

8th edition, May 2014

Identification Guide for Skates (Chondrichthyes: Rajiformes)

in Norwegian waters, for both sexes and all stadiums

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INTRODUCTION

The characters in this identification guide are compiled mainly from own data, but also from published literature. Maximum length (in mm – from tip of snout to tip of tail) refers to Norwegian specimens, and is not definitive. Specimens possessing «one median row of thorns» may have 1, 3 or 5 rows in total, while specimens with «two median rows» may have 2 or 4 rows in total. «Thorns» are thorns which are significantly larger than «small thorns». The latter may cover the whole or part of the body. «Tooth rows» are the number of vertical rows in the upper jaw, not the number of teeth in each row (Fig. 9).

Dipturus nidarosiensis, *D. batis* (which is now considered as two species), *Leucoraja circularis*, *L. naevus*, *L. fullonica* and *Raja montagui* are rare. If encountered, keep the specimen for validation or at least take a picture of the dorsal and ventral side. The critically endangered *D. batis* complex should be released alive, if possible.

This is a dichotomous/trichotomous identification guide. Read through each paragraph, and proceed to the paragraph that fits better (numbers in the right column). Pay close attention to the species descriptions and illustrations. More photos are available at www.fiskipedia.no.

Identification guides can only be improved by active use in the field, and I highly appreciate feedback if you find something difficult to understand or if something is wrong. Contact information is found on the front page.

I would like to thank all of you that have been helping me out with data (especially Otte and Tone at IMR), and thanks to Vibeke for invaluable help with the layout.

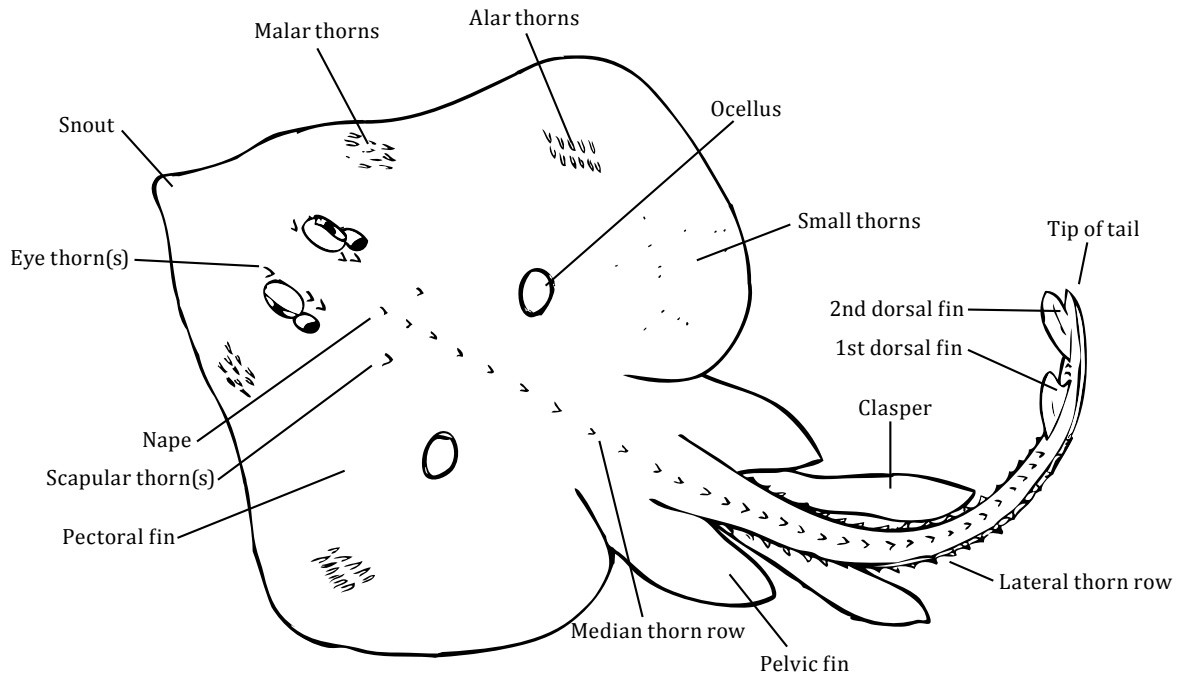


FIGURE 1. Schematic drawing of a typical skate, with the characters used in the guide. Malar- and alar thorns and claspers are male characters. All illustrations: A. Lynghammar.

