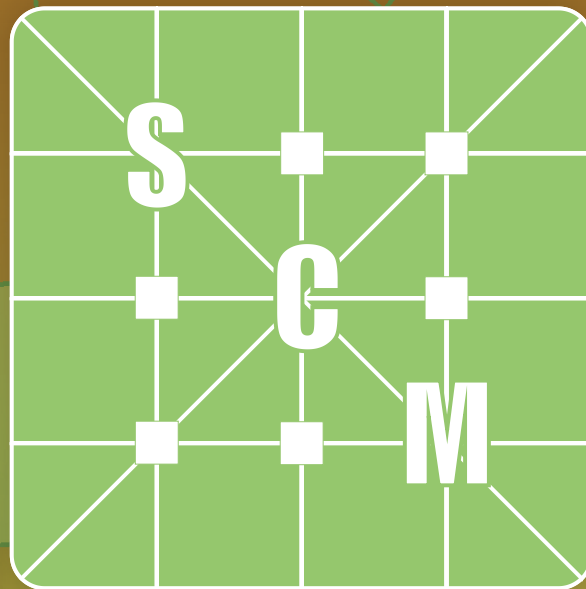


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EDITORIAL

EL PRINCIPIO DE AUTORIDAD Y LA VARIABILIDAD

Siempre nos han enseñado que una de las características principales de la ciencia moderna es el rechazo del principio de autoridad. En ese aspecto la historia de la morfología es ejemplar. El surgimiento de la anatomía moderna en el siglo XVI, encabezada por Fabricio y Vesalio, se basa en un cuestionamiento de las descripciones de los clásicos como Aristóteles y Galeno. Anteriormente los escritos de estos pensadores de la antigüedad eran respetados aún frente a las evidencias que los contradecían. Sin embargo, en los últimos años, muchas veces encontramos muestras de cómo el principio de autoridad renace. En el presente número de "Ciencias Morfológicas" Gelfo y Lorente desconocen dicho principio en su trabajo "Asociaciones de elementos poscraneales en ungulados nativos del paleógeno". Pero lo más importante es que basándose en descripciones morfológicas precisas cuestionan las conclusiones de dos de los paleontólogos de vertebrados más influyentes de la historia: Florentino Ameghino y George Gaylord Simpson. El análisis exhaustivo realizado por Gelfo y Lorente permite la reclasificación de muestras poscraneales luego de varias décadas de haberse mantenido las clasificaciones erróneas.

El trabajo de Galíndez et al. "Desarrollo y microanatomía del ovario de *Mustelus schmitti* (chondrichthyes, triakidae) a través del ciclo reproductivo" es una descripción sobre una especie muy común en nuestro medio pero poco estudiada en su morfología reproductiva. Existían numerosos estudios sobre otro miembro del género, *Mustelus canis*, que tiene características reproductivas muy diferentes ya que este último es placentado y *M. schmitti* no. Las revistas de morfología deben incluir entre sus objetivos la presentación de la diversidad. Las características morfológicas diferenciales de las distintas especies suelen ser muy marcadas. En su libro "Bone and Cartilages" de Brain Hall plantea que "la estructura del hueso que habitualmente encontramos en los libros de Histología es la de algunos huesos largos humanos". Es imposible para un texto plantear la diversidad estructural. Para eso están las revistas como "Ciencias Morfológicas".

Creemos que con la publicación de estos trabajos cumplimos dos objetivos que una revista como la nuestra debe tener.

Claudio Barbeito

Editor Científico

ASOCIACIONES DE ELEMENTOS POSTCRANEALES EN UNGULADOS NATIVOS DEL PALEÓGENO

POSTCRANIAL REMAINS ASSOCIATIONS IN PALEOGENE NATIVE UNGULATES

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RESUMEN. Los ungulados nativos del Cenozoico de América del Sur se encuentran conformados por diversos grupos extintos, correspondientes según los autores a los ordenes Litopterna (incluyendo a los Notopterna), Notoungulata, Xenungulata, Astrapotheria (incluyendo a los Trigonostylopoidea) y Pyrotheria. A estos se suma la temprana radiación de “condilartros” representados por los Mioclaenidae Kollpaniinae y los Didolodontidae, usualmente vinculados con el origen de estos grupos. Los didolodóntidos (Paleoceno medio - Oligoceno?) han sido descritos exclusivamente por restos dentales, no conociéndose postcráneo en asociación directa. Esto restringe el planteo de hipótesis filogenéticas al estudio de los caracteres dentales. Sin embargo, diversos restos postcraneos han sido asociados a los didolodóntidos. En el presente trabajo se realiza un análisis preliminar sobre (1) la morfología y la asignación de dos astrágalos izquierdos al género *Didolodus* (Eoceno de Patagonia), correspondientes a AMNH 117457 y MACN-CA 10737; y (2) se evalúa la utilidad de las herramientas utilizadas hasta el presente en el planteo de hipótesis de asociación de elementos postcraneales y dentarios.

Palabras clave: ungulados nativos, postcráneo, asociaciones, astrágalos, *Didolodus*.

ABSTRACT. The native ungulates of the Cenozoic of South America included several extinct groups, that according to different authors belong to the orders Litopterna (including Noptoterna), Notoungulata, Xenungulata (including Trigonostylopoidea), Astrapotheria and Pyrotheria. To them is added an early radiation of “condylarths”, represented by the Mioclaenidae Kollpaniinae and the Didolodontidae, usually linked to the origin of these groups. The didolodontids (mid Paleocene- Oligocene?) have been described exclusively by dental remains, without any postcranial elements directly associated. This constrains the phylogenetic hypothesis to the use of dental characters. However, postcranial remains have been referred to didolodontids. In the present paper, we perform a preliminary analysis of (1) the morphology and the assignation of two left astragali to the genus *Didolodus* (Patagonia Eocene) without any explicit criteria for association, corresponding to AMNH 117457 and MACN-CA 10737; and (2) we evaluated the utility of the tools used to make association hypothesis within dental and postcranial remains until the present.

Keywords : native ungulates, postcranium, associations, astragalus, *Didolodus*.

INTRODUCCIÓN

América del Sur funcionó durante gran parte del Cenozoico como un continente isla, donde evolucionaron distintos grupos de mamíferos endémicos, en particular una diversa fauna de placentarios denominados informalmente ungulados nativos sudamericanos (1). Éstas formas corresponden según los autores a los Litopterna (incluyendo a los Notopterna), Notoungulata, Xenungulata, Astrapotheria (incluyendo a los Trigonostylopoidea) y Pyrotheria. Si bien el origen de estos grupos, así como sus relaciones filogenéticas aún no han sido dilucidadas, existe un relativo consenso en rastrear el origen de los mismos entre alguno de los grupos incluidos entre los "Condylarthra" (2). En América del Sur, los condilartros se encuentran representados por los Kollpaniinae, vinculados a las formas del Paleoceno temprano de América del Norte (3) y por un grupo endémico, los Didolodontidae (4). Los didolodóntidos se registran desde el Paleoceno medio hasta el Eoceno tardío, y existen dudas sobre su presencia en el Oligoceno temprano. Constituyen un grupo de crucial importancia para comprender el origen de los ungulados nativos, y en particular han sido relacionados con los Litopterna (2, 5, 6). Los didolodóntidos han sido descritos exclusivamente por restos dentales, no conociéndose postcráneo directamente asociado a los mismos (2, 4). Esto condiciona la construcción de hipótesis filogenéticas al uso de caracteres dentales, los cuales presentan si se comparan distintos ordenes de ungulados nativos, diversos problemas en el reconocimiento de las homologías primarias (7). A pesar de la falta de

asociación directa, diversos elementos postcraneales, en particular elementos tarsales, han sido asignados tradicionalmente a los didolodóntidos (2, 8, 9, 10, 11), en algunos casos sin una justificación explícita de la técnica o el criterio seguido para realizar la asociación. Contar con elementos postcraneales asociables permitiría ampliar el número de caracteres utilizados en filogenia, a fin de evaluar las relaciones interordinales entre los ungulados nativos; y permitir además realizar inferencias paleobiológicas. Por este motivo, sumado a la naturaleza incompleta del registro fósil, es indispensable contar con un criterio explícito y contrastable de asociación de restos.

Los objetivos del presente trabajo son analizar la morfología y discutir de modo preliminar, los criterios de asociación de dos astrágalos izquierdos que fueran asignados al género *Didolodus* (Eoceno de Patagonia). Se pretende además, evaluar la utilidad de las herramientas estadísticas utilizadas en las hipótesis de asociación de astrágalos y restos dentarios aislados.

MATERIALES Y MÉTODOS

Las abreviaturas institucionales corresponden a: AMNH, American Museum of Natural History, USA., MACN-CA, Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Argentina, Colección Ameghino. Las abreviaturas en las fórmulas corresponden a: Ln, logaritmo natural, LA: longitud máxima del astrágalo, medida perpendicular desde las crestas trocleares hasta la cabeza astragalar, LMT: longitud máxima de la tróclea externa, medida como la distancia máxima de la tróclea, Am2: área del segundo molar inferior. Las medidas astragalares fueron tomadas con Calibre digital de mandíbulas

finas (Schwyz) y las medidas dentales fueron tomadas de la bibliografía (4).

Se utilizaron dos ecuaciones de regresión obtenidas de la bibliografía correspondientes a $\ln Am2 = -0,77 + 1,55 * \ln LA$, (9) y $\ln LT = -0,283 + 1,345 * \ln \sqrt{Am2}$ (10).

RESULTADOS

Entre los restos asignados a didolodóntidos sin la aplicación de una metodología explícita, se encuentran diversos astrágalos referidos por Ameghino (8) los que fueron posteriormente desestimados por Simpson (2), quien los consideró como pertenecientes a *Litopterna* y *Notoungulata*. Una serie de astrágalos sucintamente descriptos (2) y sólo uno de ellos ilustrado (4) fueron referidos a los *Didolodontidae*, considerando sus similitudes con aquellos pertenecientes a "*Condylarthra*" de América del Norte y su abundancia relativa respecto de los restos dentales (2). Sin embargo, las asociaciones de mayor consenso han sido realizadas a partir de los materiales del Paleoceno tardío - Eoceno temprano, colectados de las fisuras de relleno de São José de Itaboraí, Brasil (9,10). Los criterios utilizados se fundamentan en -1- la abundancia relativa en el registro fósil, entre los restos postcraneos y dentales, considerando que para un mismo taxón la conservación de ambos elementos debe ser proporcional. -2- La morfología de los elementos postcraneos desde una perspectiva evolutiva. Y por último -3- ecuaciones de regresión, basadas en la alta correlación existente en mamíferos, entre ciertas medidas dentarias y la masa corporal. Sobre la base de éste último criterio y utilizando como modelo esqueletos asociados de "*Condylarthra*" de

América del Norte, se generaron ecuaciones de regresión considerando el área del segundo molar inferior y medidas astragales. En uno de los modelos realizados se considero la LA como variable independiente (9) y en el otro el Am2 (10). Estas diferencias hacen que ambos modelos no sean fácilmente comparables. Además los valores que permitirían reproducir las ecuaciones no han sido publicados ni se encuentran disponibles a través de los autores (Cifelli y Bergqvist, com. pers.), lo que imposibilita poner a prueba el modelo, el análisis estadístico de nuevas muestras, y la contrastación de las asignaciones taxonómicas realizadas por los autores.

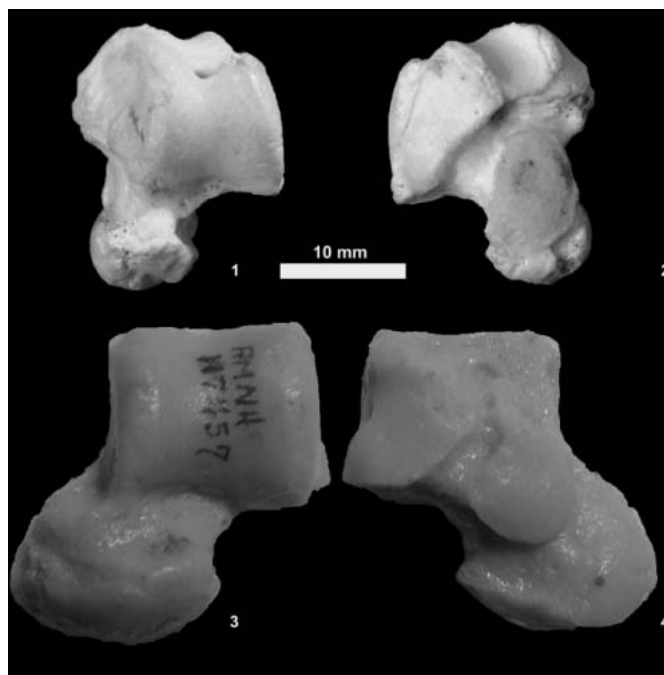


Figura 1. 1. Astrágalo MACN-CA 10737, vista dorsal. 2. Astrágalo MACN-CA 10737, vista plantar. 3. Astrágalo AMNH 117457, vista dorsal. 4. Astrágalo AMNH 117457, vista plantar.

En el presente trabajo se analizan las asignaciones de dos astrágalos con morfologías distintas asignados por igual al género *Didolodus* utilizando los modelos existentes (9,10). Uno de los restos corresponde a MACN-CA 10737, asignado sin un criterio explícito (8) y el otro AMNH 117457, referido a este taxón, por comparaciones con restos asociados de condilartros de América del Norte y la abundancia relativa de dientes y astrágalos (2). Los astrágalos muestran diferencias cualitativas indicando que se corresponden a morfotipos mutuamente excluyentes, no siendo posible atribuir ambos astrágalos a un mismo taxón. AMNH 117457 se diferencia de MACN-CA 10737, en particular por la expansión de la faceta maleolar media sobre el cuello del astrágalo, el mayor tamaño de la cabeza astragalar y su expansión transversal y, la presencia de un surco separando la faceta maleolar media y la parte distal de la cabeza del astrágalo

(Fig. 1).

La contrastación de estas hipótesis de asociación se realizó a través de la aplicación de las ecuaciones de regresión existentes (9,10). Para esto se tomaron las medidas LA y LT sobre los materiales, mientras que las medidas dentales Am2 para el género *Didolodus*, considerando un total de siete individuos asignados a *D. multicuspis*, fueron tomadas de la bibliografía (4). AMNH 117457 presenta partida una porción de la tróclea por lo que el LA y el LT corresponden a valores mínimos. Aplicando las ecuaciones de regresión mencionadas, se compararon en cada caso, los valores reales de las variables dependientes, con el valor predicho según el modelo. Así mismo se compararon las diferencias encontradas con las diferencias obtenidas originalmente en los trabajos (Tabla 1 y 2).

	AMNH 117457	MACN-CA 10737
LA (mm)	26,25	21,62
m ₂ área observada (mm ²)	66,57	
ln m ₂ área	4,20	
ln m ₂ área esperada	4,23	3,99
Diferencia entre área del m2 observada y esperada	0,096	-0,204
Diferencia máxima en Cifelli (1983b)	-1,44	

Tabla 1. Valores observados y esperados de acuerdo con: $\ln Am_2 = -0,77 + 1,55 * \ln LA$, (Cifelli, 1983b).

	AMNH 117457	MACN-CA 10737
m ₂ área observada (mm ²)	66,57	
LMT (mm)	14,13	10,52
LMT ln	2,65	2,35
LMT esperado	2,54	
Diferencia entre LMT observada y esperada	0,11	-0,19
Diferencia máxima en Bergqvist (1996)	-0,43	

Tabla 2. Valores observados y esperados de acuerdo con: $\ln LT = -0,283 + 1,345 * \ln \sqrt{Am^2}$ (Bergqvist, 1996).

DISCUSIÓN

Las fórmulas de regresión no permitieron asignar con certeza ninguno de los astrágalos analizados al género *Didolodus*. La ausencia de las medidas originales sobre las que se fundamentan los modelos de regresión (9, 10), y de los desvíos teóricos que permitirían predecir la variación esperada y sus límites, no permiten contrastar ninguna de las hipótesis de asociación. Por lo tanto la única posibilidad es comparar los valores observados y esperados de acuerdo a las mencionadas ecuaciones de regresión. Si bien los modelos utilizados parten de distintas variables dependientes e independientes, cabe destacar que el modelo de Cifelli (9) genera diferencias algo menores entre los valores esperados y los observados. Según este modelo, la utilización del astrágalo MACN-CA 10737 genera una diferencia mayor entre el Am₂ observada y la esperada. Por otra parte, los caracteres de este astrágalo, muestran importantes similitudes con aquellos pertenecientes a

diversos Notoungulata, tal como observara Simpson (2) en referencia a las asignaciones realizadas por Ameghino (8). Sin embargo, desde una perspectiva cuantitativa las diferencias entre los valores no parecen ser significativas como para refutar dicha asociación sobre la base de los modelos utilizados (9, 10).

La utilidad de las ecuaciones de regresión para realizar hipótesis de asociación entre restos dentales y elementos postcraneos aislados podría ser relevante, si se pudieran calcular el margen de error estadístico *a priori* a partir del cual se rechazarían las asociaciones. La aceptación acrítica de estos modelos ha generado controversias sobre la posición sistemática de diversos grupos de ungulados nativos y sus relaciones filogenéticas (*e.g.* Protolipternidae, Sparnotheriodontidae). En efecto, los modelos analizados y la imposibilidad de reproducir los mismos, no permiten tener por el momento, un marco teórico adecuado para el planteo de hipótesis de asociación entre dientes y elementos postcraneos.

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**DESARROLLO Y MICROANATOMÍA DEL OVARIO DE *Mustelus schmitt*
(CHONDRICHTHYES, TRIAKIDAE) A TRAVÉS DEL CICLO REPRODUCTIVO**

**THE OVARY OF *Mustelus schmitti* (CHONDRICHTHYES, TRIAKIDAE): MICROANATOMY AND
DEVELOPMENT THROUGH THE REPRODUCTIVE CYCLE**

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RESUMEN. En este trabajo se describe la evolución estructural del ovario de *Mustelus schmitti* (gatuso) a lo largo del ciclo reproductivo. Se consideraron 3 estadios madurativos macroscópicos y se analizaron la población folicular en cada uno de ellos y las características del estroma. En el ovario inmaduro (estadio I) sólo se encuentran los estadios iniciales de la foliculogénesis. En los individuos juveniles (estadio II) empiezan a apreciarse signos de atresia folicular y en la madurez sexual (estadios III) se reconocen además, folículos vitelados y cuerpos lúteos. Las ovogonias se encuentran en todas las etapas del desarrollo. Esta información es la primera, de carácter morfológico, referida al ovario del gatuso.

Palabras clave: microanatomía, ovario, *Mustelus Schmitti*.

ABSTRACT. This work is the first approach to the ovary microanatomy of *Mustelus schmitti* (gatuso) through their reproductive cycle, including the follicular population and the characteristics of the stroma. Three macroscopic stages of sexual maturity were considered. The ovaries of immature females show only the early phases of foliculogenesis. In young animals there are the first indications of follicular atresia and in mature ones all follicular stages are present as well as *corpora lutea*. The ovogonias are present through the entire reproductive cycle.

Keywords : microanatomy, ovary, *Mustelus schmitti*.

INTRODUCCIÓN

La importancia biológica y comercial de los peces cartilaginosos es indiscutible. Por un lado son los gnatostomados más antiguos que han perdurado exitosamente, con las implicaciones evolutivas que eso conlleva. Por otra parte, constituyen un recurso pesquero cuya captura mundial se ha incrementado exponencialmente, tanto en forma industrial como artesanal (1,2), lo que ha llevado a que algunas poblaciones disminuyeran su tamaño, incluso hasta el punto de la extinción (3). Esta situación pone en riesgo el estudio de la biología reproductiva de dichas especies en todos sus aspectos y esta información es crítica a la hora de elaborar medidas apropiadas de manejo de los *stocks* (4).

Los Condrictios comprenden a los tiburones, las rayas y las quimeras. Desde su aparición en el Paleozoico hasta la actualidad han sufrido pocos cambios morfofuncionales; sin embargo, las adaptaciones reproductivas contribuyeron al éxito del grupo (5,6). Dentro del clado existen especies ovíparas y vivíparas. Si bien la oviparidad es la forma de reproducción seguida por la mayoría de las rayas, las quimeras y algunos tiburones, la viviparidad pareciera ser el modelo reproductivo plesiomórfico en los gnatostomados (7,8) y es el patrón adoptado por la mayoría de los tiburones y los Myliobatiformes. En algunas especies vivíparas, los embriones crecen y se desarrollan utilizando solamente el vitelo acumulado en el huevo. Un ejemplo de este tipo de viviparidad lecitotrófica lo constituye *Scyliorhinus canicula* (9). En el otro extremo están aquellas especies que desarrollan

una placenta funcional análoga a la epiteliocorial de los mamíferos euterios, denominada placenta vitelina, que sustenta el crecimiento embrionario una vez agotado el soporte vitelino. *Mustelus canis* (10), *Prionace glauca* (11) y *Rhizoprionodon terraenovae* (6) son algunos ejemplos de especies con viviparidad matrotrofica. Entre estos extremos existen diversas variaciones del modelo matrotrofico, como son la adelfofagia o canibalismo uterino (*Carcharias taurus*), la oofagia (*Gollum attenuatus*), la presencia de análogos placentarios denominados *trophonemata*, típicos de los Myliobatiformes (12) y el matrotrofismo moderado sin placentación (*Mustelus antarcticus*) (13,14).

Si bien el amplio espectro de adaptaciones reproductivas de estas especies ha contribuido notablemente a su adaptación y supervivencia, también ha resultado en organismos que tienen un crecimiento lento, una madurez tardía y un bajo número de crías. Estas características hacen que las poblaciones afectadas por una intensa presión pesquera, tengan una recuperación muy lenta (15).

En la Argentina, el gatuso, *M. schmitti*, es el tiburón sobre el que se ejerce la mayor captura. Los datos existentes indican un incremento anual de la captura y tallas cada vez menores en los ejemplares (16). Esta información es la que ha permitido a la IUCN clasificar a *M. schmitti* como especie "en peligro". El gatuso es un pequeño tiburón endémico del Atlántico sudoccidental, cuya distribución se extiende desde Río de Janeiro (22° 27'S) hasta la Patagonia (47°45'S). Habita en aguas costeras y hasta los 140 m de profundidad y es de hábito bento-demersal (17). Es una especie de ciclo anual de entre 10 y 12 meses de

gestación, que pare entre 1 y 13 crías, con una talla al nacimiento de alrededor de 22 - 24 cm de largo total (18). Durante la gestación, cada uno de los embriones se aloja en un compartimiento uterino específico y si bien es aplacentario, el crecimiento embrionario y la evidencia histológica sugieren un cierto grado de matrotrofismo (14).

Pese a la importancia de los condriictos, la información no ecológica sobre su biología reproductiva y particularmente los conocimientos sobre la morfofisiología reproductiva, son escasos y están restringidos a unas pocas especies. El objetivo del presente trabajo es analizar la microanatomía ovárica del gatuso a lo largo de su ciclo de vida como un aporte más al conocimiento global sobre su biología reproductiva.

MATERIALES Y MÉTODOS

Se trabajó con ejemplares provenientes de la zona interna del Estuario de Bahía Blanca (38°45' - 39°45' S; 61°30' - 62°30' W), obtenidos durante los meses de abril a noviembre de los años 2007 y 2008. La captura se realizó con línea de dos anzuelos para pesca variada, en estoa, y a profundidades no mayores de 10 m. Una vez a bordo, los animales se midieron, se sexaron y se sacrificaron inmediatamente por trauma craneal. A cada uno de ellos se le asignó un estadio de madurez en base a los criterios empleados habitualmente (19). El aparato genital de las hembras fue aislado y se realizaron observaciones sobre el grado de desarrollo de los ovarios, las glándulas oviducuales y los úteros. Se fijaron porciones de las gónadas en mezcla de Bouin en agua de mar y se

procesaron según técnicas histológicas de rutina. Se realizaron cortes de entre 4 y 6 micrómetros que se colorearon con hematoxilina-eosina y tricómico de Masson. Las observaciones y fotografía se realizaron con un microscopio Olympus BX 51 equipado con una cámara Olympus Camedia C-7070.

En la tabla 1 se resumen las características macroscópicas diferenciales de cada uno de los estadios madurativos de las hembras.

En los ejemplares de estadio I (inmaduros, Fig. 1) el ovario no se diferencia macroscópicamente. La glándula oviductal es un leve engrosamiento del oviducto anterior y el útero se presenta filiforme y transparente. Todo el espacio, que luego comprenderá el ovario en los ejemplares maduros, está ocupado por el órgano epigonal. El desarrollo ovárico comienza cranealmente y envolviendo el mismo se observa un epitelio simple plano ó cúbico con cilios cortos y escasos y un corion de conectivo relativamente denso. El inicio del desarrollo ovárico se evidencia por la presencia de folículos primordiales y primarios, escasos y profundos (Fig. 2) y numerosos nidos de ovogonias ubicados inmediatamente por debajo de la túnica albugínea (Fig. 3). Los folículos en formación están separados por tejido conectivo laxo vascularizado. Si bien el inicio del desarrollo se observa tanto en el lado derecho como en el izquierdo, el proceso sólo avanza en el lado izquierdo, resultando un solo ovario funcional en los animales maduros.

En las hembras en proceso de maduración (estadio II, Fig. 4), el ovario izquierdo comienza a diferenciarse macroscópicamente en la región craneal y se observa la presencia de folículos de distinto tamaño,

transparentes o blanquecinos. El órgano epigonal va retrayéndose hacia la zona caudal y en la región que comparte con el ovario está separado del tejido gonadal por un delgado lecho vascular (Fig. 5). La población folicular aumenta en número y grado de desarrollo pudiéndose apreciar nidos de ovogonias

(Fig. 5), folículos primordiales, primarios y secundarios, donde la capa folicular se torna alta y la zona pelúcida gruesa y continua (Fig. 6). En ningún caso hay indicios de vitelogénesis, pero si, se aprecian ambas tecas. En este estadio existe un importante número de folículos atrésicos (Fig. 7).

Estadio	Talla aproximada	Ovario	Org. epigonal	Folículos
I (inmaduros)	22 - 57 cm	Indiferenciado	Se extiende desde el último basibranquial hasta la glándula rectal	No se diferencian macroscópicamente
II (en maduración)	42 - 68 cm	Comienza a diferenciarse cranealmente	Comienza a retraerse hacia caudal	Pequeños, translúcidos o blanquecinos
III (maduros)	58 - 90 cm	Ocupa toda la zona craneal	Continúa retrayéndose caudalmente	De tamaños variados, translúcidos, blanquecinos y amarillos

Tabla 1. Resumen de las características macroscópicas utilizadas habitualmente para determinar el estadio de madurez sexual de las hembras de *M. schmitti*.

Los animales sexualmente maduros tienen un ovario grande que abarca totalmente la región craneal de la cavidad corporal en posición dorsal respecto del hígado (Fig. 8). El órgano epigonal se restringe a la zona media y caudal, extendiéndose hasta la glándula rectal. El epitelio ovárico es simple cúbico con numerosas cilias y existe evidencia de cavitaciones y repliegues basolaterales en las células epiteliales (Fig. 9). La túnica albugínea es más gruesa que en los

estadios anteriores y además de un entramado grueso de fibras colágenas, se observan células musculares lisas longitudinales aisladas (Fig. 9). La población folicular comprende todos los estadios siendo los más notorios por su tamaño los folículos vitelogénicos, que se reconocen, no sólo por la presencia de placas vitelinas, sino también por el adelgazamiento de la zona pelúcida y la disminución de la altura de las células foliculares (Fig. 10). El espacio entre los

folículos está ocupado por tejido conectivo sumamente laxo, con numerosos vasos de paredes delgadas y células mieloides ocasionales (Fig. 11). El tejido linfomieloide adyacente al ovario está separado por un delgado epitelio simple plano y, en algunas

ocasiones, un estrecho lecho vascular (Fig. 12). Además de la población folicular mencionada, se encuentran nidos de ovogonias (Fig. 13), folículos atrésicos (Fig. 14) y cuerpos lúteos (Fig. 15).

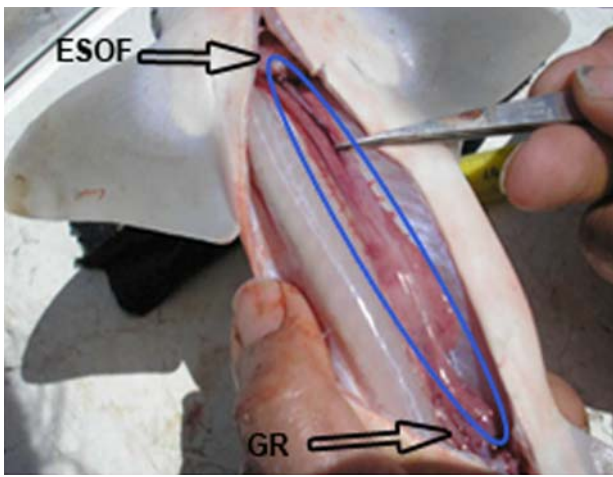


Figura 1. Vista general de la anatomía del sistema reproductor de una hembra estadio I. El óvalo marca el conjunto de órgano epigonal y ovario. GR: glándula rectal; Esóf: esófago.

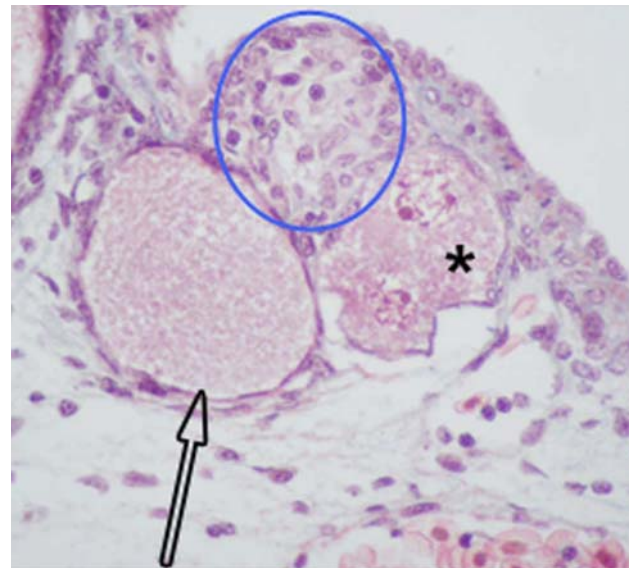


Figura 3. Epitelio ovárico y células germinales indiferenciadas (círculo), se aprecian también ovogonias en división (asterisco) y un folículo primordial temprano (flecha). Coloración: Hematoxilina-eosina.

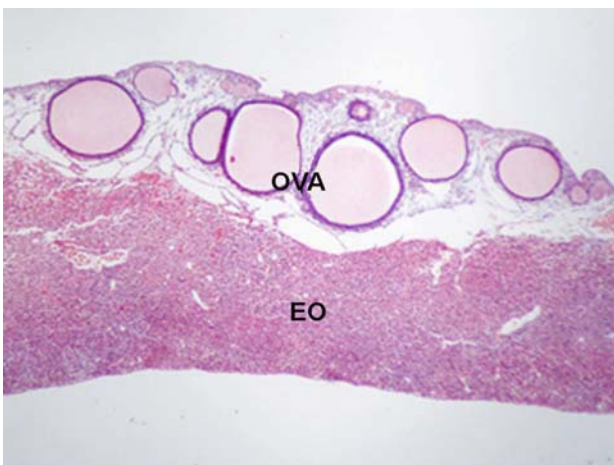


Figura 2. Baja magnificación del ovario en diferenciación en un ejemplar de estadio I. Nótese el ovario que comienza a diferenciarse (OVA) y su relación con el órgano epigonal (EO). Coloración: Hematoxilina-eosina.

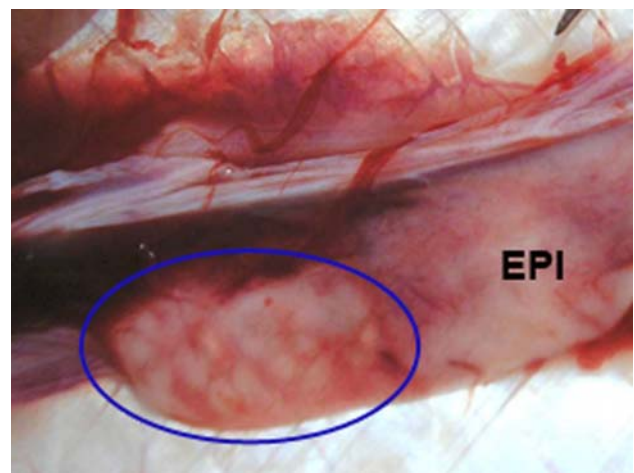


Figura 4. Vista general de la anatomía del ovario de una hembra estadio II. Se aprecia el desarrollo del ovario por la presencia de numerosos folículos blanquecinos y translúcidos (óvalo). EPI: Órgano epigonal

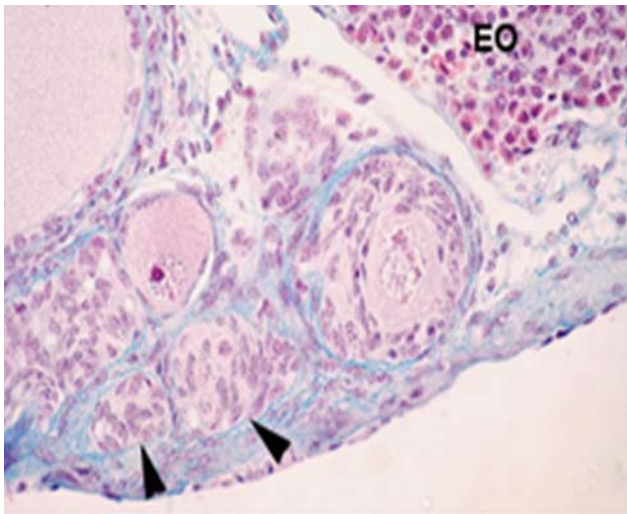


Figura 5. Estadios iniciales de la ovogénesis y la foliculogénesis en el ovario de una hembra estadio II. Se aprecian nidos de oogonias (punta de flecha), pequeños folículos primordiales reconocibles por el notorio nucléolo y el lecho vascular (flecha) que separa el ovario del órgano epigonal (EO). Coloración: Tricrómico de Masson.

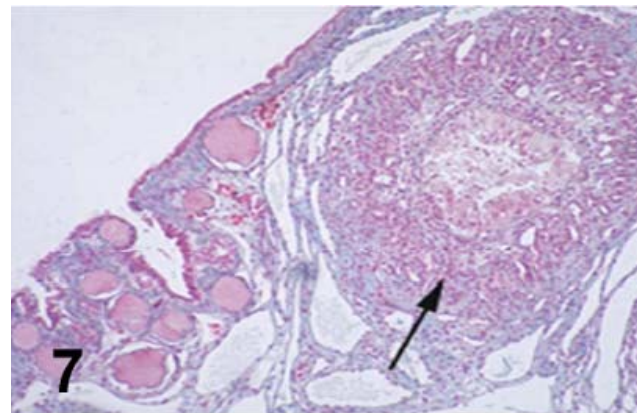


Figura 7. Folículo atrésico avanzado en una hembra estadio II (Flecha). Coloración: Tricrómico de Masson.



Figura 6. Ovario de una hembra estadio II. Se aprecian folículos en diferentes estadios de maduración así como los repliegues superficiales (cabeza de flecha). Nótese los numerosos folículos en distintos estadios madurativos: primordiales (flecha) y primarios (f_1); EO: órgano epigonal. Coloración: Tricrómico de Masson.

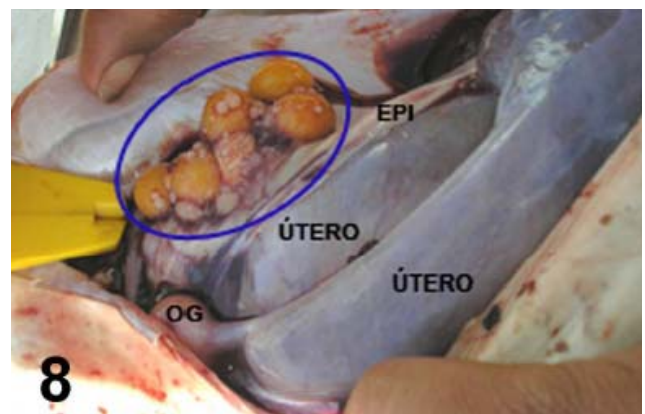


Figura 8. Vista general de la anatomía del ovario de una hembra estadio III, preñada. Se aprecia el desarrollo ovárico con múltiples folículos no vitelogénicos y grandes folículos con vitelo (óvalo). EPI: órgano epigonal, OG: glándula oviductal.

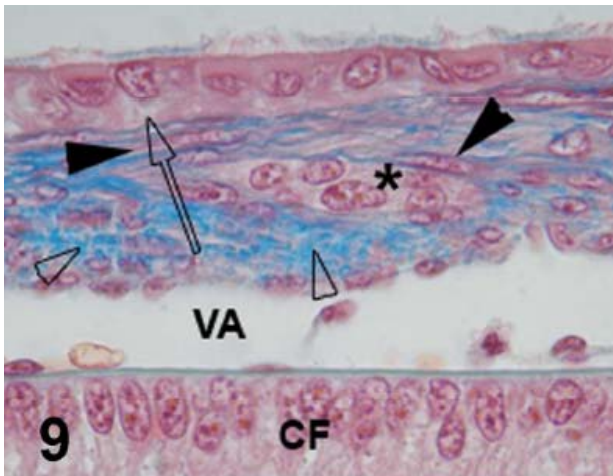


Figura 9. Detalle del epitelio ovárico ciliado en una hembra estadio III. Se observan los pliegues basolaterales (flecha), las fibras colágenas (punta de flecha delineada) y musculares lisas (punta de flecha negra) que conforman la túnica albugínea, un nido de oogonias (asterisco) y un desarrollado seno vascular (VA). Hacia abajo se observan las células foliculares (CF) de un folículo en desarrollo adyacente. Coloración: Tricrómico de Masson.

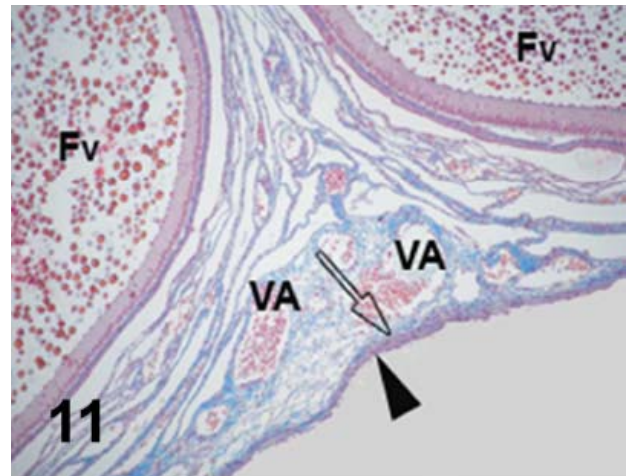


Figura 11. Magnificación media del ovario de una hembra sexualmente madura. Dominan la imagen dos folículos vitelogénicos cuyo citoplasma está ocupado por placas vitelinas (Fv) y el tejido conectivo vascularizado que hay entre ellos (VA). Punta de flecha: epitelio ovárico; flecha: albugínea. Coloración: Tricrómico de Masson.

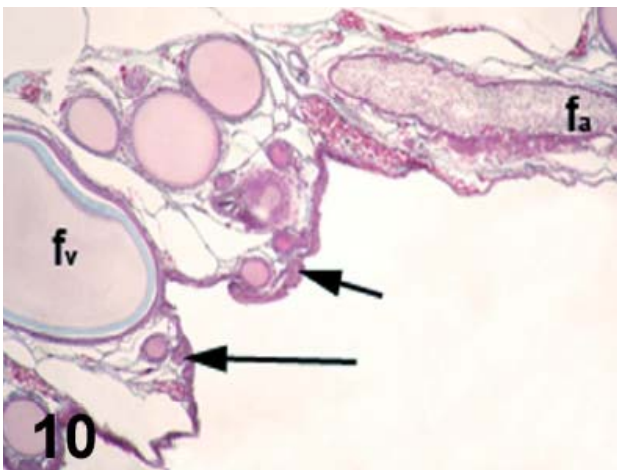


Figura 10. Baja magnificación del ovario de una hembra sexualmente madura. Se aprecian folículos primordiales por debajo del epitelio (flecha), folículos vitelogénicos en las primeras etapas (fv) y un folículo atrésico (fa). Coloración: Tricrómico de Masson.

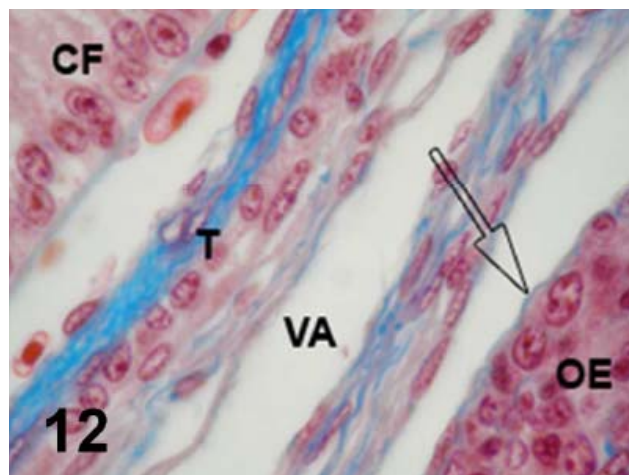


Figura 12. Alta magnificación de las cubiertas foliculares de un folículo vitelogénico, la flecha denota el delgado límite que separa el tejido mielóide del ovárico. CF: células foliculares; T: tecas; VA: vasculatura; OE: órgano epigonal. Coloración: Tricrómico de Masson.

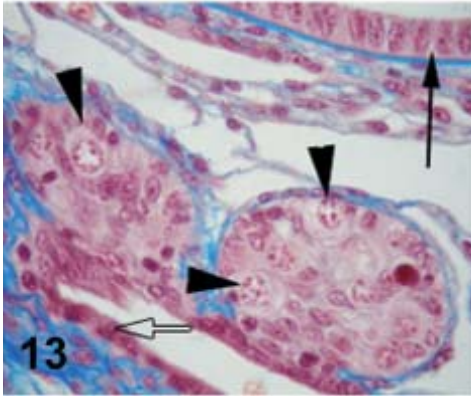


Figura 13. Nidos de oogonias (punta de flecha) en el ovario de un ejemplar estadio III. Flecha negra: folículo primario; flecha delineada: epitelio ovárico de un repliegue superficial. Coloración: Tricrómico de Masson.

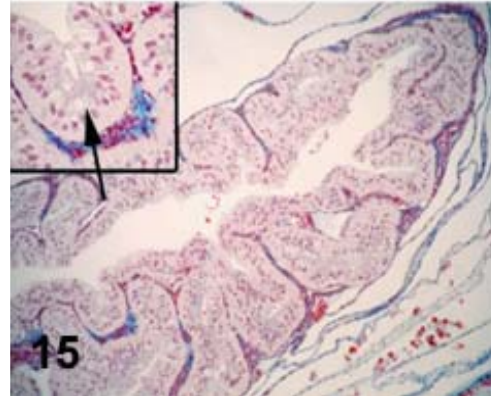


Figura 15. Cuerpo lúteo, en el inserto se aprecia el detalle de las células luteínicas. Coloración: Tricrómico de Masson.

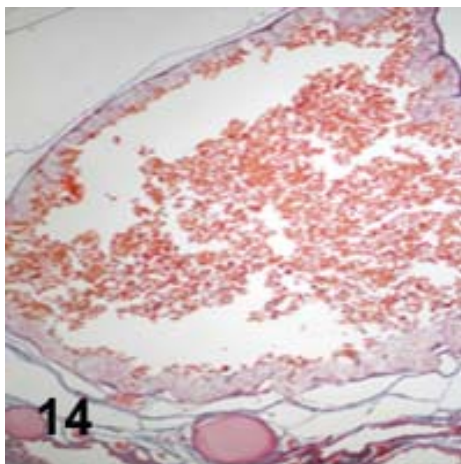


Figura 14. Folículo atrésico en una hembra estadio III. Coloración: Tricrómico de Masson.

DISCUSIÓN

La anatomía del tracto reproductor de *M. schmitti* concuerda en líneas generales con la de otras especies de tiburones vivíparos (20). La estructura ovárica del gatuso, en la que coexisten folículos en distintas etapas del desarrollo contenidos debajo de un epitelio

simple y una túnica albugínea bien desarrollada, se encuadra dentro del modelo de "ovario externo" y es típico de los miembros de las familias Carcharinidae y Sphirnidae (21). Asimismo, la asimetría ovárica es habitual en los tiburones vivíparos. En *M. schmitti* el ovario funcional es el izquierdo, a diferencia de lo observado en otros miembros del género (10,13). La asociación entre el ovario y el órgano epigonal está presente en todos los peces cartilagosos. Esta estructura es un órgano linfomieloide, exclusivo de los condrictios y especializado en la producción de granulocitos y linfocitos (22). Pese a su nombre, la posición del mismo varía entre las especies, pero siempre está en íntima asociación con la gónada, con quien guarda una relación inversa de desarrollo.

Los criterios de madurez sexual habitualmente utilizados en la determinación del estadio madurativo de las hembras, emplean observaciones macroscópicas que pueden realizarse fácilmente a bordo. Los criterios habituales adoptan como pauta primaria, la presencia o no de huevos visibles a ojo

desnudo y, de estarlo, el hecho de verse éstos vitelados (amarillos) o no (blanquecinos o translúcidos) (19,23). A ello se le suma, posteriormente, el grado de desarrollo del resto del tracto genital, permitiendo así la diferenciación de estadios intermedios. En las observaciones realizadas en este trabajo concuerdan la microscopía ovárica con la macroscopía, ya que en ninguno de los ejemplares categorizados como de estadio II se encontraron indicios de vitelogénesis. Este no es el caso de otros condriictios. En la raya *S. acuta*, se observó que en hembras en desarrollo, por debajo de la talla de primera madurez, había signos claros de vitelogénesis incipiente. Esto hace pensar que en esta raya, el compromiso con la actividad reproductiva se inicia antes de que se evidencie macroscópicamente, por lo que podría haber una subestimación del potencial reproductivo del recurso (24).

Durante la vida fetal, el tejido ovárico embrionario es invadido por células germinales primitivas provenientes del saco vitelino que posteriormente se dividirán y transformarán en ovogonias (20). Si bien en este trabajo no se analizaron embriones, en individuos inmaduros el ovario incipiente se caracteriza por la presencia de nidos de ovogonias, folículos primordiales y primarios. La presencia de células meióticas tempranas como las ovogonias observadas en todos los gatusos analizados, independientemente de su estadio de madurez sexual, no es frecuente. En algunas especies de condriictios, las ovogonias sólo se encuentran en embriones y neonatos y esto suele asociarse a un bajo potencial reproductivo (25,26). Contrariamente, *M. schmitti* exhibe nidos de ovogonias incluso en

hembras gestantes, lo cual podría indicar que la capacidad reproductiva de la especie no es tan limitada.

El ovario de las hembras en maduración (estadio II), constituye un estado de transición y como tal es difuso y continuo.

En los animales sexualmente maduros el ovario exhibe toda la gama de estadios foliculares siendo los folículos vitelados los de mayor tamaño. La foliculogénesis en los condriictios es similar, en líneas generales, a las de los demás vertebrados (27). En esta especie, la estratificación de la capa folicular sólo perdura hasta el inicio de la vitelogénesis, característica que es compartida por otras especies del género (13,27). Por el contrario, los Rájidos y Torpediniformes muestran estratificación e incluso la presencia de distintos tipos celulares foliculares que perduran hasta la ovulación (24,26). En esta etapa madurativa, el ovario de *M. schmitti* tiene una cantidad variable de cuerpos lúteos. Siendo el gatuso una especie vivípara con cierto grado de matrotrofismo (14), la presencia de dichas estructuras sería clave para sustentar la gestación. Existe evidencia de la función esteroidogénica de los cuerpos lúteos en condriictios (12). Las especies ovíparas los presentan en forma efímera, en tanto que en las especies vivíparas matrotroficas tienen una mayor permanencia (28).

Los folículos atrésicos resultan de la involución folicular en cualquier etapa de su desarrollo. En los condriictios la frecuencia de dicho proceso es alta (28) pero no existe ningún estudio cuantitativo del mismo. En los ejemplares analizados, la evidencia de atresia se presenta en hembras a partir del estadio II de

maduración y puede observarse en folículos en cualquier etapa de desarrollo. El mecanismo por el cual se desencadena este proceso en los peces cartilagosos es desconocido y algunos estudios indican que no existiría correlación aparente con los eventos reproductivos (28). Independientemente de los fenómenos de autocontrol de la viabilidad folicular, quizás la atresia podría contribuir a regular la frecuencia de la ovulación y a mantener constantes las cohortes foliculares durante el ciclo reproductivo.

El conocimiento de todas las facetas de la biología reproductiva en peces, es esencial para delinear políticas de manejo adecuadas y el género *Mustelus* presenta características que, bajo un manejo adecuado,

lo hacen susceptible de una explotación sustentable (16). Por otra parte, las observaciones aquí presentadas constituyen las primeras aproximaciones morfológicas sobre el ovario y su desarrollo en una especie de gran importancia económica para el país, así como sobre un miembro de un género problemático desde el punto de vista de la taxonomía y la sistemática (29).

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Sociedad de Ciencias Morfológicas de La Plata
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Resúmenes del **XII CONGRESO y 9^{nas} JORNADAS DE EDUCACIÓN**
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RELATIONS OF THE SUPERIOR LARYNGEAL NERVE: SURGICAL IMPORTANCE

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The superior laryngeal nerve goes from the neumogastric nerve around the plexiform ganglion, down, inside, and ahead, until it reaches the pharynx, where it is divided into its two terminal branches. The superior branch perforates the thyroid membrane and innervates the supraglottis sensitively, whereas the inferior branch descends vertically, innervates the cricothyroid muscle, and goes through the cricothyroid membrane to end in the subglottic mucosa. The bilateral injury of this nerve causes phonation and deglutition disorders since it causes strong cordal hypotonicity because of cricothyroid muscle paralysis. Besides, it seems to leave the supraglottis without innervations by annulling the cough reflex, and thus causing aspirative pneumonias. If the unilateral injury involves only the inferior branch, it is better tolerated, producing a hypotonic crosstalk. Endoscopically, it causes only a decrease in cordal tone and the bending forward of the arytenoids. In this work, we studied the anatomical repairs and variations of this nerve in 10 adult corpses by dissecting the superior laryngeal nerve to observe its relationship with the adjoining organs. We found that, in two cases (20%), the nerve was divided into the superior horn of the thyroid cartilage, and that in all the cases the superior thyroid artery was located in front of the nerve. In one case (10%), the nerve was found between the branches of the superior thyroid artery. The knowledge of these anatomical variants is important to reduce the risks of nerve injury in thyroid surgery.

Key words: laryngeal nerve, surgical importance.

ANATOMICAL LANDMARKS FOR THE LOCATION OF NEURAL ELEMENTS IN THE FACIAL REGION

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There are numerous injuries of superficial nerve elements in the facial region that are caused by surgery or are the consequence of trauma in the same area. These can bring functional and aesthetic consequences. To prevent this, it is necessary to know the landmarks of the exact location of the nerves at the moment of the reconstructive surgery. Six cadaveric sides were dissected to locate the following six risk-point spots in the facial region: Zone 1: 6.5cm below the external auditory meatus, within a 3 cm radius: point of emergence of the major auricular nerve. Zone 2: triangular area within these three points: 2 cm above the eyebrow, the orbital rim and 0.5 cm above the tragus of the external ear: temporal branch of the facial nerve. Zone 3: 2 cm behind the angle of the mouth within a 2 cm radius: cervical branch of the facial nerve. Zone 4: area within a 1.5 cm radius around the supraorbital foramen: supraorbital and supratrochlear nerves. Zone 5: area within a 1.5 cm radius around the infraorbital foramen: infraorbital nerve. Zone 6: area within 1.5 cm radius around the mandibular foramen: mandibular nerve.

Key words: facial nerve, paresis, paralysis.

DNA SYNTHESIS IN INTACT AND HEPATECTOMIZED MICE LIVER LOBULE

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The liver plays a variety of functions, many of which are specific in periportal and centrilobular zone. It has also been reported in rats, that the DNA synthesis (DNAs) in proliferating hepatocytes begins in the periportal zone and progresses toward the centrilobular area. In this study we analyzed the DNAs values of periportal and centrilobular hepatocytes in intact animals, over a circadian period, and at different times pos-hepatectomy. Intact and hepatectomized 28 days old C3H/S male mice, inbred and standardized for periodicity analysis were used. The animals were injected with 3-bromodeoxyuridine 1 h before mice were sacrificed, every 4 h after injection. For each zone of liver 1500 hepatocytes were analyzed. Index of DNAs was expressed as $X \pm SE$ and differences between groups were statistically analyzed. The results showed that intact and hepatectomized animals in both areas, exhibited significant differences in the DNAs of different timing points. The differences of DNAs between the two areas in the same time point are not significant. We demonstrated that the hepatocytes of intact and hepatectomized mice presented a circadian rhythm in the synthesis of DNAs in both zones of liver lobule.

Key words: liver, DNAs, rats.

MORPHOLOGICAL ANALYSIS OF THE TARSOMETATARSUS IN LIVING PENGUINS AND ITS CONTRIBUTION TO THE SYSTEMATICS OF THE GROUP

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The penguin tarsometatarsus presents strong modifications related to diving, in particular the development of two grooves and their respective vascular foramina. This bone is very resistant to taphonomic processes and very important in fossil systematics. The aim of this work was to evaluate its morphological variability, particularly the location and degree of development of vascular foramina and the elongation index in modern Antarctic and South American species. Total length and proximal width were measured and landmarks were placed in anterior and posterior surfaces to perform a morphogeometric analysis. Thin plate spline graphics were used, because they minimize the amount of energy required during transformation. The data obtained were used in the analysis of relative deformations. We concluded that both morphogeometric analyses distinguish the genera *Eudyptes*, *Pygoscelis* and *Spheniscus*. In addition, the measures allowed distinguishing among the different *Pygoscelis* species and between *Pygoscelis* and *Eudyptes*.

Key words: penguins, statistics, tarsometatarsus.

