Mapping the distribution of scale-rayed wrasse *Acantholabrus palloni* in Swedish Skagerrak using angling records

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In this paper, we tentatively map the distribution of scale-rayed wrasse *Acantholabrus palloni* in eastern Skagerrak based on verified records, both official and private. A recent surge in angling records in the Swedish Anglers Association's specimen database *Storfiskregistret* have provided information to suggest that this species should no longer be considered an occasional guest, but rather a species established in the Swedish parts of Skagerrak. The species is currently well spread along the Swedish Skagerrak coast, with many locations providing repeated captures of adult fish over multiple years. The typical catch sites are rocky reefs located around 15-20 km west of the Swedish mainland. The present study show that angling records provide an important, and perhaps underutilized, resource for mapping the distribution of uncommon fish species.

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ABSTRACT

In this paper, we tentatively map the distribution of scale-rayed wrasse *Acantholabrus palloni* in eastern Skagerrak based on verified records, both official and private. A recent surge in angling records in the Swedish Anglers Association's specimen database *Storfiskregistret* have provided information to suggest that this species should no longer be considered an occasional guest, but rather a species established in the Swedish parts of Skagerrak. The species is currently well spread along the Swedish Skagerrak coast, with many locations providing repeated captures of adult fish over multiple years. The typical catch sites are rocky reefs located around 15-20 km west of the Swedish mainland. The present study show that angling records provide an important, and perhaps underutilized, resource for mapping the distribution of uncommon fish species.

Key-words: Distribution, *Acantholabrus palloni*, Labridae, Skagerrak, Angling records

BACKGROUND

Records of rare species and their natural history can constitute important information for future research on these species and the ecosystems they occur in, e.g. with respect to human impacts (Boero 2013; Able 2016).

The scale-rayed wrasse *Acantholabrus palloni* (Risso, 1810) is a labrid fish inhabiting the eastern Atlantic Ocean and the Mediterranean Sea, with a known range from Gabon to south-western Norway (Debelius, 1997; Muus *et al*., 1999; Pollard, 2010). In the Mediterranean Sea it is often found on rocky bottoms at depths below 80 m (Sartoretto *et al*. 1997). In the northern parts of its range, however, it is regularly found at shallower depth (from 18 m; Debelius, 1997; Kullander *et al*., 2012). In Norway, the species has been considered as rare, but recent evidence suggest that there are larger concentrations of the species in e.g. the Hardangerfjord, and anecdotal reports from scuba-divers suggest it is more common than previously thought (Espeland *et al*., 2010). The eastern limits in the Skagerrak are not well established for *A. palloni* and the species has been noted as not being native to Swedish waters (Pethon & Svedberg, 2004; Pollard, 2010), or alternatively, only being present in the Koster Fjord area (Nilsson, 1997). It is light brown in colour and characterized by one black blotch on the posterior part of the dorsal fin, a black blotch on the dorsal part of the trunk and several lighter blotches on the back, below the dorsal fin. By these characteristics, the species is well distinguished from other wrasse species in Swedish waters, also by non-specialists.

Acantholabrus palloni is regularly captured by anglers in the Norwegian part of northern Skagerrak, just south of Langesund, on rocky bottoms at 40 to 60 m depth, elevating from deeper soft bottoms (Fig. 1., position 3; M. Lundgren, personal observations; also documented in the

49 catch-records of the Langesund Seafood and Fishing Festival; http://www.lsff.no/; accessed 2014-
50 04-23).

MATERIALS AND METHODS

Historical non-angling records (1993-2010)

Historical records were sourced from the published scientific literature (Cedhagen & Hansson 1995), and the GBIF-Sweden Data Portal (http://www.gbif.se/).

