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SUPPLEMENTARY ONLINE INFORMATION

Anatomical description and taxonomy of †*Luisiella feruglioi* (Bordas) new combination, a freshwater teleost (Actinopterygii, Teleostei) from the Upper Jurassic of Patagonia

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MATERIAL AND METHODS

The material was prepared mechanically with compressed air, brushes and spicules under the microscope. The specimens were studied under binocular microscope (Wild Heerbrugg, type

355110; Leica M80; Zeiss Stemi SV 11; Nikon SMZ 1000). Line drawings were made with the aid of a camera lucida and later digitalized and redrawn with Adobe Illustrator CS (different versions). Photographs were taken with digital cameras Jenoptik ProgRes C5 (under microscope), Canon EOS 550 D, Sony Alpha DSLR-A100, and Nikon D5100 with an AF-S VR Micro-Nikkor lens and Dino-Lite Pro Digital Microscope. Measurements were taken with a vernier calliper.

Material Referred to †*Luisiella feruglioi*

The specimens are listed according to their locality of provenience.

Puesto Almada

BSPG 1986 XI 13/2; 1986 XI 13/4; 1986 XI 13/6.

MACN 13027–13035; 13037–13055; 13058–13067; 14430; 14431; 14435.

MLP 67-III-1-1–**MLP** 67-III-1-15; **MLP** 67-III-1-17–**MLP** 67-III-1-21; **MLP** 67-III-1-23–**MLP** 67-III-1-26; **MLP** 67-III-1-29; **MLP** 67-III-1-30; **MLP** 67-III-1-32–**MLP** 67-III-1-35; **MLP** 67-III-1-37; **MLP** 67-III-1-40–**MLP** 67-III-1-45; **MLP** 67-III-1-49–**MLP** 67-III-1-53; **MLP** 67-III-1-56–**MLP** 67-III-1-60; **MLP** 67-III-1-63; **MLP** 67-III-1-65; **MLP** 67-III-1-66; **MLP** 67-III-1-68; **MLP** 67-III-1-70–**MLP** 67-III-1-74; **MLP** 76- X-7-16/2; **MLP** 92-XI-30-1–**MLP** 92-XI-30-8; 89-XI-30-1.

MPEF-PV 1385; 1469#3-5; 1469#7-10; 1470#2; 1470#3; 1470#5; 1471; 1472#3; 1472#4; 1472#6; 1472#8-10; 1473; 1474#1-8; 1475#5; 1476#1-4, 1476#6-8, 1476#11; 1477#4; 1477#6; 1477#7; 1478#1; 1478#3-6; 1478#8; 1480; 1481; 1482, 1483; 1484#1; 1484#2; 1484#5; 1484#7-9; 1484#11; 1485#3-5; 1485#7; 1485#8; 1486 A-B; 1487#1; 1487#2; 1487#4-7; 1487#10; 1488#1-8; 1489#2-5; 1489#9; 1491#1; 1491#2; 1491#4; 1491#6; 1492#3; 1493#5; 1494#1; 1494#3; 1608; 1611; 1768; 1769; 3097; 3185; 3186; 3192; 3193; 3195; 3196; 3198; 3200; 3202; 3412–3415; 3419; 3428; 3429; 3432; 3904; 3905; 3908; 3909; 3911; 3912; 3930; 3932; 3934; 3936; 3937; 3939; 3942–3944; 3950; 3951; 3952; 3957, 3960; 3965, 3967, 3977; 3979; 3983–3985; 3987.

Estancia Fernández

MPEF-PV 3096; 3420; 3422–3425; 3427; 3846–3849; 3850–3856; 3858–3861; 3864–3873; 3876; 3877; 3879–3885; 3887; 3910; 3927; 3940; 3954; 3968; 3988; 3989.

Puesto Limonao

MPEF-PV 3411; 3433; 3875; 3888; 3891; 3974; 3906; 3928; 3941; 3955; 3959; 3961; 3969; 3982; 3986; 10534.

Sierra de la Manea

MPEF-PV 1354; 1388; 1389; 1654; 3170; 3417; 3418; 3421; 3426; 3431; 3837; 3931; 3933; 3935; 3938; 3945-3949; 3953; 3956; 3962-3964; 3966; 3980; 3981; 10535.

Morphometric Measurements and their Abbreviations

All measurements were taken as distances following the longitudinal and transverse planes of the body of the fishes (Fig. S1).

Body depth (BD): maximal vertical depth of the body measured from the origin of the dorsal fin straight down to the ventral midline.

Head depth (HD): maximal vertical depth of the head measured at the level of the occiput.

