6.6. Recapture of escaped seabass and seabream in the Mediterranean Sea

ISBN: 978-82-14-05565-8

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INTRODUCTION

The problem of escaped seabream and seabass

Farmed fishes may escape into the wild due to technical or operational failures of farm facilities. Consequently, escapees could mix with local stocks, leading to negative genetic and ecological consequences through interbreeding, predation, competition for food or habitat and the transmission of pathogens to native populations (Prevent Escape Compendium Chapter 1). Within the Mediterranean Sea ecosystem, however, the knowledge concerning these potential harmful effects of escapees is still sparse, despite large numbers of seabass and seabream escapes (Prevent Escape Compendium Chapter 2; Figure 6.6.1 and 6.6.2).

Results from the Prevent Escape project have identified that escaped seabass (Dicentrarchus labrax) and seabream (Sparus aurata) are not only able to swim away from farm facilities to nearby farms (Figure 6.6.2), local fishing grounds and coastal habitats (Figure 6.6.3, 6.6.4), but they can also exploit natural resources, such as food and habitat (Prevent Escape Compendium Chapters 4.3 and 4.4; Arechavala-Lopez et al. 2011, 2012). Moreover, if the number of escapees is high, they may bias estimates of wild populations if not accounted for. Therefore, it is essential to identify the extent of farmed escapees in native stocks and recapturing them should be a primary goal to avoid negative consequences.

Wild seabass and seabream are commonly fished in the Mediterranean Sea, withstanding a considerable commercial and recreational fishing effort (e.g. in the Spanish Mediterranean Sea, about 3000 commercial fishing vessels target these species among others; MARM 2008). Consequently, using the capacity within commercial fisheries is a serious option to consider for the recapture of escaped seabass and seabream, and may complement other mechanisms of mitigation such as raising sterile individuals or ensuring low numbers of escapes by better management practices. Recapture techniques could also be implemented in regulations to reduce the dissemination of escapees, as they are in certain US states and in Scotland (Washington State Legislature 2012; Scottish Government 2012).
Figure 6.6.1. A school of escaped seabass (Dicentrarchus labrax) photographed in a shallow water coastal habitat on the Canary Islands after an escape event. Photo: Carlos Sangil

Figure 6.6.2. A school of escaped seabream (Sparus aurata) photographed beneath a fish farm on the Canary Islands after an escape event. The bottom of the cage is visible above the fish. Photo: Arturo Boyra
Figure 6.6.3. Seabream (*Sparus aurata*) in a natural sea grass habitat in the Mediterranean Sea. Photo: Pablo Sanchez-Jerez

Figure 6.6.4. Adult seabass (*Dicentrarchus labrax*) in a natural coastal habitat in the Mediterranean Sea. Photo: Maite Vazquez-Luis
OBJECTIVE

We aimed to develop and test suitable methods for recapturing escaped seabream and seabass.

Recapture capabilities of specific fishing gears

Data on acoustic and external tagging and short-term behavioural observation of seabream and seabass escapees (Prevent Escape Compendium Chapters 4.3 and 4.4) provided valuable information for targeting their recapture after an escape event (Table 6.6.1). The results revealed that seabream catches of artisanal fisheries are composed, to a large extent, by escaped seabream, sometimes up to 75% of the total seabream catches in the reproductive season (early winter). The most successful fishing gear for recapturing seabream was gill nets, as evidenced by the data obtained in several acoustic tagging experiments where the fate of individual escaped seabream and seabass were followed through time (Arechavala-Lopez et al. 2011, 2012). Nets were most effective during the dark, when seabream moved close to the bottom and became vulnerable to capture by these nets. Recreational fishing, though occasionally successfully (Figure 6.6.5), had lower success catching escaped seabream than commercial fisheries. Consequently, after a massive escape event, local artisanal fisheries should be alerted to increase pressure immediately after the incident. Fish farmers may consider having one or more emergency gill nets prepared to be deployed as soon as possible around the farm to recapture escaped seabream.

