Gastrointestinal vascularization of the bottlenose dolphin (*Tursiops truncatus*)

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Introduction

The diet of marine mammals mainly consist of fish. Their intestinal tract is long and monotonous, lacking a caecum, which makes it **difficult to differentiate between small and large intestine** and their subdivisions[1]. To overcome this problem **we studied the arteries supplying the intestine**, especially the the **celiac artery** (ca), the **cranial and caudal mesenteric arteries** (Crma and Cdma) of the bottlenose dolphin (*Tursiops truncatus*, Montagu, 1821). The **venous system** was also investigated.

Methodology

Photographic series of 10 specimens and one vascular cast were used in this study.

Casting procedure followed De Sordi et al. (2014[2]) protocol:

- Arteries and veins were first washed from the abdominal aorta (ao) and from the portal vein (pv).
- A mixture of **polyurethane foam**, acetone and (red and blue) nitro dyes was created and pressed with a syringe from the ao and pv until the capillaries (Fig. 1).
- The sample was immersed in 10% NaoH for 1 month and gently washed.
- Arteries' diameter was calculated with a calibre of 0,1 mm of precision.

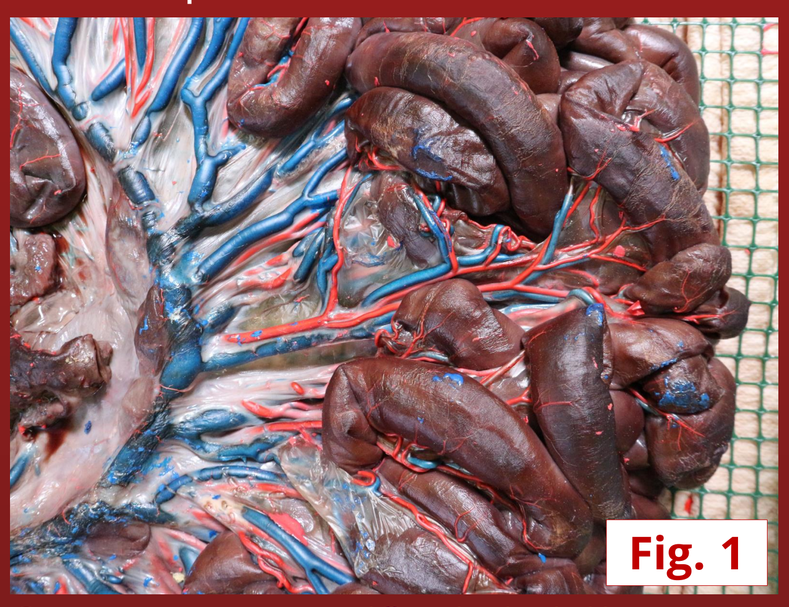


Fig. 1

Results

- **Celiac artery** gave origin to (Fig. 2):
  - hepatic artery (ha)
  - splenic artery (sa)
  - left and right gastric arteries (Lga and Rga)
  - multiple duodenal arteries (daa)
  - cranial pancreatico-duodenal artery (Crpda).
- **Cranial mesenteric artery** gave origin to (Fig. 3):
  - caudal pancreatico-duodenal artery (Cdpda)
  - multiple jejunal arteries (Jaa)
  - ileocolic artery (Ica) which divided into mesenteric ileal branch (mib), right and middle colic arteries (Rca and Mca),
  - **Caudal mesenteric artery** (Cdma) always origined from from Crma instead of ao (Fig. 4). It divided into left colic artery (Lca) and cranial rectal artery (Crra).
  - **Veins** were satellites of the arteries.