Head length (HL): distance from the tip of the snout (premaxilla) to the transverse line tangential to the most posterior point of the posterior border of the operculum.

Head length to Preoperculum (HLP): distance from the tip of the snout (premaxilla) to the transverse line tangential to the most posterior point of the posterior border of the preoperculum.

Orbital diameter (OD): longitudinal diameter of the orbit.

Snout length (SNL): distance from the tip of the snout (premaxilla) to the anterior margin of the eye orbit.

Pectoral-pelvic length (PPL): distance between the bases of the pectoral and pelvic fins.

Pelvic-anal length (PAL): distance between the basis of the pelvic fin and the origin of the anal fin.

Anal-caudal length (ACL): distance from the origin of the anal fin to the transverse line tangential to the most distal border of the hypurals.

Standard length (SL): distance from the tip of the snout (premaxilla) to the transverse line

tangential to the most distal border of the hypurals.

Total length (TL): distance from the tip of the snout (premaxilla) to the transverse line tangential to the end of the longest caudal fin rays.

Anatomical Nomenclature

The anatomical nomenclature used in this paper follows different authors. For the skull and vertebral column it follows Patterson (1975) and Patterson and Johnson (1995), elements of the hyoid arch and branchiostegal rays are named after Jarvik (1963) and Mc Allister (1964) whereas axial elements between the abdominal and caudal regions of the vertebral column are named after Mirande (2010). Cephalic sensory canals and pit lines have been identified following Nelson (1972).

The nomenclature used for the pelvic girdles and fins follow Potthoff (1980) and Stiassny and Moore (1992). Unpaired fin rays are described following Hubbs and Lagler (1947). Elements of the caudal fin have been interpreted according to Nybelin (1963), Monod (1968), Arratia (1991, 2008, 2009), and Grande and Bemis (1998), except for the uroneurals, which have been interpreted after Patterson (1968) and Arratia and Schultze (1992). A complete summary of the teleost caudal fin terminology followed in this contribution has been recently published by Schultze and Arratia (2013).

SUPPLEMENTARY TABLE S1. Skull and Standard Length measurements of 28 specimens of †*Luisiella feruglioi* (in cm). An “*” indicates estimated values.

Collection number	SL	HL	HLP	SNL	OD	HD
MACN 13069	9.2	2.27	1.55	0.47	0.55	1.79
MACN 14430	8.4*	2.02	1.49	0.43	0.49	1.71
MACN 13048	9.0	2.39	1.65	0.49	0.63	1.88
MACN 13031	8.5*	2.21	1.57	0.48	0.5	1.62
MACN 14431	9.9	2.54	1.8	0.53	0.55	2.05
MACN 13026	8.4	2.26	1.65	0.4*	0.55	1.99
MACN 13043	8.8	2.18	1.63	0.48	0.57	1.84
MACN 14435	8.5*	2.17	1.56	0.5	0.59	1.91
MLP 35-III-1-4	8.0*	2.15	1.54	0.49	0.54	1.63
MPEF-PV 3884	6.8	1.55	1.11	0.33	0.41	1.35
MPEF-PV 3883	6.9	1.66	1.2	0.32	0.48	1.36
MPEF-PV 3846	9.3	2.65	2.05	0.6	0.61	1.9
MPEF-PV 3927	8.6*	1.93	1.34	0.47	0.52	1.92
MPEF-PV 3930	7.85	2.04	1.4	0.42	0.56	1.58
MPEF-PV 3964	9.27	2.27	1.67	0.47	0.57	1.87
MPEF-PV 3982	9.25	2.64	1.83	0.58	0.61	1.85
MPEF-PV 1354	8.26	2.43	1.6	0.58	0.66	1.69
MPEF-PV 3417	8.64	2.22	1.64	0.56	0.63	1.72
MPEF-PV 3988	7.8*	1.92	1.38	0.47	0.47	1.67
MPEF-PV 1389	8.5*	2.15	1.48	0.5	0.6	1.63
MPEF-PV 3961	6.0*	1.67	1.08	0.36	0.44	1.08
MPEF-PV 3948	8.3*	2.31	1.58	0.47	0.55	1.57
MPEF-PV 3949	8.7*	2.03	1.34	0.51	0.53	1.64
MPEF-PV 3934	8.8	2.47	1.78	0.59	0.64	1.79*
MPEF-PV 3936	10	2.76	2.07	0.74	0.82	2.2
MPEF-PV 3185	7.0*	1.65	1.15	0.33	0.38	1.36

SUPPLEMENTARY TABLE S1 (Continued)

Collection number	SL	HL	HLP	SNL	OD	HD
MPEF-PV 3431	6.39*	1.71	1.22	0.45	0.44	1.32
MPEF-PV 3421	8.3*	2.03	1.39	0.54	0.54	1.71
N=28	$\bar{x}$ =8.33	$\bar{x}$ =2.15	$\bar{x}$ =1.52	$\bar{x}$ =0.48	$\bar{x}$ =0.55	$\bar{x}$ =1.70

SUPPLEMENTARY TABLE S2. Preoperculum and operculum measurements of 29 specimens of †*Luisiella feruglioi*, (in cm). An “*” indicates estimated values.

