



Maine Department of Marine Resources Cement Gland Staging

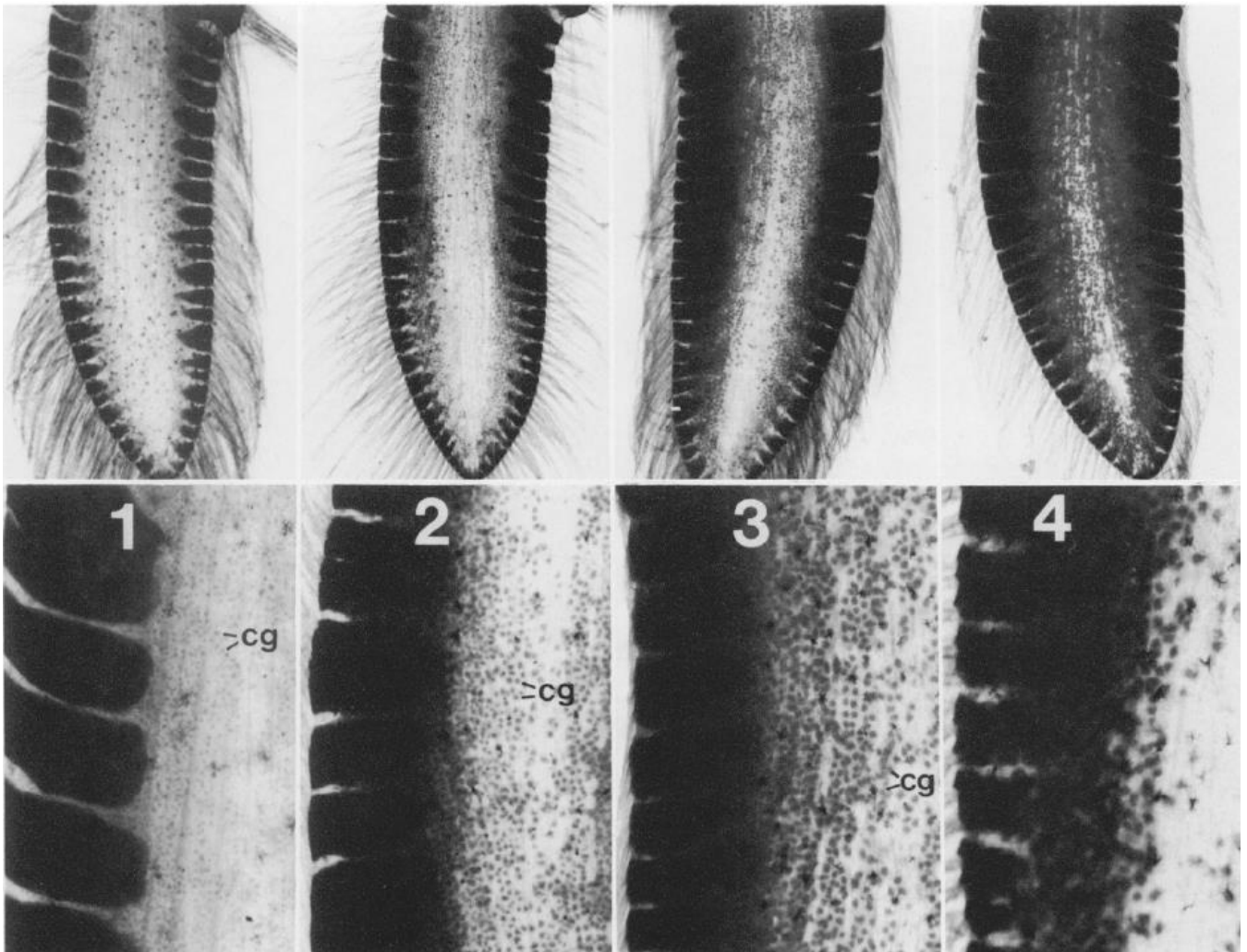
Citations:

Original methods and staging criteria: Aiken, D. E., and Waddy, S. L. 1982. Cement gland development, ovary maturation, and reproductive cycles in the American lobsters *Homarus americanus*. *Journal of Crustacean Biology*, 2: 315–327.

Atlantic Veterinary College at the University of Prince Edward Island, AVC Lobster Science Centre, 2001, “Pleopod Staging SOP #FM-02”

Waddy, S. L., and Aiken, D. E. 2005. Impact of invalid biological assumptions and misapplication of maturity criteria on size-at-maturity estimates for American lobster. *Transactions of the American Fisheries Society*, 134: 1075–1090.

Figure 4 from Aiken and Waddy (1982): Cement gland of *Homarus* stages 1-4 illustrated with whole mounts of pleopod endopodites (upper) and enlarged view of lateral or medial region (lower) showing individual cement glands (cg).