IDENTIFICATION

- | | | |
|-----|---|---|
| 1. | a. One median thorn row (Figs. 2a, b)
b. Two median thorn rows (Fig. 3)
c. No defined row, thorns scattered on the back and tail (Fig. 2c) | 2
10
<i>R. fyllae</i> |
| 2. | a. Thorn row(s) only on the tail (Fig. 2a)
b. Thorn row continues toward the head (Fig. 2b) | 3
6 |
| 3. | a. Very flexible snout (Fig. 4)
b. Rigid snout | <i>B. spinicauda</i>
4 |
| 4. | a. 30 or more thorns in the median row
b. 30 or less thorns in the median row | <i>D. nidarosiensis</i>
5 |
| 5. | a. 4–13 thorns in the median row
b. 12–28 thorns in the median row | <i>D. oxyrinchus</i>
<i>D. batis</i> |
| 6. | a. Partly or completely rough ventral side
b. Smooth ventral side | 7
8 |
| 7. | a. Pale bands on the tail (Fig. 5)
b. Paired black spots on each side of the median thorn row (Fig. 7) | <i>R. clavata</i> *
<i>R. montagui</i> |
| 8. | a. 19 or less thorns in the median row
b. 20 or more thorns in the median row | <i>A. radiata</i>
9 |
| 9. | a. 39 or less thorns in the median row
b. 40 or more thorns in the median row | <i>A. hyperborea</i> *
<i>R. lintea</i> |
| 10. | a. 8–16 symmetrical white spots on the dorsal side (Fig. 3a)
b. 3–9 thorns in a separate row behind the eyes (Fig. 3b)
c. Characteristic ocellus on the dorsal side (Fig. 10) | <i>L. circularis</i>
<i>L. fullonica</i>
<i>L. naevus</i> |

***TABLE 1.** If the specimen is small (<200 mm TL), check the character sets below. It may be difficult to separate thorns from small thorns.

SPECIES	THORNS IN FRONT OF THE EYES	THORNS BEHIND THE EYES	NUMBER OF THORNS IN MEDIAN ROW
<i>A. hyperborea</i>	1	2	22 – 39
<i>R. clavata</i>	2	3	24 – 49
<i>R. fyllae</i>	1	1	30 – 40

Body shape and tail length is useful for separating *A. hyperborea* from *R. fyllae* (<200 mm TL):



SPECIES DESCRIPTIONS

Amblyraja hyperborea

22–39 thorns in the median row. Dorsal side dark and covered with thorns and small thorns. Ventral side pale with larger dark areas and spots. Three scapular thorns, and one in front of and two behind the eyes in all stadiums. Radially ribbed thorns (Fig. 8b). 35–48 tooth rows. Up to about 1000 mm TL. Very common in cold water. **OBS! specimens <200mm may be misidentified, see Tab. 1.**

Amblyraja radiata

11–19 thorns in the median row. Radially ribbed thorns (Fig. 8b). Dorsal side brownish and covered with thorns and small thorns. Ventral side pale, but may have small dark spots. 36–46 tooth rows. Up to 750 mm TL. Very common, and nine out of ten skates in the Barents Sea is this species.

Bathyraja spinicauda

19–26 thorns in the median row. Dorsal side grey and devoid of thorns, but is covered by small and thin thorns in all stadiums (Fig. 4). Ventral side pale with darker regions on the posterior part of the pectoral fins. Ventral side of the tail is dark. Very flexible snout (Fig. 4). 30–34 tooth rows. Up to 1700 mm TL. Common in deeper water.

Dipturus batis

12–28 thorns in the median row, may be worn. Distance between front of eye to tip of snout is less than 2.5 times the distance between the eyes. May have ocellus. Dorsal side brownish with pale

spots. 40–56 tooth rows in adults, 40–45 in juveniles. Up to 2500 mm TL. This species has been splitted in two, see Tab. 2 for characters. Rare and critically endangered.

Dipturus nidarosiensis

30–52 thorns in the median row, may be worn. Dorsal- and ventral side dark. May have a thorn row on inner rim of the eyes (Fig. 3). Juveniles have 9–11 thorns in the median row and 34–42 tooth rows. Adults have 42–50 tooth rows. Up to 2030 mm TL. Relatively rare, but is found in Vestfjord, Trondheimsfjord and fjords on the west coast.