DYNAMICS OF THE GROWTH AND DEVELOPMENT OF CLASPERS IN *Sympterygia bonapartii* (CHONDRICHTHYES, RAJIDAE) FROM BAHIA BLANCA ESTUARY, ARGENTINA

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The length and degree of calcification of claspers are commonly used to determine the stage of maturation of chondrichthyan males. The aim of this work was to analyze the dynamics of growth and development of the claspers of *Sympterygia bonapartii* from the Bahía Blanca estuary, Buenos Aires, Argentina. To this end, specimens from the artisanal fishing landing of the zone (n = 199) were analyzed. Total length (TL) of each animal and length of each clasper (CL) were measured. The maturation stage was assigned following the criteria commonly used. The relationship between both variables was evaluated through a regression analysis. In immature animals, the claspers development fit exponentially according to the equation:

$$CL = 1.981 * e^{0.056 TL} \quad R^2 = 0.80 \quad n = 136$$

In mature animals, the data fit a linear model according to the equation:

$$CL = 3.583 + 2.007 TL \quad R^2 = 0.43 \quad n = 58$$

In immature specimens, the results showed a non-linear growth of the claspers. Meanwhile, the linear relationship between the variables in mature males may be associated with a quick calcification process.

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Key words: *Sympterygia bonapartii*, morphometry, claspers.

CRANIAL OSTEOLOGY OF *Liolaemus azarai* ÁVILA 2003 (SQUAMATA: LIOLAEMIDAE)

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The genus *Liolaemus*, which comprises about 200 species, is widely distributed in South America. *L. azarai* inhabits the sand dunes of northeastern Argentina and Yacyreta Island (Paraguay). It belongs to the *wiegmannii* group, which includes lizards known as "sand lizards". Morphologically, *L. azarai* is distinguished from other species of this group by its smaller body size, fewer scales around the midbody, and dorsal color pattern. In this work, we describe the cranial osteology of this species and analyzed 17 cranial features considered to be informative to the systematics and phylogeny of the *Liolaemus* genus. To this end, six specimens of *L. azarai* were cleared and double-stained to distinguish cartilage and bone and analyzed with a stereomicroscope equipped with a camera lucida. An intrageneric comparative study was carried out. Our results provide information about the variation in osteological characters in *Liolaemus*, which can be used in further studies to infer the phylogenetic relationships among members of the genus.

Key words: *Liolaemus azarai*, *wiegmannii* group, osteological features.

PENGUIN CRANIAL REMAINS (AVES, SPHENISCIFORMES) FROM THE LA MESETA FORMATION (EOCENE) OF THE ANTARCTIC PENINSULA (ANTARCTICA)

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The Eocene sediments from the La Meseta Formation (Seymour Island, Antarctica) show a large abundance of penguins in its different levels. Although scarce, new cranial and mandibular remains (Division Paleontología Vertebrados, Museo de La Plata) are here presented. In general terms, these materials belong to individuals larger than modern species. In particular, the retroarticular processes present in extant penguins are either absent or poorly developed. In addition, the articular regions are more robust than in modern penguins. In regard to the skull, the fossa temporalis is wide and shallow and the sagittal crest is elongated. This suggests a well-developed temporal region of the m. adductor mandibular externus, which could indicate greater forces acting in the closing of the jaws, suggesting a piscivorous habit. Bills show two different morphologies through the stratigraphic sequence. Those from the lower and medium levels are more robust and have a medium to large size, resembling the Miocene forms. The mandibles from the higher levels are long and slender like the classical gigantic Eocene penguins. These two morphotypes would have co-existed in the Antarctic Eocene coasts and constituted two different strategies to avoid inter-specific competence by occupying different ecological niches.

Key words: fossil penguins, Antarctica, Eocene.

DENTAL ASSESSMENT IN WILD BOAR (*Sus scrofa*) SKULLS. PRELIMINARY REPORT

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The aims of the study were to establish a working methodology –design of dental charts- and to evaluate normal and pathological findings in teeth of specimens. To this end, we used heads of wild boar (n = 27) provided by the National Parks Administration (APN) which were the product of hunting for the control of exotic mammals in the National Park El Palmar (Entre Ríos, Argentina), Resolution PD No. 154 / NPC-05, in order to determine their age. Each specimen was conditioned and recorded. Ad hoc dental charts which included the following details were elaborated: sex, tooth eruption, anodontia, bone resorption, caries, and dental wear. Using the tooth eruption as a method to determine age, 59.25% of the specimens showed to be less than 30 months old. Main results: dental caries were observed in five skulls; bone resorption –an indicator of periodontal disease - was detected in 40.74% of the specimens, and 48.1% of the skulls had true anodontia of the upper and the lower first premolar. We concluded that the age determination by tooth development is useful only in young specimens - up to 30 months old- and that in older animals it could be useful to observe tooth wear, but is not an accurate method. The upper fourth premolar tooth is the only tooth that presents a large coronary retentive surface. That would explain why it is likely to suffer tooth decay; actually, all caries were observed in this tooth.

Key words: wild boar, teeth, mouth.

THE USE OF DISCRIMINANT ANALYSIS TO DIFFERENTIATE THE BROWN SKUA AND THE SOUTH POLAR SKUA

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Skuas are marine migratory birds that live in Antarctica. The Brown Skua *Stercorarius antarctica lonnbergi* and the South Polar skua *Stercorarius maccormicki* are morphologically very similar in size and coloration. Their distributions are sympatric in some areas and they can hybridize, leaving fertile descent, which makes it very difficult to identify them in the field. The objective of this work is to contribute with osteological information to distinguish both species. To this end, twenty-three adult skuas from the collection of the Instituto Antártico Argentino were measured with a Vernier Caliper. Discriminant analysis was performed with the following features: 1) total cranial length and total cranial width, 2) beak length at the nasal bones and beak width at the sulcus glandulae nasale and 3) total mandible length and width of the mandibular articulation. The results allowed the correct assignment of the species in 94.4% (analysis 1) and 100% (analysis 2 and 3). This brings new information of great importance for differentiating these two species, in the case of fossils and modern species, usually found in Antarctica.

Key words: Skuas, osteology, discriminant.

SPATIAL EXPLORATION OF THE QUADRATE POSITION IN BIRDS AND ITS RELATIONSHIP WITH THE TROPHIC HABIT

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Birds reflect diverse anatomical adaptations of the trophic system and feeding habits, being the skull the skeletal unit with more morphological variations. Since the quadrate is essential in mandibular mobility, in this work we propose an analysis of its spatial position (QP) in birds related to different trophic groups: omnivorous (*Rhea americana*, greater rhea), hunting carnivorous (*Geranoaetus melanoleucus*, black-chested buzzard-eagle) carrion feeders (*Vultur gryphus*, Andean condor; and *Cathartes aura*, turkey vulture), frugivorous (*Ramphastos toco*, toco toucan) and granivorous (*Anser sp.*, Goose). The QP was defined as a coordinate system (x; y) of the center of the quadrate, which was calculated as the barycenter of a triangle. The triangle's vertices are the middle point of the ootic, orbital and mandibular processes. Skulls were taken to the same size from a lateral view and overlapped, allowing the comparison of the QP between species. The results indicate that the quadrate tends to adopt more rostro-dorsal positions in carnivorous birds than in the rest of the species studied. As a first approximation, we can establish that there is a relationship between the QP and the trophic habit. The mentioned analysis, which is easy to apply, could be used in a larger group of aves, allowing the exploration of the morphological and functional variations in a comparative context.

Key words: birds, quadrate position, trophic habit.

COMPARATIVE MORPHOLOGY OF THE TALONS OF THE BLACK-CHESTED BUZZARD-EAGLE *Geranoaetus melanoleucus* (AVES, ACCIPITRIDAE)

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Raptors are carnivorous birds that use mainly their hindlimbs to obtain food. The unguis phalanges (talons), as part of the posterior appendicular complex, are essential for grasping prey. Detailed descriptions of talons are scarce and restricted to isolated fossils. Here, we studied the talons of the Black-chested Buzzard-eagle *Geranoaetus melanoleucus* with the aim to determine the toe (I-IV) and hindlimb identity (left of right). We found that talons have bilateral asymmetry, being digit IV the least asymmetrical. The cotylae of the articular facet have a different relative position, being the medial one more distal and ventral than the lateral one, except in digit II. In the inferior margin of the articular facet, a middle prominence, which is either laterally (I, III, IV) or medially (II) located, is distinguished. In ventral view, the medial ventral foramen of the flexor tubercle is more distal in I, II and III, while the lateral one is more distal in IV. In distal view, the more ventral foramen is the medial one in II and III. This tubercle is medially (I) and laterally (II) orientated. There is a distinctive edge along the medial facet of the corpus only in III. All these characteristics allow distinguishing unguis I to III. The symmetry of digit IV does not allow the assignment of the hindlimb to the correct side.

Key words: aves, raptor, unguis phalanx.

ROOT RESORPTION IN TEETH OF CATS WITH PERIODONTAL DISEASE. PRELIMINARY REPORT

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Root resorption in teeth can result from many causes. Possible etiologies include: periapical inflammation, excessive occlusal or mechanical forces, dental impaction, neoplasia, odontoclastic resorptive lesions (ORL) and idiopathic causes. It is known that severe chronic periodontal disease (PD) in human patients can lead to injuries of this type, but there are few data about their occurrence in teeth of cats with PD. The aim of this study was to report the presence of root resorption in teeth of cats with PD and to quantify its extent using scanning electron microscope (SEM) and digital image analysis. A total of 28 resorptions were evaluated from 23 teeth of cats with severe PD. Cats were patients of the hospital of the Faculty of Veterinary Sciences, Buenos Aires University, Argentina, or animals that had been euthanized because of terminal illness. The teeth were scanned with SEM, looking for root resorptions, which, if found, were photographed and measured. The diameter (major axis of the defect) and area of each resorption were determined, except in five cases, in which the extension and/or irregularity of the defect made such measurements impossible. The diameter (mean \pm DE) was 0.6767 \pm 0.5819 mm and the area 0.2788 \pm 0.4205 mm². Resorptions were similarly distributed among the root thirds: coronary (48.1%) and medium (51.9%), with complete alteration of the normal cementum architecture. The results suggest a relationship between PD and the presence of severe root resorptions, which start in the periodontium, similarly to that observed in human teeth, but different in their location (predominantly in the apical third in humans). A larger number of samples should be studied to gain more insights into the relation of the presence of root resorption and PD.

Key words: dentistry, periodontal disease, cat.

CRANIAL COMPARATIVE MORPHOMETRY OF *Chaetophractus vellerosus* AND *Zaedyus pichiy* (MAMMALIA, DASYPODIDAE)

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The knowledge of the skull of dasypodids is incomplete, despite its importance as a structure that reflects the evolution degree of the group. In the present work, a comparative morphometric study of the skull of the armadillos *Chaetophractus vellerosus* (n=30) and *Zaedyus pichiy* (n=23) was performed by means of traditional and geometric techniques, with the aim to investigate the existence of intra and interspecific variations in size and shape. Adult specimens from the surroundings of Bahía Blanca, Buenos Aires, Argentina, were used. Traditional multivariate analysis was performed over six linear cranial characters; for the geometric analysis, 11 landmarks were digitalized over photographs of the dorsal side of the skull. The traditional morphometric analysis identified the interorbital and extratympanic widths as the most important variables to discriminate species, with percentages of correct classification higher than 88%. Intraspecific differences were detected only in *C. vellerosus*, with females of larger cranial size than males (percentages of correct classification higher than 68% for both sexes). The geometric analysis showed interspecific differences in shape. *Zaedyus pichiy* has a longer and narrower snout, higher interorbital width and lower extratympanic width than the other species. Differences between sexes were observed only in *C. vellerosus*, in which females have a relatively larger cranial vault than males. The results obtained are of interest to analyze changes and variations in the skull of dasypodids and open new possibilities for further evolutionary studies in this group.

Key words: skull, morphometry, Dasypodidae.

MORPHOLOGY OF THE POSTERIOR END OF MALE MERMITID (NEMATODA) PARASITES OF MOSQUITO LARVAE

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The study of nematode parasites of mosquitoes (Diptera, Culicidae) from the Province of Buenos Aires, Argentina, using light microscopy revealed a variation in the posterior end of males within the species of mermitids, showing different number and distribution of male genital papillae. The purpose of this study was to observe these structures and use them to describe the species. To this end, parasites were killed in distilled water at 60 °C for 2 minutes and fixed in TAF (triethanolamine, formalin and distilled water) and ultrastructural observations made using scanning electron microscope (SEM). The specimens were dehydrated in an increasing series of alcohols and then metallized with gold 24 in plasma of argon. The use of this technique allowed determining that the number and arrangement of the genital papillae were as follows: three rows of genital papillae, two ventrolateral rows with 24 single genital papillae each, and a ventral row with 16 plus 5 simple papillae double preanal papillae, and 7 double postanal papillae.

Key words: morphology SEM, posterior end males, nematode.

CRANIOFACIAL MORPHOLOGICAL VARIATION WITHIN HUMAN POPULATIONS OF NORTHWESTERN PATAGONIA DURING THE LATE HOLOCENE

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Previous ethnohistorical and archeological evidences have led to propose that the populations of Northwestern Patagonia (NWP) during the Late Holocene were characterized by high levels of gene flow with neighboring regions, migratory events to variable distance and changes in the mobility and subsistence. Even though it seems probable that these factors have contributed to shaping the biological variation of the region, the patterns of morphological variation of these groups have not yet been analyzed systematically from an evolutionary perspective. This study aimed to analyze the intra-regional variation in the craniofacial morphology of the human populations of NWP assignable to Late Holocene and make regional comparisons using samples from Northeastern and Central-Eastern Patagonia. To this end, thirty three skulls belonging to adults of both sexes proceeding from various sites of Neuquén province were analyzed. Coordinates of landmarks and semilandmarks in 2D were obtained from digital pictures in frontal view, and principal components and Foote's disparity were calculated from the superimposed coordinates. The variation in size was also analyzed. The results obtained are discussed taking into account the hypotheses proposed previously.

Key words: craniofacial, morphometry, Neuquén.

