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## *Eimeria halleri* sp. n. (Apicomplexa: Eimeriidae) from the Round Stingray, *Urolophus halleri* (Rajiformes: Dasyatidae)

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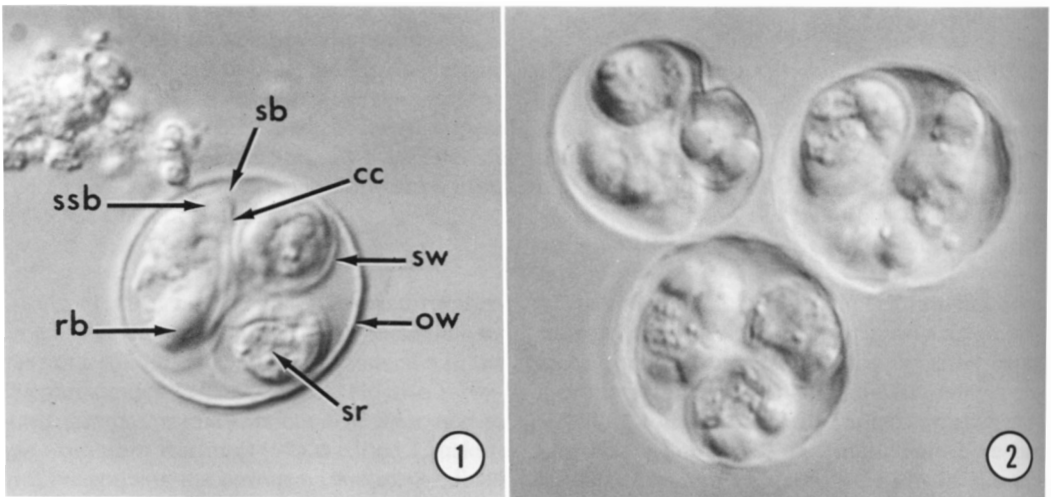
**ABSTRACT:** *Eimeria halleri* sp. n. (Apicomplexa: Eimeriidae) is described from the rectal contents of the round stingray, *Urolophus halleri* Cooper (Rajiformes: Dasyatidae) from Puerto Peñasco, Mexico. Oocysts are spherical or subspherical,  $16.9 \times 16.8$  ( $15.0-18.0 \times 15.0-18.0$ )  $\mu\text{m}$ , with a smooth, thin wall. Micropyle, polar granule, and oocyst residuum are absent. Sporocysts are ovoid,  $11.1 \times 6.8$  ( $10.0-13.0 \times 6.0-7.5$ )  $\mu\text{m}$  and possess Stieda and substieda bodies. Sporozoites are comma-shaped,  $9.9 \times 3.2$  ( $9.0-11.0 \times 2.8-4.0$ )  $\mu\text{m}$  and contain an ovoid posterior and a spherical anterior refractile body. The sporocyst residuum consists either of numerous finely granular particles scattered among the sporozoites or as a spherical mass.

During a survey of marine fish for parasites at Puerto Peñasco, Mexico, we noted many round stingrays, *Urolophus halleri* Cooper, to be passing unsporulated coccidian oocysts in the feces. Further examination of these oocysts revealed a previously unknown species of *Eimeria*. This paper describes the morphological characteristics of this new species of coccidian.

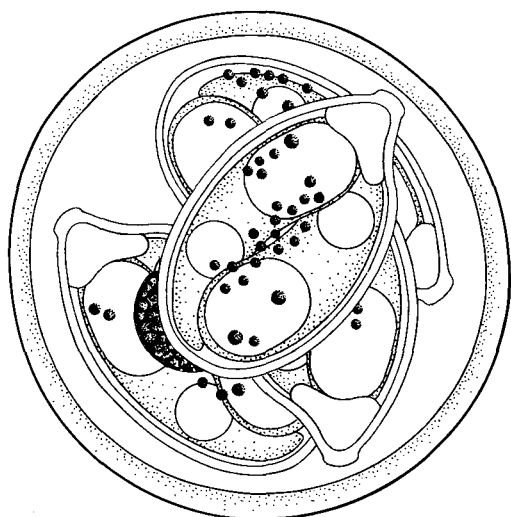
### Materials and Methods

Both male and female round stingrays, *Urolophus halleri*, were collected either with a Hawaiian sling or by seining along the coastline at Puerto Peñasco, Mexico, in October 1984. Spiral valve contents from each

stingray were divided into four equal portions and each portion placed within one of the following solutions: 1) 2.5% (w/v) potassium dichromate ( $\text{K}_2\text{Cr}_2\text{O}_7$ ) in tap water; 2) 1.0% (w/v)  $\text{K}_2\text{Cr}_2\text{O}_7$  in 1:1 seawater-tap water; 3) 1.0% (v/v)  $\text{H}_2\text{SO}_4$  in tap water; or 4) seawater supplemented with 100 IU/ml penicillin G, 100  $\mu\text{g}/\text{ml}$  streptomycin, and 0.25  $\mu\text{g}/\text{ml}$  Actidione. Samples were stored in screw-top vials at room temperature ( $\sim 25^\circ\text{C}$ ) for three days, placed in petri dishes at room temperature for five days so that oocysts could sporulate, and examined by brightfield and Nomarski interference contrast microscopy for parasites. All measurements were made with a calibrated ocular micrometer and are reported in micrometers ( $\mu\text{m}$ ), with the mean followed by the range in parentheses. Fifty parasites were used for each measurement.



Figures 1-2. Nomarski interference contrast photomicrographs of oocysts of *Eimeria halleri* sp. n.  $\times 2,000$ . 1. Sporulated oocyst. Note concave side of sporocyst wall (CC), oocyst wall (OW), refractile body (RB), Stieda body (SB), sporocyst residuum (SR), substieda body (SSB), and sporocyst wall (SW). 2. Three sporulated oocysts.



3

10  $\mu$ m

Figure 3. Composite line drawing of sporulated oocyst of *Eimeria halleri* sp. n.

### Results

Seven of 21 (33%) *Urolophus halleri* were found to be passing a previously undescribed species of *Eimeria* in the feces. Only oocysts placed in seawater supplemented with antibiotics sporulated. Below is the description of the form that we saw.

#### Apicomplexa: Eimeriidae

##### *Eimeria halleri* sp. n.

(Figs. 1-3)

**DESCRIPTION:** Oocysts spherical or subspherical,  $16.9 \times 16.8$  ( $15.0-18.0 \times 15.0-18.0$ ); shape index (length/width) 1.0 (1.0-1.1). Wall smooth, composed of a single colorless layer  $<1.0$  thick (confirmed by crushing oocysts between slide and coverslip). Micropyle, polar granule, and oocyst residuum absent. Sporocysts ovoid,  $11.1 \times 6.8$  ( $10.0-13.0 \times 6.0-7.5$ ); shape index 1.7 (1.4-2.0). Wall smooth and thin, and appears to be composed of a single colorless layer. The pointed end of the sporocyst is often curved to one side (Figs. 1, 3) and has a thin, knoblike Stieda body; substieda body present, large and homogenous,  $\sim 2.5$  wide  $\times$  2.0 high. Sporozoites comma-shaped, with the anterior end distinctly more pointed than the posterior end,  $9.9 \times 3.2$  ( $9.0-11.0 \times 2.8-4.0$ ) in situ. Each sporozoite contains an

ovoid posterior refractile body  $4.0$  long  $\times$   $3.0$  wide ( $3.0-5.0 \times 2.0-3.5$ ) and, usually, a spherical anterior refractile body,  $2.1$  ( $1.0-3.0$ ). Sporocyst residuum present, consisting of numerous fine granules,  $\sim 0.2-0.5$  in diameter, scattered among the sporozoites or (sometimes) as a compact sphere.

**TYPE HOST:** *Urolophus halleri* Cooper "round stingray" (Rajiformes: Dasyatidae).

**TYPE LOCALITY:** Puerto Peñasco, Mexico.

**SITE OF INFECTION:** Unknown. Oocysts found in feces and contents of spiral valve.

**SPORULATION:** Exogenous. All oocysts recovered from the feces and spiral valve were unsporulated but became fully sporulated after 5 days in seawater supplemented with 100 IU/ml penicillin, 100  $\mu$ g/ml streptomycin, and 0.25  $\mu$ g/ml Actidione at  $\sim 22^\circ\text{C}$ .

**PREVALENCE:** 7/21 (33%) stingrays.

**TYPE SPECIMENS:** Syntypes (sporulated oocysts in 10% formalin) USNM Helm. Coll. No. 78490.

**REMARKS:** Only four species of coccidia have been described previously from stingrays: *Eimeria ottojiroveci* Dyková and Lom, 1983 from *Raja clavata*; *E. raiaarum* van den Berghe, 1937 from *Raja batis*; and *E. quentini* Boulard, 1977, and *E. southwelli* Halawani, 1930 from *Aetobatis narinari* (see Halawani, 1930; van den Berghe, 1937; Boulard, 1977; Lom and Dyková, 1981; Dyková and Lom, 1983). *Eimeria halleri* differs from these species by the following characteristics: Oocysts and sporocysts of *E. ottojiroveci* are smaller, the Stieda and substieda bodies are structurally different, and the sporocyst residuum is compact and coarse, rather than fine grained and often dispersed; oocysts of *E. raiaarum* are larger, the sporocysts smaller, and an oocyst residuum is present; oocysts of *E. quentini* and *E. southwelli* are larger and far more elongate and an oocyst residuum is sometimes present.

#### Acknowledgments

We wish to thank Mr. Kevin D. Roy and Mr. Russell R. Broadus for aiding in the collection of many of the stingrays represented in this study.

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