Dipturus oxyrinchus

4–13 thorns in the median row, may be worn. Very pointed snout, and distance between front of eyes to snout at least four times the distance between the eyes. Dorsal side greyish to brownish, often with pale spots. Ventral side pale, but anterior half is often darker. 34–38 tooth rows. Up to 1500 mm TL. Rare in the north, more common in the south. **OBS! If juvenile, check with *D. nidarosiensis* as well.**

Leucoraja circularis

A patch of thorns on the nape and 8–16 milky-white, symmetrical spots on the dorsal side in all stadiums (Fig. 3a, pattern may vary). Adults have 32–38 thorns in each row. Juveniles have one median row with about 33–37 thorns. 64–68 tooth rows in juveniles, 64–84 in adults. Up to about 1200 mm TL. Rare.

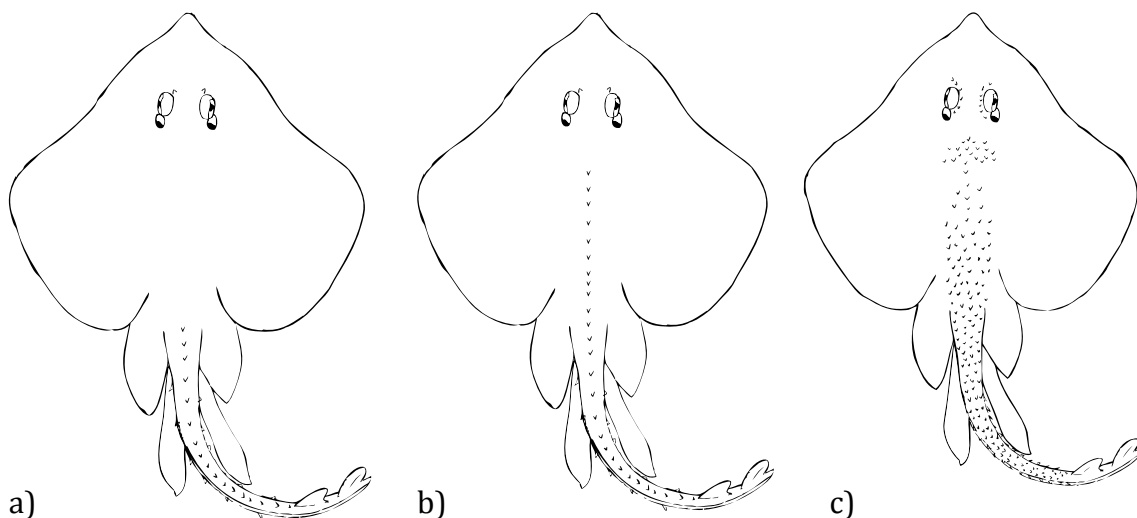


FIGURE 2. Schematic configuration of thorn rows. a) one median row restricted to the tail, b) one median thorn row continuing towards the head and c) scattered thorns.

Leucoraja fullonica

3–9 nape thorns, separated from the two median rows which has 35–58 thorns (Fig. 3b). Juveniles have about 13 thorns in one median row, in addition to the nape thorns. 58 tooth rows in juveniles, 68 in adults. Up to about 1050 mm TL. Rare.

Leucoraja naevus

Characteristic black ocelli with yellowish spots present in all stadiums (Fig. 10). About 43 thorns in each median row in adults. Juveniles have about 33–34 thorns in one median row. 54–60 tooth rows. Up to about 700 mm TL. Southern, and very rare.

Raja clavata

24–50 thorns in the median row. Dorsal side rough, and may have thorns unevenly scattered. At least one scapular thorn. Brownish and marbled, may have ocelli. Pale bands on the tail (Fig. 5). Ventral side rough, pale and may have thorns (Fig. 6). Thorns on back and tail may be of variable size, but all are smooth (Fig. 8a). 36–44 tooth rows. Up to 1045 mm TL. Common near shore in south, more rare in the north. **OBS! specimens <200mm may have smooth ventral side and could be misidentified, see Tab. 1.**

Raja montagui

40–50 thorns in the median row. Dorsal side brownish with blackish spots, arranged pairwise on the tail (Fig. 7). No scapular thorns. Ventral side of juveniles <300 mm TL is smooth, rough in larger specimens. 38–60 tooth rows. Up to 800 mm TL. Southern, and very rare.

