascala in 2000, there has been a great increase in fishing activities by local sport-fishers in the area in search of medium and large sized fish attracted by the food provided to the tuna for fattening. In the summer of 2006, one of the fishing enthusiasts frequenting this area started noticing an increase in the number of birds present near the tuna pens.

The majority of birds observed being mainly yellow-legged gulls *Larus michahellis* a resident breeding bird as well as small flocks of black terns *Chlidonias niger* a summer visitor. Both species were regularly observed resting on the pens' rail guards. He also noticed that from the end of July to the third week of August he saw small brown-black birds flying low over the water (Tab. 1).

There is very little information about the diet of the Mediterranean subspecies of the storm petrel. During ringing activities on Filfla, a sample of 12 regurgitations was collected in 2009-2011; identified material included crustaceans, small sized fish and undetermined "gelatinous" matter (jellyfish?) (pers. obs.). Albores *et al* (2010) found the pelagic fish *Gymnammodites cicerellus* as the most common preyed item by the petrels breeding on Marettimo Island, Sicily. The Tuna in this farm are fed with a mixture of mashed small pelagic fish, squid and shrimp and feeding takes place twice daily, at dawn and in the early afternoon (Adi 2005, pers obs.).

MATERIAL AND METHODS

The area investigated is located at approximately 35°51' 26.57"N - 14°39'51.00"E and is located about 9 km east from the nearest shoreline at Marsascala. This site is located about 30km from the main breeding colony of Filfla, situated 5km off the south coast of Malta. Visits were carried out on board a small (5 metre long) boat with a 15hp engine. Observations for any signs of storm petrels started at a distance of 1km from shore. While waiting for the feeding boat to arrive near the tuna pens, all birds present in the area where logged in a database. On all occasions, during the pre-feeding time, storm petrels were absent from area. Timing of first feed was taken when the first food bag was lowered inside the tuna pen and time elapsed up to the first arrival of the petrels was also recorded.

The feeding behaviour of petrels and interactions with conspecifics was also recorded. Finally, as birds were constantly approaching our boat it was possible to see that a number of birds were undergoing wing moult (primaries) therefore, a record of these moulting birds was also kept (Fig. 3).

RESULTS

In July and August of 2006, very small numbers of storm petrel were reported to the author, while an increase was noted in July 2007, but with fewer numbers in autumn. In the summer of 2008, again in the months of July and Au-

Table 1. Inshore sightings of storm petrels from 2001 to 2007.

DATE	No. storm petrels seen	Date	Locality	Source
2001	15	9 Sept	off Qawra	Bonavia <i>et al</i> 2010
2001	Up to 4	22 Aug-29 Sep	Off Qawra	Bonavia <i>et al</i> 2010
2001	1	5 Dec	Off Qawra	Bonavia <i>et al</i> 2010
2001	1	30 Dec	Gozo Channel	Bonavia <i>et al</i> 2010
2002	1	9 July	Off Qawra	Bonavia <i>et al</i> 2010
2003	1	30 July	Off Qawra	Bonavia <i>et al</i> 2010
2003	1	1 Aug	Off Qawra	Bonavia <i>et al</i> 2010
2003	1	2 Aug	Off Qawra	Bonavia <i>et al</i> 2010
2003	1	5 Aug	Off Qawra	Bonavia <i>et al</i> 2010
2003	2	14 Sep	Off Qawra	Bonavia <i>et al</i> 2010
2006	1	05 Aug	Off Qawra	Unpublished records
2006	2	08 Aug	Off Qawra	Unpublished records
2006	3	10 Aug	Off Qawra	Unpublished records
2006	1	12 Aug	Off Qawra	Unpublished records
2007	1	04 Aug	Off Qawra	Unpublished records