Cement Gland Staging

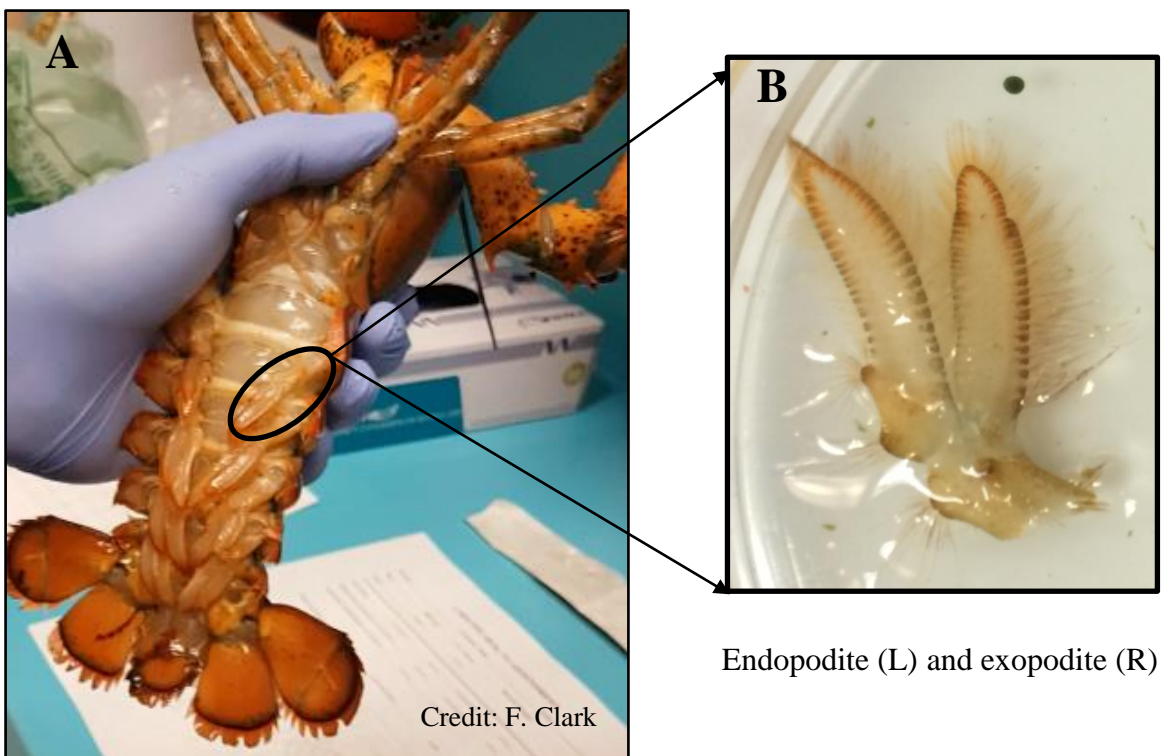
Suggested supplies for pleopod collection:

- Dissecting microscope with undermount lighting
- Camera mounted on microscope
- Microscope slides or glass dish
- Small, dissection scissors
- Kim wipes or similar wipes for microscope slides
- Forceps
- Cold, filtered seawater (FSW) in a squirt bottle

Pleopod collection and prep:

- 1) Put a small amount of FSW on a microscope slide or glass dish.
- 2) Hold the lobster in one hand so the ventral side is facing upwards.
- 3) Using scissors, cut the second pair on the right side (Fig. 1A).
 - If missing or deformed, collect the third pleopod set on the same side. For consistency and ease of interpretation, attempt to collect the same location on each lobster.
- 4) Gently grasp the pleopod by the base with forceps and place in the FSW.
 - Cut pleopods can be stored in chilled FSW for 24 hours
- 5) Examine and determine stage only from the **endopodite** (Fig. 1B).

Figure 1. The ventral side of a lobster with the second set of pleopods circled (A) and the pleopod endopodite and exopodite (B).



Cement Gland Staging

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Stage 0 (1.5x, immature):



- Pleopod appears transparent throughout
- No visible shading or rosettes (shaded circles of secretory material)
- Glands cover 0% of pleopod surface

Stage 1 (immature, 1x):



- Mostly transparent with light shading on the medial and lateral edges
- Individual cement glands are not visible
- Under the microscope, cement glands (~100 μ m) seen as hazy spots
- Cement glands appear white and cloudy in overhead lighting
- Rosettes are not yet visible
- Glands cover 25% or less of pleopod surface



Cement Gland Staging

Image credits: MEDMR

Stage 2 (mature, 0.8-1x):



- Mostly transparent with distinct shading on the medial and lateral edges
- Cement glands can be seen in the central region for the first time
- Some individual cement glands are visible under the microscope
- Glands cover 25-50% of the pleopod

Stage 3 (mature, 0.8x):



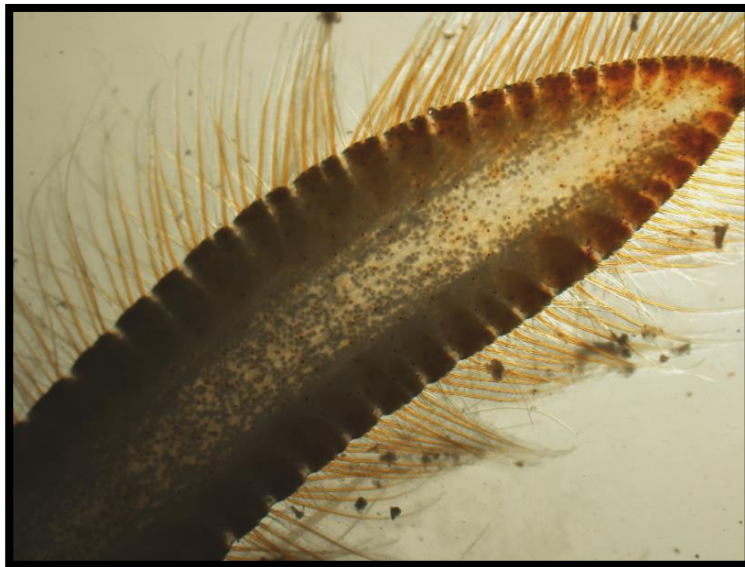
- Glands are present and well-developed across the center of the pleopod
- Individual glands are visible to the naked eye (~150 μ m)
- Aside from the tip, pleopod appears "cloudy" to the naked eye
- Glands cover 50-75% of the pleopod



Cement Gland Staging

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Stage 4 (mature, 0.8x):



- Entirety of the pleopod looks opaque to the naked eye
- Glands are enlarged (~200 μ m) and individual glands are easily defined
- Glands may appear in rows, particularly in the center of the pleopod
- Glands cover 75-100% of the pleopod