Rajella fyllae

30–40 thorns in a median row as juveniles (<200 mm TL), adults develop irregular thorn rows and one row of thorns on the inner rim of the eyes (Fig. 2c). Juveniles have one scapular thorn, one thorn in front of and one behind the eyes. 30–36 tooth rows. Up to about 720 mm TL. Common. **OBS! specimens <200mm may be misidentified, see Tab. 1.**

Rajella lintea

40–52 thorns in the median row. Dorsal side pale or greyish. Ventral side is generally pale, but dark on the posterior part of pectoral fins and may have a bean-shaped dark spot on each side of the cloaca. Row of thorns on the inner rim of the eyes (Fig. 3). Ventral side of tail is dark. 48–50 tooth rows. Up to 1230 mm TL. Rare in the north, more common in the south.

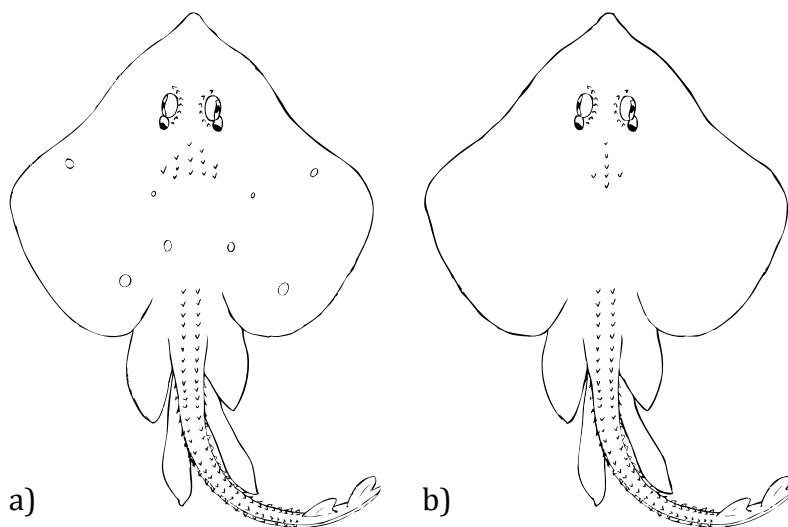


FIGURE 3. Schematic figure of skates possessing two median thorn rows and one row on the inner rim of the eye. a) 8 white spots and a triangular patch of thorns on the nape, or b) separated row of nape thorns.



FIGURE 4. *Very flexible snout in Bathyraja spinicauda. Notice the small, thin thorns that covers the dorsal surface. Photo: Arve Lynghammar.*



FIGURE 5. *Pale bands on the tail of Raja clavata. Photo: Arve Lynghammar.*



FIGURE 6. *Thorns and rough ventral side of Raja clavata. Photo: Arve Lynghammar.*



FIGURE 7. *Raja montagui. Notice the paired black spots on each side of the median thorn row. Photo: A. Lynghammar.*