Angling records (1995-2016)

The majority of the angling records were obtained from the curated specimen registry (*Storfiskregistret*) of the Swedish Anglers Association (SAA; http://www.sportfiskarna.se/), where anglers can report catches of fish specimens above a certain species-specific mass-limit, which then gets validated based on photographs, accessory information, and, if needed, expert assessment. The SAA records contains additional information about capture location, depth, habitat, and capture method. The mass-limit for recording an *A. palloni* in the SAA specimen registry is 250 g (effective since 2012; before that it was 300 g, but no records exist from this time-period). This, and the fact that gape-size of small individuals limits catchability in sea angling, which typically utilizes larger hook and bait sizes, suggests that the list of records is heavily skewed against larger specimens. Therefore, there is likely an additional number of captured individuals that have not been identified by the authors.

Additional records were supplied by Swedish anglers, located through posts on internet blogs or through personal communication. A number of records are also direct personal observations by the authors.

Data reliability

All records in Table 1 have been verified by the authors from photographs, or direct observation.

SAA carries digital copies of all fish in their records.

RESULTS

Previously documented Swedish records

The occurrence of *A. palloni* in Swedish waters is rarely reported prior to 2010, with a first record of a juvenile specimen from year 1993 from somewhere between 50 and 115 m depth in the mouth of Singlefjorden, northeastern Skagerrak (Cedhagen & Hansson, 1995; Fig. 1., position 1). The species has also been previously reported from the area around the Koster Islands, northern Skagerrak, (Hallberg, 2011) and 6 km west of Rörö Island (Fig 1., position 10), southern Skagerrak in 2008 (data provided by Swedish Museum of Natural History, Stockholm; accessed through GBIF-Sweden Data Portal, 2014-04-25).

Angling records

Between the first Swedish record in 1993 (Cedhagen & Hansson 1995) and 2011, a few angling records of *A. palloni* were noted from different sites on the Swedish west coast (Table 1). Between 2011 and 2016, several records of *A. palloni* have been provided by leisure anglers (Table 1). Repeated captures of the species have been made across years, suggesting stable residence of the species, at least at a few positions (e.g. position 9; Table 1). However, number of captures at any given position are likely related to fishing pressure at that site. The species has received some attention in Swedish angling magazines, leading to increased interest from specimen anglers.

All angled specimens are reported to be caught on, or directly above, rocky bottom at depths of 28-50 m, except for one (Record #11) which was reported to be caught at 12 m depth (bottom at 12.5 m). One specimen standing out from the rest is record #15 which is the only one caught

inshore (in the Gullmarn fjord, Fig 1, Position 11), apart from the first Swedish record by Cedhagen & Hansson (1995).

The list of records (Table 1) is likely not a complete record of angles *A. palloni*, as several other specimens (typically smaller ones) have been verbally described to the authors by anglers, without any specific information being noted by the angler.

DISCUSSION

The presented records extend the knowledge about the marine ichthyofauna of eastern Skagerrak, which is a generally well documented area regarding fish species distributions (Kullander *et al*., 2012).

The records of *A. palloni* presented here are, to the authors' knowledge, the first documentation of several individuals of this species being repeatedly caught in the same general location in Swedish waters, outside of the Kosterfjord area, in the scientific literature. This indicates *A. palloni* could be established in some areas of eastern Skagerrak, and that it should no longer be considered an occasional visitor. Possibly, the recent surge in records could be an indication of a range extension, perhaps due to changing climate as has been indicated in other places in European marine waters, including the North Sea which is adjacent to Skagerrak (Hiddink and ter Hofstede, 2008; Nicolas *et al*., 2011). However, general lack of appropriate data makes it impossible to distinguish climate effects from effects of fishing or meta-population dynamics (Brander and Havenhand, 2016). The habitat choice of the species relieves it from coastal angling and smaller species have historically not been targeted by off-shore anglers to the same extent they are currently. Furthermore, the typical habitat is likely seldom trawled by commercial fishermen, probably leading to few specimens being caught (Pollard, 2010). While clearly distinguished at closer inspection, it also resembles the common goldsinny wrasse *Ctenolabrus rupestris* (Linnaeus 1758) and young female cuckoo wrasse *Labrus mixtus* Linnaeus 1758 in coloration. These facts may have limited the number of historical reports from Swedish waters. Despite its relatively small size, the *A. palloni* has value for marine specimen angling in Sweden, e.g. in marine angling competitions where the number of species caught is rewarded. In fact, the angling records being presented in this article are largely a consequence of this species being acknowledged as a target for specimen anglers,