DENTAL MORPHOLOGICAL VARIATION IN HUMAN POPULATIONS OF THE PARANA DELTA

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The morphology of the crown of the permanent dentition has a short development period in relation to other structures (e.g. the skull). Once the crown has completed its training, the morphological changes can be caused only by the action of environmental factors that act after tooth eruption. The physical properties (hardness and abrasiveness) and food composition (proportion of carbohydrates) are the most important factors affecting the differential patterns of tooth wear, fractures and cavities. The aim of this study was to analyze the morphology of permanent teeth in human populations from the Paraná delta from the end of the Late Holocene and to evaluate the influence of these factors. We analyzed the frequency of caries, fractures and the degree of dental abrasion factors in a sample of 70 adult and subadult skulls of both sexes from the Mounds I and II of Paraná Guazú, Mounds I of Brazo Gutiérrez and Mounds I of Brazo Largo High River Paraná. We also collected data on stable isotopes, plant and animal remains and artifacts found in the area. Available environmental information will be used to discuss the patterns of variation observed.

Key words: tooth wear, caries, northeast of the Pampa.

ESTIMATION OF SEX FROM THE JAW: DISCRIMINANT ANALYSIS

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The aim of this work was to develop a specific discriminant function to estimate the sex from the jaw. The sample consisted of 110 mandibles from the osteological collection "Prof. Dr. Rómulo Lambre" (School of Medical Sciences, University of La Plata, Argentina). We selected 77 non-pathological mandibles that were surveyed on nine metric variables by traditional morphometric techniques. Statistical analysis was performed using SPSS 17.0. Six of the nine variables showed significant differences between the sexes ($p \leq 0.05$). The most powerful discriminatory variables were the symphysis height, symphysis width and mandibular bicondilar length. The discriminant function obtained classified correctly 76.6% of the cases original grouped and 74.0% of cases through cross-validation. We believe that the underrepresentation of female individuals and the age range of the sample could have influenced the results, because the percentage of correctly classified cases in this sample is lower than those obtained from other reference collections.

Key words: estimation of sex, discriminant function, jaw.

TYMPANIC BONE DEVELOPMENT AS AN ESTIMATOR OF AGE

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This study aimed to evaluate the temporal bone development as an estimator of age in the perinatal period. The temporal bone is a complex of intramembranous and endochondral ossification that is part of the braincase and in early stages it is found separated in three different parts: squamous part, petrous part and tympanic ring. The development of the tympanic bone has been proposed as an estimator of age because it presents a number of characteristic changes. This process was evaluated by Weaver (1979), who defined six stages of development that would serve as estimators of age from conception to six years of age. We selected the temporal bones from 75 individuals between 25 and 55 weeks of gestational age belonging to the osteological collection "Prof. Dr. Rómulo Lambre" (School of Medical Sciences, University of La Plata, Argentina), and scored the developmental stage of the tympanic bone. Only stages 1, 2 and 3 were found represented. We performed an analysis of variance and found significant differences in mean age for different stages ($p < 0.000$). We observed that stage 1 is found in individuals with less than 40 weeks of gestation and that those with more than 45 weeks have only stage 3. We concluded that the development of the tympanic bone is especially useful in the discrimination of fetal postnatal individuals.

Keywords: temporal bone, age estimation, subadults.

PERIODONTAL PATHOLOGIES IN A WELL-DOCUMENTED SKELETAL SAMPLE

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Periodontal diseases at present are distinguished as multifactorial, resulting from the interaction between periodontal pathogenic bacterium and the immune response mechanism of the host. This inflammatory reaction affects periodontal tissues, including alveolar bones. Since the frequency of such pathology is currently high, our objective was to detect its presence in a contemporary skeletal series. The observed sample consisted of 35 crania from the osteological collection "Prof. Dr. Rómulo Lambre" (School of Medical Sciences, University of La Plata, Argentina), belonging to adult individuals (23 males and 12 females). A total of 14 crania were eliminated to show total reabsorption in both alveolar arcades. In the remaining 20 crania, horizontal and vertical alveolar bone loss was macroscopically observed with the help of a Mitutoyo Digital Caliper (0.01 mm of precision). Frequencies were calculated for each feature and for each dental piece. The results showed that 75% of the sample presents features attributable to periodontal diseases. Fenestrations and dehiscences were observed in 55% of the crania analyzed. These results coincide with the high prevalence of such pathology recorded in the specified clinical bibliography.

Key words: periodontal disease, documented sample.

SIZE AND SHAPE IN MORPHOMETRICS: A COMPARISON OF TECHNIQUES BASED ON LINEAR DISTANCES AND CARTESIAN COORDINATES

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The studies of the processes of morphological diversification among different groups of organisms have been generally addressed using both uni and multivariate statistical techniques applied to data on size and shape of a given structure. Although these studies have been traditionally based on linear distances between anatomical points (landmarks), there are a number of arguments that have emerged from the theory of shape analysis in favor of the use of Cartesian coordinates to measure the shape and size of a group of individuals. In the present study, we analyzed adult skulls of both sexes coming from Chubut, Río Negro, Buenos Aires, San Juan, Mendoza and Pampa Grande (N=136) deposited at Museo de La Plata. Skulls were recorded on landmarks and semilandmarks Cartesian coordinates in three dimensions and traditional linear distances were calculated following Howells definitions. Finally, we compare the results of morphometric techniques based on traditional linear distances and landmarks and semilandmarks Cartesian coordinates, and then discuss the differences between them in respect to the study of variation patterns and size and shape discrimination.

Key words: multivariate methods, traditional morphometrics, geometric morphometrics.

THE EFFECT OF SIZE AND PHYLOGENETIC RELATIONSHIPS ON CRANIOFACIAL VARIATION IN PRIMATES

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The study of primate diversification holds great interest for Biological Anthropology. To properly understand it, phylogenetic, morphological and ecological information should be integrated. In this work, we used molecular phylogenies, multivariate morphometrics and the comparative phylogenetic method to study morphological diversification in primates and, particularly, their differentiation into modern humans. To this end, we analyzed 147 specimens from 20 primate species of the infraorders Lemniphorm, Platyrrhini and Catharrhini. To describe the different cranial modules, 30 craniometrical variables were recorded. The size variation was described by means of the Geometric Mean, while shape variation was studied calculating the Principal Components on Mosimann shape variables (i.e. proportions). The results obtained show that the shape divergence between species is unrelated to phylogeny, and only marginally related to size variation. However, size variation between species is mostly associated with the phylogenetic structure of the order. We then discuss multiple hypotheses that could be used to explain the great craniofacial shape divergence present among primates.

Key words: molecular phylogenies, multivariate methods, craniofunctional method.

LEARNING OF MORPHOLOGICAL STRUCTURES IN THE FIRST-YEAR SUBJECT "GENERAL ZOOLOGY" OF THE SCHOOL OF NATURAL SCIENCES AND MUSEUM, UNIVERSITY OF LA PLATA, ARGENTINA

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The main objective of this study was to understand the most frequent motivations and learning strategies of the students of Biology in the subject "Zología General" (General Zoology) of the School of Natural Sciences and Museum of the University of La Plata, Argentina. Data were collected by means of a Questionnaire Study Process Assessment and Learning (in Spanish known as CEPEA), which was delivered individually and collectively to 98 student volunteers. The analysis of the results allowed us to assess the learning approaches adopted by college students in the study process of morphological structures. We found that most students (66%) used predominantly the surface approach, showing extrinsically motivated. However, they used both rote learning strategies, taking pictures with the cellular structure or setting the type of container where it is. About 25% of the students adopted a deep approach, reasoning and searching for the why, whereas the remaining 9% used a combination of memory with understanding, using complex strategies. These learning characteristics provide important clues to understand the peculiarities of the academic learning of the students questioned. The results suggest the need to continue our studies in this research.

Key words: learning strategies, morphology, CEPEA questionnaire.

REPRESENTATIONAL SYSTEMS IN STUDENTS OF VETERINARY HISTOLOGY

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Representational systems are the way in which each person mentally processes information, generating visual or auditory images or having kinesthetic sensations. The objectives of this exploratory study were to analyze the representational systems of a sample of students in the course of Veterinary Histology of the School of Veterinary Sciences of the University of La Plata (Argentina) and to determine the degree of relationship between the visual, auditory and kinesthetic styles and the academic performance in that course. The students' preferred representational systems were surveyed by a six-item questionnaire that was e-mailed and answered by 30 students. Academic performances were obtained from the records of the Board of Professors of Veterinary Histology. The visual, auditory and kinesthetic systems were preferred by 14, 10, and 4 students, respectively, whereas the remaining two students preferred bimodal systems. Auditory and kinesthetic learners obtained a higher average total score on the assessments of laboratory classes. However, visual learners achieved a higher proportion of performance from items that included illustrations. Knowing the students' favorite representational systems has important implications in the classroom in various aspects such as presentation of contents, design and evaluation of educational materials, all teaching activities in which results of the present study will be taken in consideration.

Key words: representational systems, Histology teaching, academic performance.

ACADEMIC PERFORMANCE OF THE STUDENTS OF THE COURSE OF VETERINARY ANATOMY I OF THE SCHOOL OF VETERINARY SCIENCES OF THE UNIVERSITY OF LA PLATA, ARGENTINA

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The knowledge of some academic indicators such as dropout and persistence constitutes an essential tool to investigate the performance of students at university. Therefore, the aim of this work was to analyze the students' academic performance within the course of Veterinary Anatomy (first year, second semester) of the Veterinary Medical School of the University of La Plata, Buenos Aires, Argentina. The students were grouped in different categories according to the enrolment year (cohorts 2007, 2008 and 2009) and their performance was analyzed along the three academic periods. The course enrolment increase does not change the total number of successful students that pass the course examinations; therefore, the percentage of promoted students diminishes while the course enrolment increases. This seems to be the most important variable, because the number of teachers and the pedagogical methodology were kept constant along the three years studied, but the enrolment increase establishes a higher number of students per teacher, thus affecting the educational quality directly. When the teacher/students relationship increases progressively, the teacher efficiency to detect comprehension mistakes or misunderstanding decreases dramatically. As a result, the course shows an increase in the percentage of students who failed examinations. On the other hand, there is no correlation between the enrolment increase and the percentage of student dropout.

Key words: dropout, course enrolment, anatomy, academic performance.

STEREOLOGY VERSUS TRADITIONAL METHODS OF QUANTIFICATION IN THE SUBSTANTIA NIGRA OF ADULT AND SENILE RATS

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The counting of cellular elements (cells, nuclei and organelles) in sections of tissues is a permanently controversial subject. Several methods have been applied to investigate the number of elements from a systematic sampling section. Quantitative and semiquantitative methods are important to make a comparison between species, normal and pathological conditions and between control and experimentally lesioned animals. The substantia nigra is an area of great interest because of its relation with Parkinson and Huntington diseases. The aim of this work was to analyze the dopaminergic immunostained neurons of the substantia nigra of adult and senile rats. Different methods of quantification (manual counting, digital counting, optical dissector counting, optical median density and immunoreactive area) were compared on a series of 30- μ m thick slices using different image processing programs such as: NIH image 1.62, ImagePro Plus v5.1 and Adobe Photoshop CS2. The statistical analysis demonstrated that all methods indicated similar differences between adult and senile animals. However, we believe that the neuron number is the best method to express the results in the substantia nigra because it is a heterogeneous nucleus.

Key words: substantia nigra, immunohistochemistry, neuronal count, stereology.

INFILTRATIVE AND PUSHING GROWTH PATTERNS IN BREAST DUCTAL CARCINOMAS: RELATIONSHIP WITH PROGNOSTIC FACTORS

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Infiltrative and pushing growth patterns might be considered among prognostic factors in breast cancer, because they show different relationships with tumor grade and reactivity for estrogen (ER) and progesterone (PR) receptors. The aim of this study was to correlate both patterns of growth with tumor grade, reactivity for ER and PR, vascular microdensity, mitotic activity and apoptosis. Fifty-five cases of infiltrative ductal breast carcinomas stained with Hematoxylin-eosin were analyzed. The pattern of growth and Nottingham score were determined. Immunohistochemistry for ER and PR were performed following a standard protocol. Microvascular density (CD34 immunostaining) was determined in hot spots in 10 high power fields (HPF). Mitosis and apoptosis images were counted according to Kerr's criteria in 10 HPF. The results showed 53% infiltrative carcinomas, 43% pushing carcinomas and 4% not evaluable, being the former type most frequent in grade 2, with 72% of ER/PR+. The second group was predominantly of grade 3, with 75% of ER/PR+. The relationship between mitosis, apoptosis and microvascular density did not show statistical significance (Student's, $p > 0.05$). We conclude that, in our series, the results do not correlate with published data, as we could not find significant differences between both groups of carcinomas.

Key words: breast carcinoma, infiltrative and pushing growth patterns, prognostic factors.

HISTOLOGY OF THE SKIN IN THE FLANK OF ADULTS OF THE PLAINS VISCACHA (*Lagostomus maximus*)

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The skin of *Lagostomus maximus* varies in different regions of the body. Our objective was to study the characteristic histology of the flank skin. In this study, two males and four females adult were used. Samples of 3 µm were processed for their embedding in paraffin and staining with hematoxylin and eosin, Masson's trichrome method, orcein, Gomori's argentic impregnation, toluidine blue and Periodic Acid Schiff (PAS). The skin showed an epidermis and a dermis with very diverse papillary and reticular layers. The hypodermis was thin, whereas the epidermis showed numerous cellular layers and scarce cornification. The technique of Gomori showed a particularly gross reticular lamina. The pilosebaceous complex was formed by a principal follicle and some secondary follicles, associated with a small sebaceous gland. The hair follicles were encircled by abundant reticular fibers. No sweat glands were found in this region. There were mast cells related to blood vessels around hair follicles like in papillary dermis. Elastic fibers were found in both regions of the dermis. We concluded that the skin in the flank of the plains viscacha shows similarities to that of other mammals, although with some peculiarities of its own.

Key words: tegument, hystricomorph rodents, cutaneous annexes.