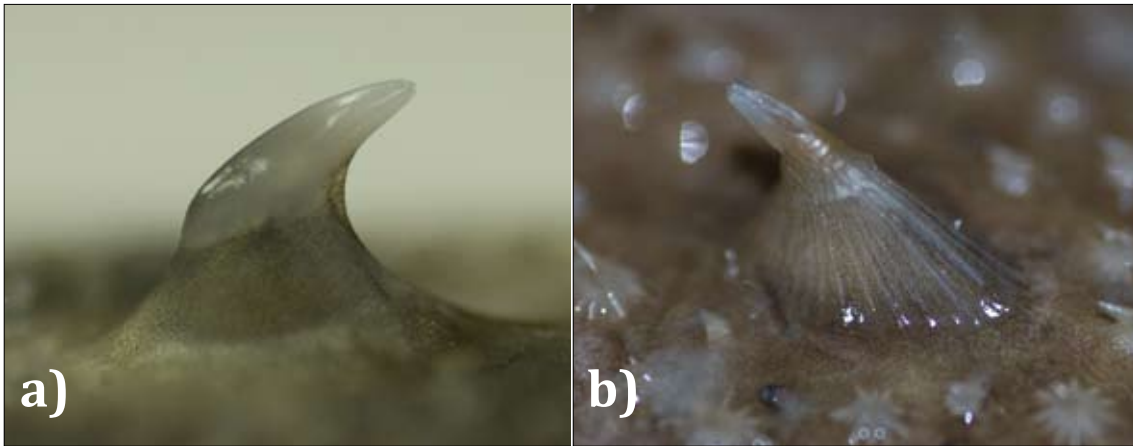


FIGURE 8. a) Smooth thorns in *Raja clavata*. b) *Amblyraja radiata* and *A. hyperborea* have radiate ribs on the thorns. From the nape region. Photo: Arve Lynghammar.

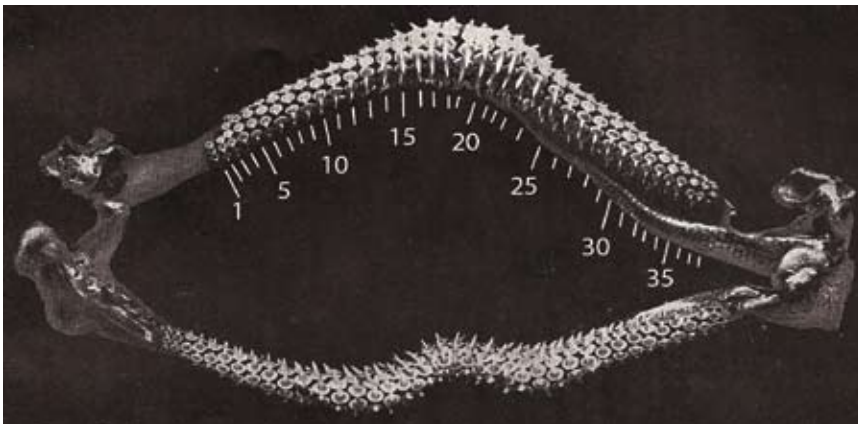


FIGURE 9. How to count tooth rows. Upper- and lower jaw may have uneven numbers of teeth. This picture shows an *A. radiata* male with 38 tooth rows (modified from Clark, 1926).



FIGURE 10. *Leucoraja naevus* with its characteristic ocelli on the dorsal side. Photo: A. Lynghammar.

TABLES

TABLE 2. Diagnostic characters for the two species formerly known as *Dipturus batis*. Name suggestions and characters are adopted from Iglésias et al. (2010).

CHARACTER	<i>Dipturus cf. flossada</i>	<i>Dipturus cf. intermedia</i>
Eye colour	Yellow iris	Dark green-olive iris
Ocellus	Dark centre with a pale ring	A patch of pale spots
Thorns in lateral rows	Points 90° from the tail	Points toward the head
Distance between dorsals	Short (1.2 ±0.4 % of TL)	Long (2.4 ±0.5 % of TL)
Teeth shape	Narrow	Wide
Maximum total length	1432 mm	2288 mm

TABLE 3. Scientific and English names.

SCIENTIFIC NAME – ENGLISH NAME	SCIENTIFIC NAME – ENGLISH NAME
<i>Amblyraja hyperborea</i> – Arctic skate	<i>Leucoraja fullonica</i> – shagreen ray
<i>Amblyraja radiata</i> – starry ray	<i>Leucoraja naevus</i> – cockoo ray
<i>Bathyraja spinicauda</i> – spinetail ray	<i>Raja clavata</i> – thornback ray
<i>Dipturus batis</i> – common skate	<i>Raja montagui</i> – spotted ray
<i>Dipturus nidarosiensis</i> – Norwegian skate	<i>Rajella fyllae</i> – round ray
<i>Dipturus oxyrinchus</i> – longnose skate	<i>Rajella lintea</i> – sail ray
<i>Leucoraja circularis</i> – sandy ray	

REFERENCES:

Clark, R.S. (1926). *Rays and Skates - a Revision of the European Species*. Fisheries, Scotland, Scientific Investigations 1: 66 pp.

Iglésias, S.P., Toulhoat, L. & Sellos, D.Y. (2010). Taxonomic confusion and market mislabelling of threatened skates: important consequences for their conservation status. *Aquatic Conservation: Marine and Freshwater Ecosystems* 20: 319-333.

NOTES: