

## Short communication

# *Lycodes adolfi* Nielsen & Fosså, 1993 (Teleostei: Zoarcidae) recorded near Jan Mayen and in the eastern part of the Norwegian Sea

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Byrkjedal I., Brattgard T. and Møller P.R. 2009. *Lycodes adolfi* Nielsen & Fosså, 1993 (Teleostei: Zoarcidae) recorded near Jan Mayen and in the eastern part of the Norwegian Sea. *Fauna norvegica* 28: 1-3.

Specimens of *Lycodes adolfi* were collected from an epibenthic sampler at six stations near Jan Mayen and in the eastern part of the Norwegian Sea. The stations were at depths from 708 to 2150 m and all of them had subzero water temperatures. The records substantially increase the known distribution of this cold-water eelpout, previously known only from waters near Greenland.

Keywords: Zoarcidae, *Lycodes adolfi*, distribution, morphology

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## INTRODUCTION

The fairly recently discovered eelpout *Lycodes adolfi* Nielsen & Fosså, 1993, has been known from Baffin Bay and East Greenland waters between 67° 34' and 73° 54'N, depth 386-1880 m (Nielsen & Fosså 1993, Treble et al. 2000, Møller & Gravlund 2003, Chambers and Dick 2007). On the Baffin Bay continental slopes *L. adolfi* is not rare and it was found to be a secondary indicator species for the deepest recognized fish fauna assemblage in the Bay (Jørgensen et al. 2005). It is not found in southern Greenland waters (Møller & Jørgensen 2000) and it is likely that the east and west Greenland specimens are isolated from each other, due to shallow waters in the north and warm water in the south.

Benthic invertebrate sampling in the western and eastern parts of the Norwegian Sea yielded several specimens of this eelpout, extending its known distribution considerably. The present note reports the new records and briefly discusses the distribution of the species. Being a little studied species, we also summarize some meristic and morphometric data for the specimens.

## MATERIAL AND METHODS

The samples of eelpouts were taken during cruises with R/V "Håkon Mosby" (University of Bergen) in 1983 (cruise 13-83) and 1986 (cruises 16-86 and 20-86). The cruises were carried out primarily to study the composition of the hyperbenthic invertebrate fauna of the deeper parts of the Norwegian Sea.

The sampling gear that yielded eelpouts was a Rothlisberg & Percy (RP) epibenthic sampler (Rothlisberg & Percy 1977, Buhl-Jensen 1986, Brattegard & Fosså 1991) with a net of 0.5 mm mesh size.

Temperature measurements of near-bottom water were made using a Neil Brown III CTD. The material was elutriated in liberal amounts of sea water and strained in a set of sieves. The eelpouts were handpicked from the sieves and fixed in buffered 4 % formaldehyde-seawater solution and later transferred to 70% ethanol for permanent storage in the vertebrate collections at Bergen Museum. The fishes were examined and measured after preservation, generally following the methods of Anderson (1994). The specimens were radiographed, and vertebrae, dorsal and anal fin rays were counted from radiograph images.

## RESULTS

The material contained seven individuals of *L. adolfi* from six stations (Table 1), two of which were from waters near the island Jan Mayen, one on the Jan Mayen Ridge, two northeast of the Faroes, and one on the Vøring Plateau (Figure 1). The specimens were caught on the continental slopes, at depths between 708 and 2150 m, all of them in subzero water temperatures (between -0.3 and -0.9 °C).

The specimens had a standard length ( $S_L$ ) of 38-127 mm, a preanal length of 35.9-40.5 % of  $S_L$ , and a body depth at anus

Table 1. Station informations for the new specimens of *L. adolfi*. Bergen Museum catalogue numbers are given under the acronym ZMUB.

ZMUB	Date	Position	Depth (m)	Temp (°C)
15661	27 July 1986	70°41'N – 7°38'W	1243	-0.6
15659	25 July 1986	69°01'N – 8°25'W	879	-0.6
15660	27 July 1986	70°49'N – 9°44'W	886	-0.6
16095, 16096	17 August 1986	63°35'N – 0°06'W	2150	-0.9
15667	2 June 1983	62°12'N – 0°00'W	708	-0.3
15657	30 July 1986	67°55'N – 2°26'E	1698	-0.9

of 6.4-8.4 % of  $S_L$  (Table 2). The three largest specimens ( $S_L$  111-127 mm) had a maximum of 17-20 scale rows between the dorsal and anal fins and a distance from the snout to the anterior scales of 43.6-52.0 % of  $S_L$ , whereas the four smaller ones (38-50 mm  $S_L$ ) had only scattered scales in the midlateral region of the tail. All the specimens were uniformly brown with a dark (blackish) peritoneum; none showed any indication of transverse bands or other pigment patterns of the integument. Lateral lines were difficult to observe, but a single lateral line was found in the largest specimens. The operculum showed a pronounced pointed tip, and the pectoral fins almost reached anus (Figure 2).

## DISCUSSION

The records show that the species is not restricted to continental slope waters near Greenland. While the occurrence near Jan Mayen might not be surprising as an extension along the ridge systems from the Greenland range at the same latitude, the records on the eastern side of the Norwegian Sea indicate a much larger distribution of this species than formerly reported. Previous as well as present records show *L. adolfi*

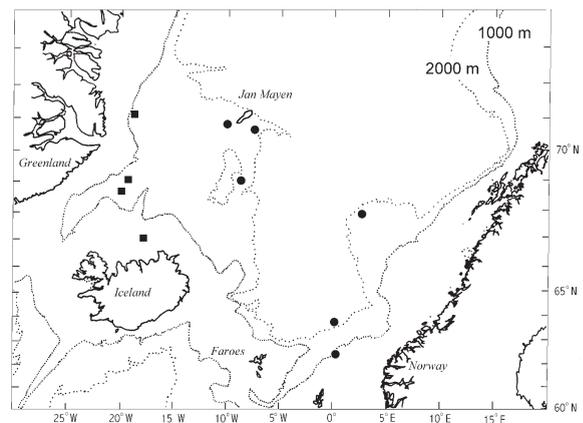


Figure 1. Localities at which *Lycodes adolfi* has been caught in the Nordic Seas. Squares denote previously known occurrences (from Nielsen & Fosså 1993), circles show new records.

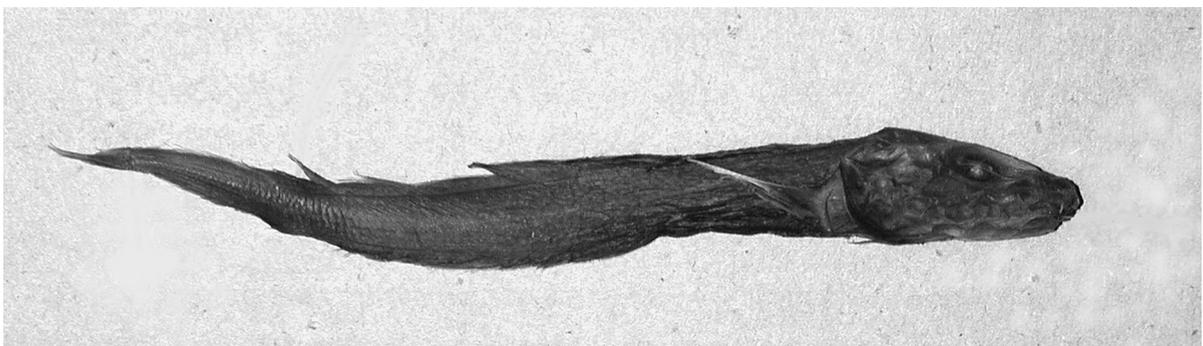


Figure 2. *Lycodes adolfi*, specimen ZMUB 15661;  $S_L$  127 mm.

Table 2. Meristic and morphometric characters of the new specimens of *Lycodes adolfi* (n=7) caught in the Norwegian Sea.

Characters	Average	SD	Range
Standard length (mm)	75.4	40.5944	38.2-127
Meristic characters:			
Dorsal fin rays	96.0	3.2950	92-101
Anal fin rays	81.7	3.8065	77-87
Pectoral fin rays	17.3	0.4900	17-18
Anal fin origin below dorsal fin ray no.	16.0	1.0000	14-17
Total vertebrae	102.1	3.2701	98-106
Precaudal vertebrae	20.3	0.6999	19-21
Teeth on vomer	6.6	0.9820	2-5
Morphometric characters as % of $S_L$ :			
Head length	22.2	1.5450	19.7-24.2
Preanal length	38.6	1.8046	35.9-40.5
Predorsal length	26.4	1.8435	22.6-28.3
Snout length	6.0	1.0641	4.5-7.3
Depth at anus	7.6	0.7947	6.4-8.4
Pectoral fin length	15.9	1.3100	13.7-17.3
Pelvic fin length	4.3	0.5500	3.5-5.2

to be a cold-water species found in water temperatures below (or just above) 0°C and at fairly great depth, usually more than 1000 m (Nielsen & Fosså 1993, Møller & Jørgensen 2000). The Norwegian Sea basin has subzero temperatures at depths below 600-700 m due to Arctic water branching from the East Greenland Current (Blindheim 2004), and thus, conditions for this species possibly exist in the deep basin as well as along larger parts of its surrounding continental slopes. Zoarcids form an important part of the deep-sea cold-water fish communities along the slope of the eastern Norwegian Sea; from 17 trawl stations Bergstad et al. (1999) recorded 11 zoarcid species, of which only two were associated with the warmer Atlantic Water found along the shelf edge. The dominant species in the deep central part of the Norwegian Sea is *L. frigidus* Collett, 1879. *Lycodes adolfi* and *L. frigidus* are similar in many characters, and scaleless juveniles less than 100 mm of the two species are difficult to separate. *Lycodes adolfi* differs by having fewer pectoral fin rays (16-19 versus 19-23) and precaudal vertebrae (19-21 versus 21-24) (Møller unpublished data).

The present material consisted of small (juvenile) specimens (3-13 cm). Møller & Jørgensen (2000) found no sexually mature specimens within the size range of 7-18 cm that they examined from West Greenland, while Nielsen & Fosså (1993), who examined specimens up to 23 cm, found several that were sexually mature. Morphologically the specimens are well in accordance with the diagnosis given by Nielsen & Fosså (1993): restricted squamation, pointed opercular tip, one lateral line, preanal length less than 45% of the  $S_L$ , depth at anus less than 10% of the  $S_L$ , pectoral fin rays 17-18, less than 25 scale rows between dorsal and anal fins, pectoral fin almost reaching anus, and plain colour.

## ACKNOWLEDGEMENTS

We would like to thank professor H. Haflidason for giving us access to the radiograph at the Department of Earth Science, University of Bergen. We are also grateful to two anonymous reviewers for their comments on our manuscript.

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