1. Basic Reporting

The present research presents a functional myologic analysis of the musculature of two similar-sized species which constitute a phylogenetic and morphofunctional bracket for inferring four non-conserved myologic characters of a fossil species, *Massetognathus pascuali*. The manuscript is self-contained and presents relevant results as it is the first estimation of PCSA in a fossil species. This character is fundamental for a confident functional comparison among species and the authors provide a strong base for myologic parameter´s calculation by dissecting two similar-sized species as “brackets”. Although the general interest is not new (evolution of pectoral girdles in vertebrates, associated to habitat and locomotor changes has been largely studied), the approach is original and worthy of publication.

The paper has a good structure that allows easy reading and interpretation, also, structure is ok according the Journal requested format. The English writing is good and unambiguous. Although I am not a native English speaker, I found three or four things that did not sound correct, so I left some suggestions in the attached file. Please, make sure a native speaker checks on them.

Cited literature was pertinent and sufficient. Regarding background, I believe the authors could add some small details to help scientist who are not specialist in vertebrate anatomical evolution, better understand the anatomical differences between species (particularly pectoral girdle). Also, no functional description is made of the fossil about its posture and locomotor mode, more information about this is needed.

Article´s structure is ok and most raw data is available in well-structured tables, but I was not able to find availability of scanned 3D images throughout the manuscript.

My only suggestion about Table 1 is to mark significant differences (may be the usually used *), even when they are in Fig. 6, as this information helps readers.

Figures are all necessary, in a general point of view they are appropriately described and labeled, but I would suggest the following changes:

All figures: The journal format ask for labeling each part of a multi part figure with an uppercase letter, this requisite is not present in the figures. Also, as requested by the journal, Figures must be cited in the order they appear in the text, please check that the last figures appear cited first in your manuscript (see also comments in attached file).

Figure 1

- ➔ The name of the muscles in the color-coding area are too small, please make them slightly larger.

Right lateral view of pectoral girdle and proximal region of the forelimb of the Argentine black and white tegu (*Salvator merianae*) and the Virginia opossum (*Didelphis virginiana*).

Figure 2

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Con formato: Fuente: Sin Cursiva, Color de fuente: Automático

- ➔ The names/codes of the muscles are too small, please make them slightly larger. (same for figure 3, 4 and 5).
- ➔ I suggest removing the cube reference in the middle of the figure as it may generate some confusion, as some people may understand that all four figures should be interpreted in the same 3D representation of the cube. The legend explains enough, or if you want, you could add the view in the top of each figure, so it is self-explanatory (same for figure 3, 4 and 5).

Shown in medial (top left), cranial (top right), caudal (bottom left), and lateral (bottom right) view. Stippled areas represent loose fascial associations between muscle and bone. Muscle abbreviations and color-coding follow Figure 1.

Comentado [Rev1]: this is actually within the figure not in the legend

Eliminado: legend

Figure 5

- ➔ Please check, I understand that trl should actually be trs as no insertion for triceps scapularis is presented in the figure, and triceps lateralis is within trh (humeralis).

Figure 6

- ➔ Definition is not good, and combined with the very small letters, it makes the figure a little hard to read. May be a high contrast version of this figure could help (as authors did for Fig. 7).

Additionally, I would suggest if possible, another figure (should be the first or in supplementary material) with osteological structure compared between the two studied species and the fossil, again to make it easier to read and understand for a non-specialized vertebrate anatomist, but also to make a more complete functional reading of your findings. Alternatively, authors could consider adding in Fig. 1, the names of the bones mentioned in the text (may be with coding) and address the reader to Fig. 1 in Lai et al., 2018 (doi: 10.1111/joa.12766) to see the osteological structure of the fossil species.

All results are the ones relevant to the hypothesis.

2. Experimental design

Primary research falls within Aims and Scope of the Journal. The manuscript presents a clear question, i.e. calculating non-conserved myologic parameters like PCSA in fossil species. Methods were described with sufficient detail & information to replicate.

3. Validity of the Findings

The data on which the conclusions are based are statistically sound and controlled. Conclusions are well stated, linked to original research question and extremely limited to supporting results. Actually, I would like the authors to use a bit more of the Journal´s allowance for speculation to see more interpretations with previous analysis. For example, how do you think your knew approach influences previous morphofunctional interpretations of the fossil species? (I mean besides the posture, are there other ecological factors that can be associated to these changes?) And in a broader way? How would the possibility of calculating these parameters will affect future fossil´s research?

Finally, results are strong and with biological sense (not only statistical), and as a first approach to solving an extremely difficult problem, it is well sustained and practical.

☐ 4. General comments

This is a well-supported study that provides a new approach to solving an important issue in inferring fossil species eco-morphology. It provides a practical and useful example on how to calculate important myologic parameters fundamental to complement typical fossil´s reconstructions.

A have mostly small suggestions to make about the paper and they are disclosed in the attached file, but here I summarize the most notable ones.

1) The paper is very well written, but in a certain way I feel the authors are writing for a very specialized public, I would suggest some small changes that can make reading easier for non-specialists, e.g., adding the names of bones in figures (or a new figure; see attached file) or adding more background of *Massetognathus pascuali* inferred ecology and ecomorphology.
2) Discussion section is extremely limited to supporting results. I would like the authors to use a bit more of the Journal´s allowance for speculation to see more interpretations including information of previous analysis.
3) I don´t know if I missed it, but I haven't seen availability of the 3D scanned images (as requested by the journal)
4) Improving size letters in figures and change format according to the Journal

☐ 5. Confidential notes to the editor

N/A

Specific comments

Lines 61-62: Permian emergence of the therapsid clade (Kemp, 2005). Differing hypotheses (e.g. Jenkins, 1970; Bakker, 1975; Kemp, 2005; Lai, Biewener & Pierce, 2018)

Line 206: (see below). Finally, normalized PCSA was plotted against normalized L_f to uncover gross trends in muscle

Line 233: paddle-shaped, with a rounded lateral (clavicular) end and a tapered medial (manubrial) end (Fig. 4). This

Line 260: pectoralis is more trapezoidal in shape

Line 270: pectoralis pennation, L_f is significantly greater in the opossum (Fig. 6, table. 1).