who are specifically targeting large specimens of different species (e.g. Hellenberg 2014a,b; Lundgren & Waje 2015). In commercial fisheries, however, it has little value (Machias *et al*., 2001). Smaller wrasse species are fished commercially in Scandinavia for sea lice control in salmon farms (Espeland *et al*. 2010), but *A. palloni* is not suited for such fishery as it is deeper living than most of the other smaller wrasse species and, thus, generally subjected to severe barotrauma when hauled, resulting in inflated swim-bladders and bulging eye-balls (see e.g. Fig. 2).

CONCLUSIONS

In this article, we summarize the present knowledge about the current distribution of *A. palloni* in Swedish waters, at the edge of the species' northern distribution range. The records of *A. palloni* presented here in particular highlight the importance of anglers' reports and angling records as useful contributions for ichthyological investigations of presence and distribution of non-commercial fish species.

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FUNDING

No funding was obtained for this project.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

ETHICAL APPROVAL

This article does not contain any direct studies with animals performed by any of the authors.

SAMPLING AND FIELD STUDIES

Fish specimens reported were caught following Swedish or Norwegian angling regulations. All cases where the authors captured recorded specimens were part of non-scientific angling expeditions, conducted prior to the conception of the study.

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205 FIGURE LEGENDS

206 **Figure 1.** Approximate positions for records of *Acantholabrus palloni* mentioned in the text. 1:
207 Single Fjord, mouth; 2: Grisbådarna; 3: S. Langesund city, Norwegian mainland; 4: W.
208 Ursholmen; 5: Persgrunden; 6: Väderöarna; 7: N.W. Hunnebostrand city, Swedish mainland; 8:
209 Svaberget; 9: Kullarna (S.W. Måseskär lighthouse); 10: W. Stora Pölsan lighthouse; 11: Gullmarn
210 Fjord. Names of areas are based on Lundgren & Waje (2015).

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212 **Figure 2.** Pictures of *Acantholabrus palloni* from Swedish waters. Top: Record #7, Table 1.
213 Bottom: Record #8, Table 1. Published with permission (Photo credit: M. Lundgren).

Table 1(on next page)

Records of *A. palloni* in Swedish water.

Records of *A. palloni* in Swedish waters. L = Total length, M = wet mass.

1 **Table 1.** Records of *A. palloni* in Swedish waters. L = Total length, M = wet mass.

Record number	Date	Size	Capture method	Location (Fig 1)	Notes	Information source
1	1993	Juvenile	Dredge haul	Pos 1	First record from Swedish waters, first inshore record	Cedhagen & Hansson 1995
2	1995-07	L: 23 cm M: 142 g	Angling	Pos 2		Hanefors 1995
3	2007-07-09	L: No record M: 265 g	Angling	Pos 5		Records of Kungsbacka Angling Club (M. Lundgren)
4	2008	L: No record M: No record	Unknown	Pos 10		http://www.gbif.se/
5	No info. (Pre-2011)	L: No record M: No record	Filmed, Remotely Operated Vehicle	Koster Fjord area		Hallberg 2011
6	2010	L: No record M: No record	Angling	Pos 9		M. Durell, pers comm.
7	2011-06-04	L: No record M: 220 g	Angling	Pos 9		M. Lundgren, pers. obs.
8	2011-06-05	L: No record M: 180 g	Angling	Pos 9		M. Lundgren, pers. obs.
9	2011-06-05	L: No record M: 160-180 g (estimated)	Angling	Pos 9		M. Lundgren, pers. obs.