After escape, seabass suffered high mortality and their movement patterns and susceptibility to be fished differed to seabream. Mortalities were numerous within the first days and survivors tended to move towards the coastline. Recreational fishermen, mainly using fishing rods, were more successful capturing seabass than seabream. Therefore, we recommend that efforts to inform recreational fishers at local marinas, fishing shops or fishing clubs should be undertaken after large escape events. Moreover, the use of beach-moored barrier nets (e.g. something like the moruna, used along the Spanish Mediterranean coasts to catch seabass; García Alcaraz et al. 2005) may be the most useful method in the case of a massive seabass escape incident, given the behavioural tendency of seabass to approach close to the shore after an escape. Similar gear types have proved partially successful in recapturing salmon (Chittenden et al. 2011). However, the efficiency of this fishing gear has not been tested for seabass and therefore deserves more research. During the Prevent Escape project, baited fish traps were also tested; these had marginal success in recapturing escaped seabass, seabream and meagre.
While various fishing gears had greater or lower rates of success in recapturing escapees, all recapture attempts in the Prevent Escape Project proved only partially effective in recapturing escaped seabream and seabass. Despite relatively intensive fishing efforts, usually through simultaneous use of several fishing methods, we never recaptured more than 10% of escapees in any single simulated release. This low recapture rate is likely due to several reasons, including: 1) poor survival of the escapees after release, possibly due to the abundant wild fish predators.
around fish farms; 2) rapid dispersal away from the point of escape, possibly due to escapees responding to reduce predation risk, which reduced the capture efficiency of fishing gears; and 3) under-reporting of recaptures by commercial and recreational fishers. Even if survival is poor and under-reporting of recaptures occurs, significant numbers of escapees are likely to enter coastal environments and begin to interact with their wild counterparts. Our results emphasize that the focus in preventing escapes should first and foremost be placed upon improving farming regulations, component technologies and operational routines so that fish do not escape in the first place, rather than relying on trying to recapture fish after they have escaped.

While only partially effective, recapture fisheries may be a realistic option in specific circumstances to reduce the impact of escape events (Uglem et al. 2010, Skilbrei and Jørgensen 2010), although consideration must also be given to the likelihood that by-catch of non-target species will be high before such measures are implemented. The most effective gears were gillnets for seabream and fishing rods for seabass. These results are supported by the fact that farm-aggregated wild fish are actively exploited by artisanal gill net fisheries in the Mediterranean (Akyol & Ertoluk 2010) and escape incidents are often followed by increased catches in these local artisanal fisheries, recording high recapture rates. Trawling appears to be ineffective in recapturing salmon escapees (Skilbrei & Jorgensen 2010) despite fish being present along the towing tracks. However, trawling may work better for seabream, as they are a demersal species, but this remains untested.

Predation of escapees by wild fish appears to be important in the early stages after an escape event in rapidly reducing the number of escapees that survive (Arechavala-Lopez et al. 2011, 2012). Therefore, measures to ensure that populations of piscivorous predators are maintained around fish farms will assist in reducing the survival of escapees. Many Mediterranean seabream and seabass farms (e.g. Spanish Mediterranean farms) have a no fishing requirement within the leasehold area. This regulation will likely assist in mitigating escapes.

We conclude that after a major escape event, a significant proportion of escaped seabream and seabass could be recaptured if fishing effort is implemented, both in the immediate vicinity of the farm and up to several kilometres away in likely natural habitats where the escapees may disperse to. The fishing efforts should last for several weeks to reduce the number of escaped seabream and seabass that survive.
As all methods of recapture are only partially effective and have implications for other species (e.g. by-catch), the primary focus of authorities should be upon implementing measures to prevent escape (Prevent Escape Compendium Chapter 7), with re-capture methodologies a secondary consideration.

Predation of seabream and seabass escapees by wild fish is important in the early stages after an escape event in rapidly reducing the number of escapees that survive. Therefore, spatial protection from fishing to ensure predator populations occur around fish farms will assist in reducing the survival of escapees and mitigate their effects.

Gillnets are the most suitable gear to recapture seabream. After a large-scale escape event, they should be deployed over several kilometres around the fish farm for several weeks.

Fish farmers should consider having one or more emergency gill nets prepared to be deployed as soon as possible around the farm to recapture escaped seabream.

Fishing rods and beach moored gear are more effective in catching escaped seabass near the coastline. Coastal fishers should be made rapidly aware of large-scale escape incidents.

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