Lines 304-305: On an architectural level, similarities and differences are evident between the tegu and opossum´s mm. deltoideus.

Eliminado: (

Eliminado:)

Comentado [Rev2]: it makes no sense to call Fig 6 before 1-5

Eliminado: Fig. 6

Comentado [Rev3]: Fig. 4 appears after 6...

Comentado [Rev4]: I think Fig. 1 is not very good to see the shape of the muscle

Eliminado:

Eliminado: (Fig. 1)

Comentado [Rev5]: before Fig. 5

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Lines 325-327: The tegu supracoracoideus is unipennate, while the opossum infraspinatus and supraspinatus are multipennate with significantly shorter fibers. Mm. infraspinatus and supraspinatus in the opossum sum to a significantly **greater total mass** and PSCA than m. supracoracoideus in the tegu (Fig. 6, table 1).

Lines 339-344: The mention of figures are lacking.

Lines 375-378: No m. teres major is evident in the tegu. Although such a muscle has been described for crocodilians (Meers, 2003; Klinkhamer et al., 2017), turtles (WALKER & E., 1973), and the lizard *Uromastyx* (Lecuru-Renous, 1968), its area of origin in the tegu is occupied by a portion of m. latissimus dorsi instead (Fig. 2).

Lines 424-426 impossible to consistently divide, and are grouped here as m. triceps humeralis. An additional coracoid head has been described in various lepidosaurs (*Sphenodon* (Fürbringer, 1900), *Iguana* (Romer, 1922; Lecuru-Renous, 1968), and *Varanus* (Jenkins & Goslow, 1983)), but is absent in the tegu.

Lines 428-430: In both animals, tegu and opossum, m. triceps scapularis originates via tendon on the axillary border of the scapula, immediately dorsal to the origin of m. teres minor and the glenoid fossa respectively (Fig. 2). The area of origin is a small ellipsoid adjacent to the cranio-dorsal cruciate ligament in the tegu, and a long, narrow strip in the

Line 448: humeral extensor surface as well (Fig. 3). The tegu´s m. brachialis inserts via two common tendons with m.

Lines 458-449: the two species (e.g. Dickson & Pierce; Lieber, 2002; Eng et al., 2008; Allen et al., 2010; Dick & Clemente, 2016).

Line 536: A possible explanation for the broad parallels shown here is that both, tegu and opossum, have

Line 540: anatomy and function between the Savannah monitor *Varanus exanthemicus* and the *Virginia opossum*,

Lines 548-549: conservation and convergence: *Sphenodon* is an early-diverging lepidosaur that attains comparable adult body sizes to *S. merianae* and *D. virginiana* (Halliday, 1945- & Adler, 1986), and would be a useful point

Lines 592-593: The triceps complex is notably more massive in the opossum, but its architecture in both species suggests different functional specializations between the scapular and humeral heads and thus should be considered separately. The opossum m. triceps scapularis

Line 601: control in therians, and the humeral heads becoming specialized for position control of zeugopod.

Line 611: serve to stabilize the humerus against the less-predictable loads generated by active therian locomotion

Line 621: opossum may provide realistic "bookends" for the phylogenetically- and morphologically-intermediate

Lines 636-638: exceeds the tegu-like estimate by approximately a factor of four. In such cases of great divergence, the relative sizes of muscle attachment areas may serve as a guide, particularly in proximal muscles with fleshy origins and short or absent distal tendons.

Lines 634-642: column 2). As expected, values for most muscles appear generally similar, with the notable exception of the m. supracoracoideus/mm. infraspinatus+supraspinatus group, where the opossum-like estimate exceeds the tegu-like estimate by approximately a factor of four. In such cases of great divergence, the relative sizes of muscle attachment areas may serve as a guide, particularly in proximal muscles with fleshy origins and short or absent distal tendons. As shown in the electronic

Comentado [Rev6]: please use Lf as in the rest of the paper; see also below: with "greater total mass" change to Mm (check througout tha paper)

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Comentado [Rev7]: I think this part would belong actually to the discussion section

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Comentado [Rev8]: Again, tecnically, this part should be in discussion section.

Comentado [Rev9]: It would be nice if you could add the position of this structure in Figure 2

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Comentado [Rev11]: Could you please make explicit why these loads are less predictable?

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Comentado [Rev12]: Cuold you please add a cite for this sentence?

supplementary material, table S5, the tegu and the opossum exhibit similar PCSA: origin area ratios for the m. supracoracoideus/mm. infraspinatus+supraspinatus. Of the three *Massetognathus* PCSA estimates, only the tegu-like estimate shows a similar proportion to the reconstructed area of origin, indicating that the tegu may be the more appropriate extant model for this muscle's architectural properties in the cynodont.

Comentado [Rev13]: How do you interpret this results when compared to what you found previously? See Lai et al., 2018 (doi: 10.1111/joa.12766)
Are they contradictory?... as M. supraspinatus and m. infraspinatus were resconstructed as separately muscles in the paper mentioned.