10	2012-05-26	L: No record M: 120 g	Angling	Pos 9		http://www.sg-zander.se/
11	2014-06-01	L: 26 cm M: 275 g	Angling	Pos 9	12.5 m depth, rocky bottom	http://www.sportfiskarna.se/, Hellenberg 2014a,b
12	2014-07-26	L: 26 cm M: 260 g	Angling	Pos 7	44 m depth, rocky bottom	http://www.sportfiskarna.se/, Hellenberg 2014b
13	2014-08-16	L: 26 cm M: 250 g	Angling	Pos 7	47 m depth, rocky bottom	http://www.sportfiskarna.se/, Hellenberg 2014b
14	2014-08-16	L: 27.5 cm M: 282 g	Angling	Pos 7	46 m depth, rocky bottom	http://www.sportfiskarna.se/, Hellenberg 2014b
15	2015-07-13	L: No record M: 200 g	Angling	Pos 11	First record from the fjord Gullmarn, second inshore record	M. Jonsson, pers. comm.
16	2015-07-17	L: 29 cm M: 296 g	Angling	Pos 8	26 m depth, rocky bottom	http://www.sportfiskarna.se/
17	2015-08-06	L: 28 cm M: 293 g	Angling	Pos 7	50 m depth, rocky bottom	http://www.sportfiskarna.se/
18	2015-08-06	L: 28 cm M: 285 g	Angling	Pos 7	50 m depth, rocky bottom	http://www.sportfiskarna.se/
19	2015-08-06	L: 27 cm M: 267 g	Angling	Pos 7	50 m depth, rocky bottom	http://www.sportfiskarna.se/
20	2015-08-09	L: 27.5 cm M: 260 g	Angling	Pos 6	35 m depth, rocky bottom	http://www.sportfiskarna.se/
21	2015-08-20	L: 26.5 cm M: 260 g	Angling	Pos 9	42 m depth, rocky bottom	http://www.sportfiskarna.se/

22	2015-08-20	L: 26 cm M: 250 g	Angling	Pos 9	41 m depth, rocky bottom	http://www.sportfiskarna.se/
23	2015-08-21	L: 27 cm M: 260 g	Angling	Pos 6	32 m depth, rocky bottom	http://www.sportfiskarna.se/
24	2015-08-22	L: 27 cm M: 280 g	Angling	Pos 7	40 m depth	http://www.sportfiskarna.se/
25	2015-08-22	L: 27.5 cm M: 267 g	Angling	Pos 7	38 m depth, rocky bottom	http://www.sportfiskarna.se/
26	2015-08-22	L: 28 cm M: 270 g	Angling	Pos 7	40 m depth, rocky bottom	http://www.sportfiskarna.se/
27	2015-08-22	L 28.5 cm M: 300 g	Angling	Pos 7	45 m depth, rocky bottom	http://www.sportfiskarna.se/
28	2015-10-04	L: 27 cm M: 270 g	Angling	Pos 10	28 m depth, rocky bottom	http://www.sportfiskarna.se/
29	2016-07-24	L: 26 cm M: 260 g	Angling	Pos 5	37 m depth, rocky bottom	A. Enemar, pers. comm.
30-35	2016-09	L: No record M: 70-200 g	Angling	Pos 4	5 individuals. 35-50 m depth, rocky bottom	A. Enemar, pers. comm.
36	2016-08-19	L: 28.5 cm M: 320 g	Angling	Pos 9	42 m depth, rocky bottom	http://www.sportfiskarna.se/ Anonymous 2017a
37	2016-08-25	L: 26.5 cm M: 270 g	Angling	Pos 8	41 m depth, rocky bottom	http://www.sportfiskarna.se/ Anonymous 2017b

Figure 1

Approximate positions for records of *Acantholabrus palloni* mentioned in the tex.

Approximate positions for records of *Acantholabrus palloni* mentioned in the text. 1: Single Fjord, mouth; 2: Grisbådarna; 3: S. Langesund city, Norwegian mainland; 4: W. Ursholmen; 5: Persgrunden; 6: Väderöarna; 7: N.W. Hunnebostrand city, Swedish mainland; 8: Svaberget; 9: Kullarna (S.W. Måseskär lighthouse); 10: W. Stora Pölsan lighthouse; 11: Gullmarn Fjord. Names of areas are based on Lundgren & Waje (2015).