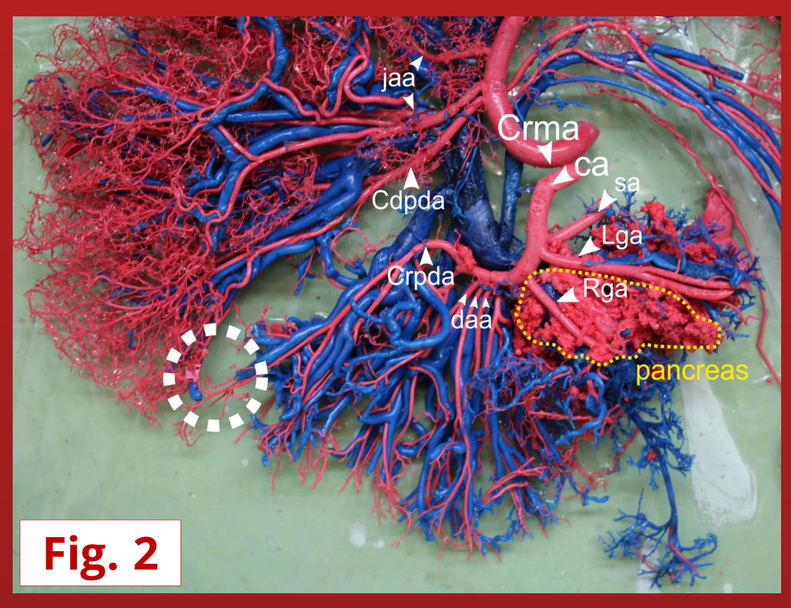


Fig. 2

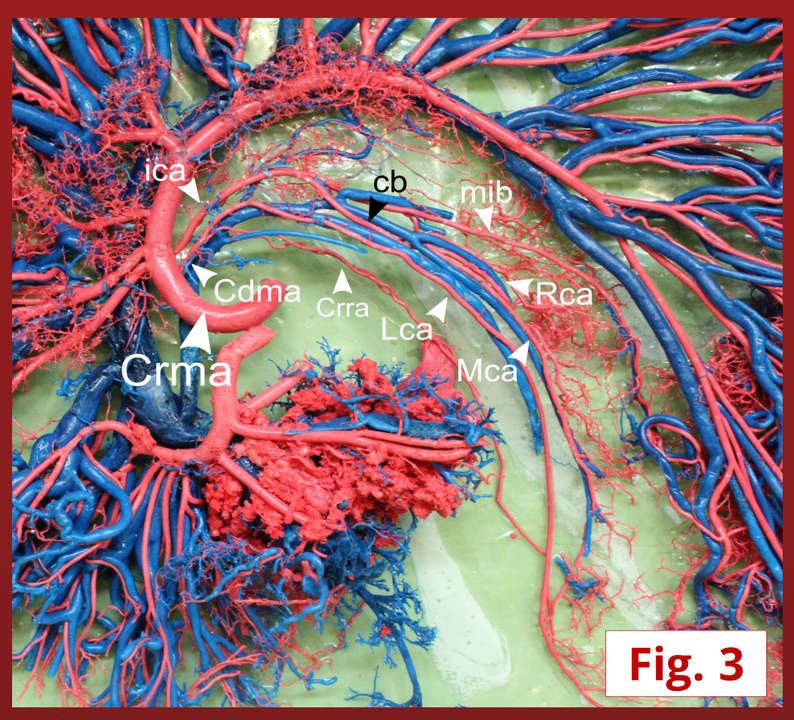


Fig. 3

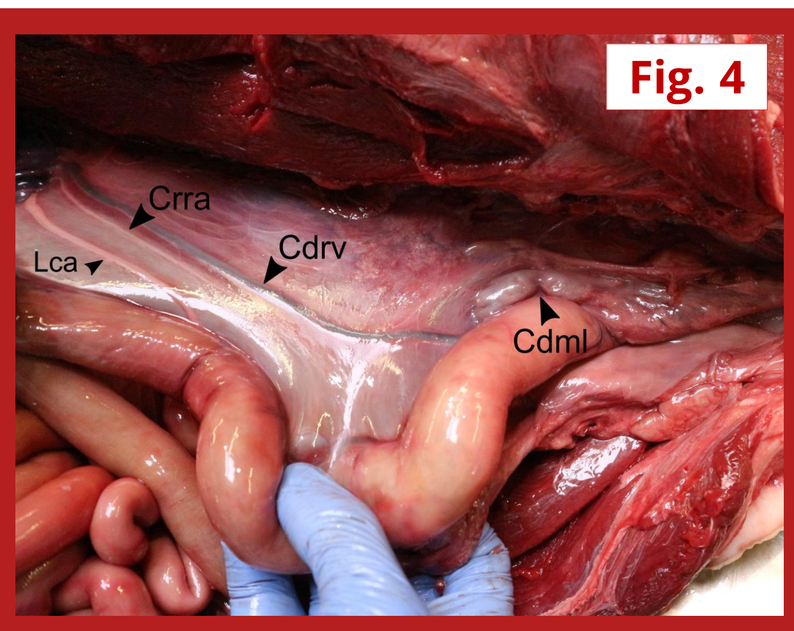
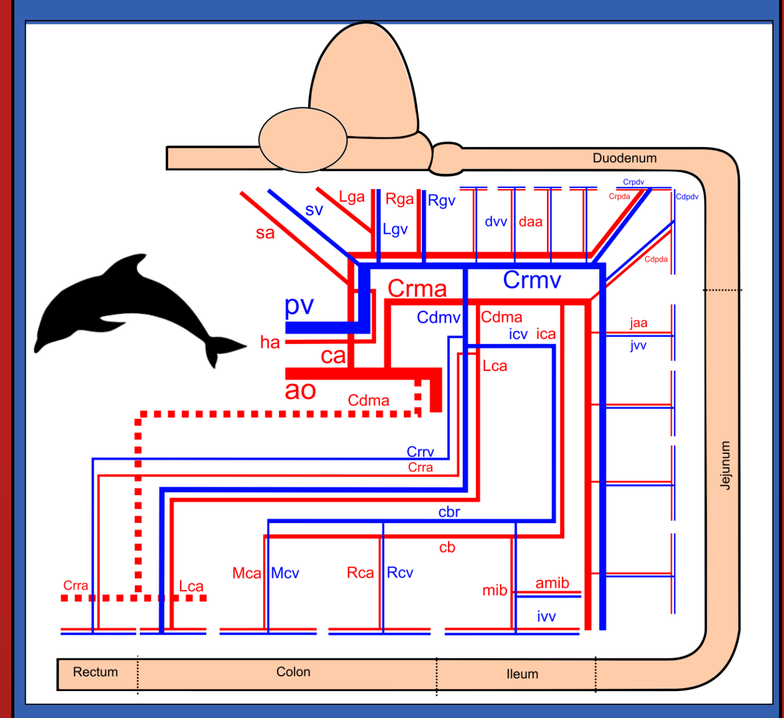


Fig. 4

Table 1 - Principal and branching arteries (mm)

Ca (8) • Lca (5,5) • Rca (5) • ha (5,3) • sa (4,2) • daa (mean of 2,7) • Crpda (2,1)	**Crma** (11,1) Cdpda (4,3) • Jaa (mean of 4,4) • **Cdma** (2) to • Lca (2) • Crra (1,3) • Ica (3.3) to • Mib (2.5) • Cb (2.5) to Rca (2) and Mca (1,8)



General scheme of the dolphins vascularization of the gastrointestinal tract

Conclusion

The arterial pattern revealed a duodenal elongation as well as a shortening of the colic tract. This could be related to the loss of pelvic girdle and the critical need to digest whole prey and avoid the traditional gas-producing colic fermentations.

References

[1]Cozzi, B., Huggenberger, S., & Oelschläger, H. A. (2017). Anatomy of dolphins: insights into body structure and function. Academic Press.

[2]De Sordi, N., Bombardi, C., Chiocchetti, R., Clavenzani, P., Trerè, C., Canova, M., & Grandis, A. (2014). A new method of producing casts for anatomical studies. Anatomical science international, 89, 255-265.

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