ULTRASTRUCTURE OF THE PROSTATE OF THE FEMALE PLAINS VISCACHA (*Lagostomus maximus*)

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The female prostate (Paraurethral gland or Skene's gland) is inconstant in most adult female mammals. This gland is present in all female plains viscacha and is located around the urethra. It has a lobular pattern with adenomers lined with a single epithelium with some cells showing secreting aspect. In this study, we analyzed the ultra-structure of the prostate of the female viscacha. Samples from three pregnant adult females were fixed in a mixture of glutaraldehyde and osmic acid. Semi-thin sections were observed with an optical microscope while ultra-thin sections were analyzed under a transmission electron microscope. We found that the epithelium of the adenomers is pseudo-stratified, showing basal pyramid-shaped cells with undifferentiated aspect and columnar cells with different characteristics. The latter reach the adenomer light. Some of these cells present secretory granules in the apical region and a highly developed rough endoplasmic reticulum. Other cells have vacuolated appearance and their nuclei are basally located. The features described confirm that this gland is functional and resemble those found in women and some female rodents.

Key words: tegument, hystricomorph rodents, cutaneous annexes.

COMPARATIVE STUDY OF MICROSCOPIC MORPHOLOGY OF THE DIGESTIVE TRACT OF TWO MARSUPIAL SPECIES FROM ARGENTINA

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Argentinian marsupials include an important diversity, with species occupying varied niches and habits. For this histological comparative study, we selected subadult specimens of didelphid opossums: *Didelphis albiventris* and *Monodelphis dimidiata*. The former is arboreal, with omnivore diet and nocturnal habits, whereas the latter is terrestrial, insectivorous and diurnal. Organs were fixed in buffered formalin and processed for routine histological techniques (Hematoxylin-eosin). Results show differences in the histology of the digestive tract between both species, such as a differentiated distribution in the submucosa glands of the esophagus, the presence of folds in the stomach of *Didelphis albiventris*, differences in the length of the Lieberkhum crypts in the small intestine, and the presence of short villi in the colon of *Didelphis albiventris*. We postulate that these differences are correlated with the type of specific diet of each species.

Key words: comparative study, microscopic morphology, marsupials.

CLAW CLOSER MUSCLE OF THE ESTUARINE CRAB *Cyrtograpsus angulatus* (GRAPSOIDEA, VARUNIDAE): HISTOCHEMICAL COMPOSITION OF MUSCLE FIBERS

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The claw is a multifunctional organ composed of muscles with diverse types of fibers on the basis of morphological, physiological and histochemical criteria. The aim of the present study was to analyze the fiber composition of the claw closer muscle of *Cyrtograpsus angulatus*, by assessing the activities of the enzymes Succinate Dehydrogenase (SDH) and myosinATPase (mATPase), and the contents of glycogen and lipids. Adult male crabs in intermoult collected from Laguna Mar Chiquita (Buenos Aires, Argentina) were acclimated in aquaria. The closer muscle was fixed in liquid nitrogen. Cryosections were subjected to histochemical techniques: SDH, mATPase, Periodic Acid Schiff (PAS) and Sudán Black-B. These studies allowed the characterization of four types of muscle fibers in the *C. angulatus* claw closer muscle. I and IV types would be 'extreme' groups: I fibers (large, weak and pH-labile mATPase, weak SDH, PAS and Sudán); IV (small, very strong and pH-resistant mATPase, strong SDH and PAS, moderate Sudán). II and III types would belong to an 'intermediate' group. We concluded that the histochemical heterogeneity of fibers in the *C. angulatus* claw closer muscle would be linked to the role that each cell type carries out.

Key words: claw, closer muscle, histochemistry.

ULTRASTRUCTURE OF SPERMATOOA HEADS OF RAM. EVALUATION OF DIFFERENT EXTENDERS

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The aim of this work was to evaluate different extenders through analysis of ultrastructural changes in ram spermatozoa heads. To this end, we used heterospermic semen samples, which were diluted according to the treatment. A tris-citric acid-glucose-egg yolk base diluent (S Diluent) was used as control and contrasted with: S diluent + trehalose (ST Diluent) and S diluent + sacarose (SS Diluent).

Treatments were performed as follows: T1: S Diluent; T2: ST Diluent + trehalose at 30° C; T3: SS Diluent + sacarose at 30° C and T4: SS Diluent + sacarose at 5° C. Seminal content was loaded into straws, frozen and stored in liquid nitrogen. Samples were taken at post-refrigeration state (prior to freezing) and then processed to obtain a pellet that was fixed and sent to the Transmission Electron Microscopy Service of the School of Veterinary Sciences of the University of La Plata, Argentina. Longitudinal and transversal cuts of spermatozoa heads were analyzed, counting the frequency of normal, broken and swollen plasma membranes or with false acrosome reaction. The Chi-square test was used to compare treatments. Significant differences were obtained between T1 and T2 at the post-acrosomal region. In T1, plasma membranes of the post-acrosomal region were observed intact but swollen, while in T2 the membranes were normal (not swollen). It can be concluded that the addition of disaccharides (especially trehalose) in ram seminal diluents would allow maintaining the plasma membrane of the spermatozoa head normal and reducing the cell damage during cryopreservation.

Key words: ultrastructure, theriogenology, extenders.

MORPHOLOGY OF THE TESTES OF *Sympterygia bonapartii* (MÜLLER & HENLE, 1891) (CHONDRICHTYES, RAJIDAE) IN IMMATURE AND JUVENILE SPECIMENS

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The smallnose fanskate, *Sympterygia bonapartii*, reproduces in the Bahía Blanca estuary. The aim of this work is to describe the histology of the immature and maturing testes in this species. The stage of maturation was determined analyzing the length and degree of calcification of the claspers. The organs were processed by routine histological techniques. Testes are composed of lobes having numerous spermatocysts. At the distal and lateral surface of the organ, there are several germinal zones (GZ). Cysts are formed in these zones and, as they evolve, they draw away radially from the GZ and through the testis diameter. Each cyst contains reproductive cells at the same developmental stage. Juvenile specimens have cysts in four developmental stages: stage I: associated spermatogonia and Sertoli cells; stage II: germ cells surrounding Sertoli cells (a situation that is reversed as maturation goes on); stage III: primary and secondary spermatocytes; and stage IV: secondary spermatocytes transform into spermatids. No mature spermatids or spermatozoa are observed in juvenile specimens. Stages I, II and III are found in immature males. In the latter, only primary spermatocytes are found. The spermatogenesis in *S. bonapartii* agrees with the composite model of other Rajiforms.

This work was supported by the SGCyT-UNS, PGI 24/B140. We thank the Prefectura Naval Bahía Blanca for their help with the samplings.

Key words: *Sympterygia bonapartii*, testis, histology.

THE DIRECT COMMUNICATION BETWEEN THE FOURTH VENTRICLE AND THE CENTRAL CANAL OF THE SPINAL CORD ALLOWS THE CIRCULATION OF THE CEREBROSPINAL FLUID

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The aim of this study was to determine whether there is an anatomical and functional communication of the fourth ventricle (4V) with the central canal of the spinal cord. Sprague-Dawley rats were injected at the lateral ventricles or into the Obex with 10 µl of a suspension containing 1011 plaque forming units (PFU)/ml of an adenovector carrying a gene that codifies for green fluorescent protein (GFP). Rats were sacrificed 48 h after injection. Another group of rats were inoculated at the Obex with a suspension of quantum dots (Qdots) and sacrificed 10 min later. The brain and the spinal cord were cut into 2 mm-thick coronal section, from the 4V and through the entire cervical region. Each segment was then serially cut into 20 µm-thick sections with a vibratome and stained with 4', 6-diamino-2-phenylindone (DAPI). Images were captured and analyzed with a confocal microscope. The serial sections from the Obex to C1 showed physical continuity between the 4V and the spinal canal. GFP expression was observed in lateral ventricles, 3V, 4V and spinal canal up to C6. Qdots were observed from the Obex up to C8. No fluorescence was observed in the meninges. These results show the physical continuity between the 4V and the spinal canal.

Key words: spinal cord, central canal, cerebrospinal fluid.

ANATOMICAL AND HISTOLOGICAL ANALYSIS OF OVARIAN DEVELOPMENT IN *Columba livia* (AVES: COLUMBIFORMES)

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During the ontogeny of birds, the differentiation between the two ovaries is dissimilar: the right ovary degenerates whereas the left one becomes functional in the adult. In this work, we describe the ovarian development in *Columba livia* in order to characterize the sequence and gonadal differentiation in birds. A total of 32 embryos and 12 neonates were analyzed under a stereomicroscope and SEM. Histological analysis was performed using standard hematoxylin-eosin staining. In stage 19, gonadal outlines were evident as two elongated bodies in the ventro-medial region of the mesonephros. In stage 27, the right ovary consisted of a core region, while the left also had a cortical zone. Progressive regression of the right gonad was evident from stage 37 to 5 days after hatching, when it was absent. In the left ovary, oogonia nests in the cortex from stage 37 and follicles and a gradual increase in the number of follicle cells from 5 days post-hatching were observed. The results provide data for future developmental comparative studies in birds.

Key words: morphogenesis, female reproductive system, Columbidae.

HISTOLOGY OF THE SKIN AND SUBCUTANEOUS DIVERTICULA OF THE SOUTHERN SCREAMER *Chauna torquata*

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The skin in birds has been studied mainly in domestic species but little is known about the skin of non-domesticated bird species. The Southern screamer (*Chauna torquata*) is an Anseriformes restricted to the Neotropical region that inhabits open areas near watersides. Underneath its skin, it has extensions of the air sac system that form a network of air-filled chambers called subcutaneous diverticula. The aim of this work was to analyze the histological structure of the skin and these diverticula. Serial sections were made and stained with hematoxylin-eosin staining (HE), orcein, reticulin, Masson's trichrome and Periodic Acid Schiff (PAS). The epidermis creates deep and branched invaginations. The dermis is rich in elastic fibers although the lamina elastica layer was not distinguished. The structure of the subcutaneous diverticula was similar to that of the air sacs. When the diverticula are filled with air, the abundant elastic fibers and epidermic invaginations could provide great stretchability to the skin. The presence of these diverticula, together with the great skeletal pneumaticity, could serve to reduce the body mass and optimize aerial transport.

Key words: histology, skin, Southern Screamer (*Chauna torquata*).

THE OVARY OF *Mustelus schmitti* (CHONDRICHTHYES, TRIAKIDAE): MICROANATOMY AND DEVELOPMENT THROUGH THE REPRODUCTIVE CYCLE

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The smoothhound dogfish, *Mustelus schmitti*, is an important resource for the Argentinean fisheries. Considering its reproductive features and that this species is "in danger" for the IUCN, it is essential to study its reproductive biology to elaborate appropriate management strategies. The aim of this work was to analyze the microanatomy of the ovary of *M. schmitti* through its development. The animals were caught in the inner area of the Bahía Blanca estuary, Argentina. The ovaries were fixed in Bouin's fixative and processed by routine histological techniques. Immature (stage I), in maturation (stage II) and mature (stage III) females were analyzed. We found that immature ovaries are macroscopically indistinguishable and microscopically characterized by the presence of germ cells arranged into clusters and primordial follicles. At stage II, the ovary can be recognized by the presence of translucent and white follicles. Microscopic clusters of oogonias, primordial and primary follicles are present. There is also evidence of follicular atresia and beginning of vitellogenesis. Mature ovaries exhibit follicles of different sizes, some of which are yolked, together with clusters of oogonia. These results show a development pattern similar to that of other elasmobranchs and suggest that the reproductive activity of this important species begins early in life.

This work was supported by the SGCyT-UNS, PGI 24/B140. We thank the Prefectura Naval Bahía Blanca for their help with the samplings.

Key words: *Mustelus schmitti*, ovary, histology.

HISTOCHEMICAL CHARACTERIZATION OF GLYCOPROTEINS OF THE GLANDULAR STOMACH OF *Mugil platamus* (Actinopterygii; Fam. Mugilidae)

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The aim of the present study was to analyze the composition and distribution of glycoproteins (GPs) of the glandular stomach mucosa of *Mugil platamus*. Adult specimens of both sexes were collected from the inner part of Laguna de Mar Chiquita (Buenos Aires Province, Argentina). The glandular stomach was removed, fixed by immersion in Davidson, and histologically analyzed with hematoxylin-eosin staining and Masson trichrome stain. For histochemical identification of GPs, we used: PAS for oxidizable vicinal diols; KOH/PA*S for sialic acid residues; PA/Bh/KOH/PAS and PAPS for sialic acid residues with O-acyl substitution at C7, C8 or C9; KOH/PA*/Bh/PAS for neutral GPs with oxidizable vicinal diols; AB pH 2.5; 1.0 and 0.5 for carboxyl groups and with O-sulphate esters. The GPs of the secretory epithelium presented oxidizable vicinal diol groups, sulphate and carboxyl groups, and sialic acid residues with and without O-acyl substitution at C7, C8 or C9 and O-acyl sugars. The GPs of glandular cells presented oxidizable vicinal diol groups and sialic acid residues with O-acyl substitution at C7, C8 or C9 and O-acyl sugars, showing in its apical edge a more intense positive reaction to the histochemical techniques. The presence of different classes of GPs would contribute to playing various functional roles.

Key words: *Mugil platamus*, glycoproteins, histochemistry.

STRUCTURAL CHARACTERISTICS OF THE FETUS'S SKIN OF THE PLAINS VIZCACHA (*Lagostomus maximus*) IN DIFFERENT DEVELOPMENT STAGES

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The plains vizcacha is a rodent that lives in the plains of South America. The aim of the present work was to analyze the fetus's skin in different development stages. To this end, we used eight animals divided in groups depending on the caudo-cranial length and the gestation age. Samples of flank skin were processed for embedding in paraffin and dyed with hematoxylin and eosin, Masson's trichrome method, Gomori's argentic impregnation, Orcein, toluidine blue and Periodic Acid Schiff (PAS). In the epidermis, the smaller fetuses (5.3 cm) had an evident periderm, which was detached in later stages, whereas in the larger ones (14.5 cm), the epithelium is stratified plane, with a higher number of layers and maximum cornification. The dermis consisted of mesenchymatic tissue with scarce fibers, in the younger animals. Subsequently, the connective tissue localized near the epithelium was more cellular, whereas in the older ones there was a differentiation between the papilar and reticular layer and mature mast cells were observed. The primodium of the hair follicles appears to begin at 2.5 months of gestation, and in later stages it is a pilosebaceous complex with a principal follicle, and numerous secondary and sebaceous glands. The development of the skin is similar to that observed in other rodents but with some differential characteristics.

Key words: vizcacha, fetus, skin.

BITE FORCE IN BIRDS

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The bite force (BF) influences the skill of the species not only to kill preys, but also to process and manipulate food. In neontology and paleontology, knowing this parameter is crucial in the interpretations about trophic ecology. In birds, this information is practically absent. The aim of this work was to analyze the possible correlation between BF and the type of feeding ecology. To this end, we measured the real BF of birds by using two devices: a piezoelectric and a piezoresistive sensor. Four trophic categories were selected: omnivorous birds (*Rhea americana*, greater rhea), carrion feeders (*Sarcoramphus papa*, king vulture), frugivorous birds (*Ramphastos toco*, toco toucan) and granivorous birds (*Anser anser*, domestic goose). *S. papa* showed the highest BF value (110 Newtons), whereas *R. toco* showed the lowest (25.14 Newtons). The omnivorous and granivorous species revealed intermediate values (*R. americana*, 48.59 Newtons, and *A. anser*, 50.32 Newtons). It could be asserted that BF and feeding habit are correlated. The highest values were shown by species whose trophic items require being ripped. These results complement qualitative osseous and muscular morphological studies, allowing a better functional interpretation of the mandibular complex.

Key words: birds, bite force, trophic habit.

COMPARATIVE STUDY OF THE MORPHO-ANATOMY OF THE FLORAL AND EXTRAFLORAL NECTARIES OF *Heliocarpus popayanensis* (MALVACEAE-GREWIOIDEAE)

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Heliocarpus popayanensis Kunth is a species with perfect flower and pistillate flowers, which presents floral and extrafloral trichomatic nectaries. The floral nectaries, which are four nectariferous glands, have a subcircular outline and are located on a short gynophore. The extrafloral nectaries are cup-shaped and are located on the margins at the base of the leaf. For the anatomical study, serial transversal and longitudinal histological sections were made and analyzed with light microscopy and scanning electron microscopy. There were differences in the size and shape of basal cells, in the number of cells of the foot and the head of the glandular trichomes comprising the secretory epidermis, in the size and distribution of drusen in the secretory parenchyma, and in the vascularization. A T test ($\alpha = 0.05$) was used to compare the means of the variables analyzed between the two types of nectaries. The results showed significant differences ($p < 0.0001$) between both types of nectaries for the variables length and diameter of the trichome foot, length of the trichome and smallest diameter of the cristalliferous idioblasts. We discuss the differences between both types of nectaries and compare them with results reported for *Triumfetta rhomboidea* Jacq. and *T. semitriloba* Jacq.

Keywords: Malvaceae, trichomatic nectaries, T test.

MORPHOANATOMICAL CHARACTERISTICS OF THE LEAVES OF TWO NEW ECOTYPES OF OREGANO: CORDOBÉS SERRANO and ROSA FUERTE

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Biological material for this study was obtained by mass selection in an oregano field of a farmer in Traslasierra (Dpto. San Alberto-Córdoba, Argentina) and selected according to best size, foliation, aroma, production and agronomic behaviour. The two ecotypes studied (Cordobés Serrano and Rosa fuerte) have exomorphological characteristics that are different from each other and from traditional ones. The aim of this study was to analyze the morphoanatomical characteristics of the leaves to contribute to the taxonomic characterization of these two ecotypes. Histological slides were prepared with the middle section of mature leaves. Epidermis portions of both sides, obtained by "peeling", were stained with astral blue-safranine. Both ecotypes showed: leaves with dorsiventral mesophyll, unistrata epidermis and thick cuticle, stomata on both sides and different non-glandular and glandular trichomes. Multicellular and uniseriate non-glandular trichomes, surrounded by 2 to 6 basal cells, were numerous in the edge of the limb on the venation, and less numerous between the veins. Two glandular trichomes were found: a- small trichomes on the adaxial central vein, with two cellular foot and tetracellular secretory head; b- peltate trichomes, inserted in depressed zones of the epidermis, with an octocellular head that participates in the synthesis and secretion of essential oils. Since these anatomic results showed no differences between the two ecotypes, we suggest carrying out further determinations.

Key words: *Origanum* sp., morphoanatomy, leaf.

MORPHOLOGY OF THREE ASTERACEAE NATIVE SPECIES FROM CORDOBA (ARGENTINA) WITH ORNAMENTAL POTENTIALITY

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The goal of this study was to analyze morphological characteristics of three asteraceae native species which grow in Córdoba (Argentina) to introduce them in the landscape design, to revalue and preserve the vernacular germplasm. *Grindelia cabreræ* and *Wedelia bupththalmiflora*, and *Solidago chilensis*, a rhizomatous herb, were chosen because of their beauty. The exomorphology was described for fresh and herbarium specimens. The anatomy was analyzed in organs fixed in FAA. Achenes collected in the field were sown in the laboratory and seedlings were described. Observations until now show adaptations to xeromorphic environments: leaves with isobilateral mesophyll, unistrata epidermis, thick cuticle, and glandular and non-glandular trichomes. Primary stems have eusteles. In both organs, collenchyma cells are found just beneath the epidermis and sclerenchyma tissue is associated to vascular bundles. Primary roots are tetrarc and they have an early develop into secondary structure as well as the stems. The presence of secretory channels is constant. The yellow capitula have dimorphic flowers: ligulate ones at the edge and tubular ones in the disc. The fruits are dimorphic achenes in *Wedelia*, crushed in the disc and triquetrous in the margin. In the other species, fruits are isomorphic. Seedlings have epigeal germination and they are chriptocotilar, except seedlings of *Solidago*.

Key words: asteraceae, morphoanatomy, native flora.

ORGANOGRAPHY IN CARYOPHYLLACEAE IN ARGENTINA: SEEDS AND POLLEN GRAINS

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Spermatology and palynology studies on Caryophyllaceae constitute an important tool for taxonomic studies in this family of plants. In the present work, scanning electron microscopy was used for the observation of seeds and pollen grains extracted from herbarium material. Both were mounted on double face tape, without previous treatment. In the seeds of Caryophyllaceae, the embryo is generally curved and surrounded with the perisperm, which determines the central or subcentral position of the hilum. The disposition of these features generates seeds of circular, reniform or triangular-pyramidal contour. In the *Stellaria* genus, the study of seed morphology allowed the discovery of two species new to science: *S. antoniana* Volponi and *S. perdersenii* Volponi, and the first citation of *S. yungasensis* (Rusby) Volponi for Argentina. In the *Polycarpon* genus, through spermatology studies, *P. alsinifolium* (Biv.) DC. was mentioned for the first time for Argentina. The morphology of the pollen grains depends on the type of apertures and the position of each grain in the tetrads. Generally, the pollen grains in Caryophyllaceae are spheroidal and polyhedric, pantoporate in most species, although spheroidal, tricolpate pollen grains were found in some other genera. In *Cardionema*, cubic pollen grains with six pores were found. The study of the pollen in *Cerastium* allowed finding the hybrid *C. glomeratum* Thuill. X *C. humifusum* Cambess., by differences in the sizes and structures in the tectum.

As a researcher of the Comisión de Investigaciones Científicas de la provincia de Buenos Aires, thanks are given for the funding to support these studies.

Key words: Caryophyllaceae, seeds, pollen grains, scanning electron microscope.

MICROHARDNESS OF THE TYPES OF ENAMEL IN POSTERIOR PERMANENT TEETH

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The type of radial enamel with parallel prisms presents higher abrasion resistance. However, the microhardness of the enamel types has not been studied although it is in direct relation with the wear resistance. The aim of this study was to relate the microstructure of human dental enamel with biomechanics function. Six premolar crowns (PM) and six lower molar crowns (M) were sectioned, included, ground, etched with acid and metalized to be observed under a Scanning Electron Microscope. The micrographics occurred in the vestibular cusps (VC) and lingual cusps (LC), in the external (A) and internal (B) third. The microhardness was measured in (A) and (B) with Vickers penetrators, loads of 100 g and a time of 5 ". In both cusps of PM, we observed radial enamel in (A) and irregular enamel in (B); the mean of microhardness (Hv 100 = Vk) in PM was: in VC (A) 314.9 and VC (B) 309.6; in LC (A) 326.9 and in LC (B) 312.3. In M we observed in LC radial enamel in (A) and irregular enamel in (B); in VC radial enamel in (A) and enamel with bands in (B); whereas the mean of microhardness in M was: in VC (A) 390.8, in VC (B) 326.31, in LC (A) 380.59 and in LC (B) 316.27. Radial enamel and the highest values of microhardness in the outer zone of the cusps constitute adaptations to biomechanics wear.

Key words: enamel, biomechanics, microhardness, wear.

PROPOLEO AS AN ALTERNATIVE IN ENDODONTICS

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Propolis is a substance made by bees and its hydroalcoholic solutions are used in stomatitis, against staphylococci, streptococci, pneumococci, and other species considered in dentistry. The aim of this study was to identify the usefulness of propolis hydroalcoholic 0.5% in the irrigation of teeth with chronic periapical abscesses. Patients were divided into two groups of 40 patients each, and propolis and chlorhexidine 0.2% was applied respectively. Irrigations were performed for 48 hours after which the medication was withdrawn, taking the sample with paper cones that were introduced in tubes containing thioglycollate to send to laboratory for bacteriological analysis. We found that 39 of the 40 patients irrigated with propolis were negative and only 1 was positive. The group irrigated with chlorhexidine gave similar results. Although the sample was small, we can conclude that since the antimicrobial action of both antiseptics was similar, they could be used as drugs to cure periapical abscesses.

Keywords: propolis, endodontics, chlorhexidine.

IDENTIFICATION OF RECORDED MOUTH DISEASES AT THE STOMATOLOGICAL CLINIC OF THE SCHOOL OF DENTISTRY OF THE UNIVERSITY OF LA PLATA, ARGENTINA

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The oral mucosa covers a cavity that serves different functions: phonetic and digestive; it endures physical, chemical and mechanical traumas; it conforms a barrier against microorganisms, and constitutes a sensory organ. Different pathologies, such as infectious, immunological, endocrinological, inflammatory and tumoral pathologies, are manifested in the mucosa. In the present work, 853 patients were studied and the following factors considered: age, gender, occupation, subdivision of the lesions according to their etiology. Principal and complementary methods were used for diagnosis. With an age range of 10-90, 521 patients were women, 332 were men; 535 were students (63%) and 122 were employees. The most relevant recorded lesions were: 122 Desquamative Cheilitis (14 %); 120 Aphotous Ulcers (14%); 94 Traumatic Lesions (11%) related to non-adaptive prostheses, orthodontic appliances and chewing problems; 62 Herpes Simplex (7%); and 40 Leukoplakia (5%) associated with tobacco and alcohol. The ones most commonly found were: Desquamative Cheilitis, Aphotous Ulcers, Herpes Simplex and Traumatic Lesions. As regards occupation, most of the patients were students. The results obtained provide data about lesions and diseases which the dentist should diagnose to carry out appropriate treatment, and educational and preventive action for oral health.

Key words: lesions, oral cavity, stomatological clinic.

SERIC LEVELS OF ESTROGENS AND PROGESTERONE IN ADOLESCENTS DURING THE THIRD TRIMESTER OF PREGNANCY. IT'S RELATIONS WITH GINGIVAL DISEASES

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The hormonal incrementation during pregnancy produces alteration of the fibrinolytic equilibrium and influences on the gingival manifestations. The gingival disease is worse when the pregnant is young and the symptoms get even worse as the pregnancy goes on. The greatest hormonal incrementation occurs during the eighth month of pregnancy. The purpose of this investigation is to compare seric levels of estrogens and progesterone in pregnant and non pregnant adolescents, to settle the interference in gingival diseases. As gingival changes are related with, hormonal changes in adolescents we made a transverse research in Sanitary Unity Nro 44, Berisso. The sample consist on 60 girls between 14 to 19 years (30 pregnant and 30 not pregnant). We connect seric levels of hormones and the degree of gingival diseases according to the gingival bleeding. In no pregnant adolescents were found values of estradiol between 8 to 36 pg/ml, and in pregnant adolescents the values were between 127 and 281 pg/ml. The gingival bleeding and the gingival edema was lower in no pregnant adolescents, instead, it was abundant and spontaneous in pregnant adolescents. This result allows us to conclude that the increase of seric levels in hormones has a direct incidence on gingival diseases.

Key words: pregnant, gingival, diseases, bleeding.

SODIUM HYPOCHLORITE AS A DISINFECTANT OF GUTTA-PERCHA CONES

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Gutta-percha is the most accepted material to fill root canals, for having the lowest degree of tissue irritation. It is therefore essential to ensure the absence of microorganisms on the material. The aim of this study was to evaluate the antimicrobial action of sodium hypochlorite for the disinfection of gutta-percha cones used in endodontics. Gutta-percha cones were exposed to the environment and placed in sodium hypochlorite 1%, 3% and 6% for 1, 5 and 60 min. They were then introduced in test tubes in tryptic soy agar and incubated at 37 °C for 48 h. Finally, samples of the tubes with bacterial growth for Gram stain were examined microscopically. There was also a control group where sterile distilled water was used. Bacterial growth was observed when the cones were dipped in sodium hypochlorite 1% for 1 and 5 min and in sodium hypochlorite 3% for 1 min. There was no bacterial growth in sodium hypochlorite 6%. The results suggest that sodium hypochlorite 6% is a better disinfectant.

Key words: gutta-percha, hypochlorite, disinfectant.

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