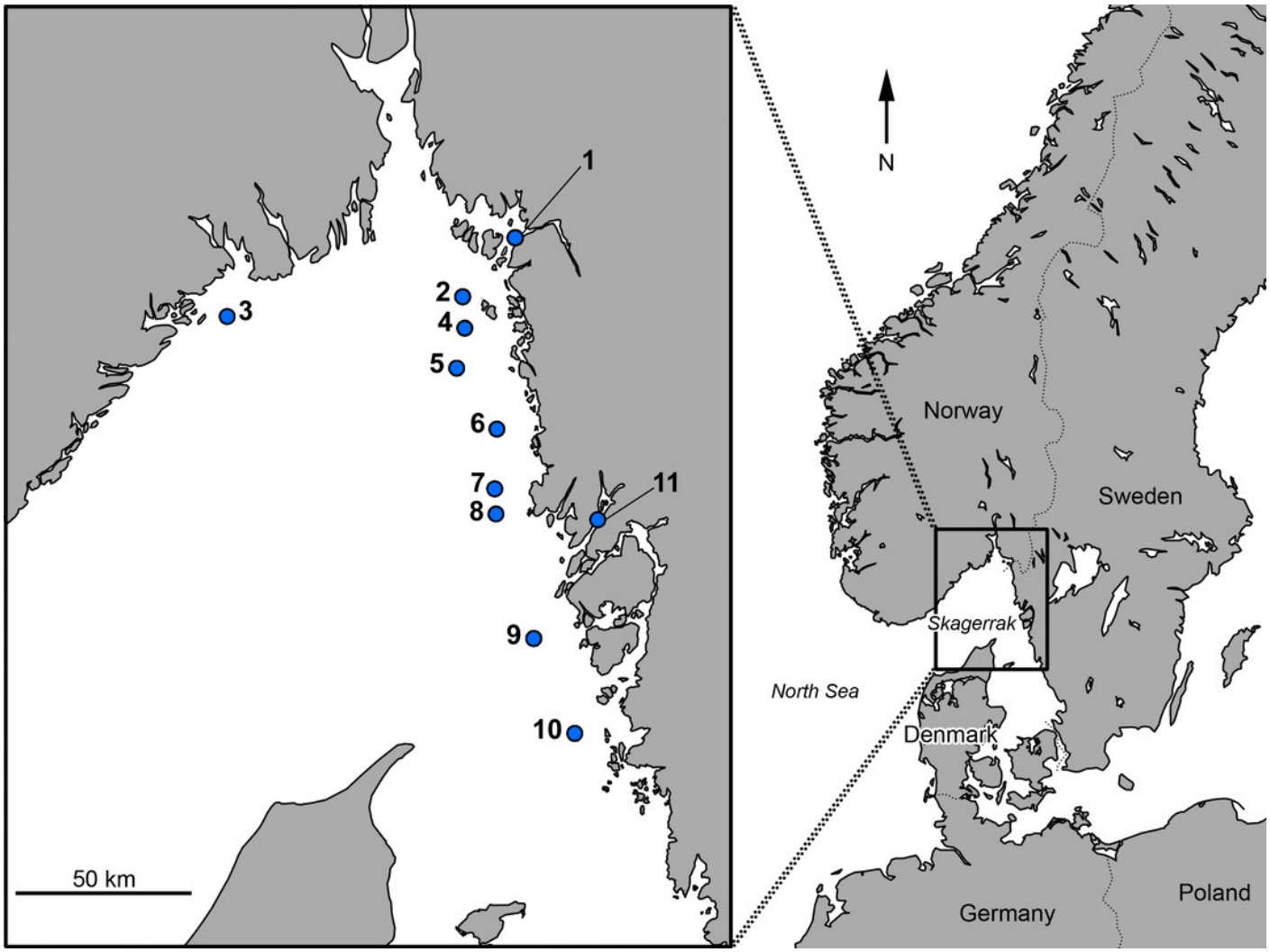

Figure 2

Pictures of *Acantholabrus palloni* from Swedish waters.

Pictures of *Acantholabrus palloni* from Swedish waters. Top: Record #7, Table 1. Bottom: Record #8, Table 1. Published with permission (Photo credit: M. Lundgren).