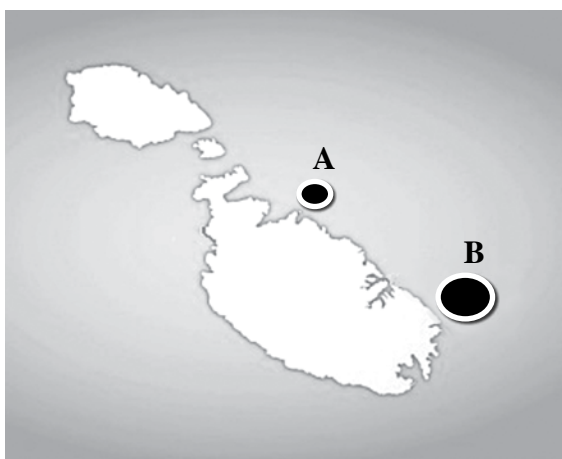


Figure 1. Location of the two tuna farms off the East coast of Malta.

gust, single birds were noted almost daily with up to 30 counted on several occasions (M. Zammit-Marmara pers. comm.). A visit to the pens on 8th September 2008 did not produce any petrels.

In the following year, again following reports of single to double figures close to the pens a visit was organised on 24 August 2009. Single storm petrels were seen crisscrossing the bow of the boat flying in no particular direction. Some birds were also noted in small groups of up to 5 birds swimming on the calm surface. At 10.30 am (summer time) birds were noted flying in a straight direction towards the tuna pens. It soon became apparent that this flight frenzy by the storm petrels resulted from the initiation of fish-feeding activities at the farm. It was not long before a flock of 100-120 birds formed close to the feed ship; flying and dipping their beaks in the water. This behaviour continued throughout the tuna feeding activity which lasted for about 20 minutes when soon after the birds widened their feeding area as the oil slick started drifting towards the North-east. The majority (95%) of storm petrels observed close to the boat were moulting their primary feathers), the rest being recently fledged birds covered in a fresh layer of black feathers. In 2010 and 2011 the feeding time was changed and the

tuna were being fed at around 8.30am. This change in timing does not appear to have affected the birds as the same pattern of behaviour noted in 2009, was again observed. A sizeable flock of 100-120 birds were counted on 12 August 2011 feeding close to one of the pens. Once again the overall majority of birds seen were moulting birds.

DISCUSSION

The use of raw, unwashed fish food is fundamental in attracting storm petrels closer to these tuna pens. The same food supply has attracted a constant presence of small fish around the pens which in-turn attract gulls and terns, especially the black tern. Observations have shown that the majority of storm petrels frequenting the area are adult birds undergoing primary wing moult, suggesting breeders, probably not venturing far away from the colonies during the chick rearing period. The planned use of radio tags on storm petrels from the Filfla colony in summer of 2012 will provide more information on this aspect. A smaller number of birds seen during the site visits where juvenile birds covered in a fresh coat of dark plumage. These young birds are present from the latter part of August to early September. Tuna penning is locally carried out during the summer and autumn months (mid-July to December). Further investigations will aim to identify if this reliable food source has any effect on the breeding success and fledglings survival in storm petrels. While adult storm petrels regularly fall prey to yellow-legged gulls on Filfla (Borg *et al.* 1992-94, Sultana *et al.* 2011) no interactions between gulls and storm petrels were ever noted near the tuna pens. Further research is required to determine the extent of dependency by storm petrels on this food source, especially if feeding regulations are enforced and the baitfish is washed before fed to the tuna.

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Table 2. Summary of seabirds seen during three visits to tuna farms.

Species	08 September 2008	24 August 2009	12 August 2011
<i>Calonectris diomedea</i>	12	50-60	40-50
<i>Puffinus yelkouan</i>	0	3	0
<i>Hydrobates pelagicus</i>	0	100-120	100-130
<i>Chlidonias niger</i>	120	1000-1100	0



Figure 2. Some storm petrels around the tuna farm off the East coast of Malta.



Figure 3. Storm petrel moulting wing feathers.

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