Collection number	Preoperculum horizontal limb length	Preoperculum vertical limb length	Angle among limbs	Operculum anterior border length	Operculum ventral border length	Operculum anteroventral angle
MACN 13069	0.63	0.88	110°	0.98	0.78	40°
MACN 13046	0.79	0.95	108°	1.21	1.01	39°
MPEF-PV 1769	0.7	1.29	110°	1.27	1.04	40°
MPEF-PV 3185	0.47	0.87	110°	0.8	0.62	42°
MPEF-PV 3193	0.6	1.04	-	0.95	0.76	40°
MPEF-PV 3431	0.49	0.84	114°	0.76	0.59	40°
MPEF-PV 3426	0.63	1.14	112°	0.84	0.69	38°
MPEF-PV 3417	0.69	1.17	111°	1.02	0.8	38°
MPEF-PV 1385	0.75	1.38	112°	1.28	1.13	40°
MPEF-PV 1389	0.6	1.106	109°	1.05	0.82	40°
MPEF-PV 1354	0.65	1.17	110°	0.96	0.8	38°
MPEF-PV 3959	0.43	0.76	-	0.57	0.46	41°
MPEF-PV 3949	0.58	1.03	110°	1.1	0.87	40°
MPEF-PV 3948	0.65	1.12	108°	0.94	0.78	42°
MPEF-PV 3936	0.7	1.3	111°	1.18	0.94	40°
MPEF-PV 3941	0.55	0.94	110°	0.79	0.65	38°

SUPPLEMENTARY TABLE S2 (Continued)

Collection number	Preoperculum horizontal limb length	Preoperculum vertical limb length	Angle among limbs	Operculum anterior border length	Operculum ventral border length	Operculum anteroventral angle
MPEF-PV 3887	0.54	0.97	110°	0.84	0.68	40°
MPEF-PV 3879	0.59	0.98	109°	0.92	0.77	40°
MPEF-PV 1608-1	0.41	0.72	107°	0.7	0.58	41°
MPEF-PV 3987	0.62	1.03	108°	0.98	0.76	42°
MPEF-PV 3930	0.61	1.12	110°	0.94	0.78	40°
MPEF-PV 3876	0.63	1.11	109°	0.94	0.75	41°
MPEF-PV 3859	0.68	1.21	110°	1	0.82	42°
MPEF-PV 3858	0.53	0.91	108°	0.81	0.67	40°
MPEF-PV 3891	0.55	0.95	110°	0.81	0.68	39°
MPEF-PV 3979	0.52	0.94	108°	0.93	0.78	40°
MPEF-PV 1481	0.63	1.09	109°	1.12	0.88	40°
MPEF-PV 1388	0.71	1.34	109	1.18	0.98	40°
MPEF-PV 1654	0.59	1.04	108°	0.78	0.62	40°
N= 29	$\bar{x}$ =0.60	$\bar{x}$ =1.05	R=107°–111°	$\bar{x}$ =0.95	$\bar{x}$ =0.77	R =38°–42°

SUPPLEMENTARY TABLE S3. Postcranial and standard length measurements of 26 specimens of †*Luisiella feruglioi* (in cm). An “*” indicates estimated values.

Collection number	SL	PPL	PAL	ACL
MACN 13069	9.2*	2.25	2.01	-
MACN 14430	8.4*	2.52	1.98	2.09
MACN 14431	9.9	2.65	2.18	2.43
MACN 13043	8.8	2.43	1.87	2.39
MACN 14435	8.5*	2.06	1.8	1.88
MPL 35-III-1-4	8.0*	2.13	1.75	1.9

SUPPLEMENTARY TABLE S3 (Continued)

Collection number	SL	PPL	PAL	ACL
MPEF-PV 3884	6.8	1.72	1.48	1.63
MPEF-PV 3846	9.3	2.51	1.9	2.02
MPEF-PV 3927	8.6*	2.14	1.77	2.18
MPEF-PV 3930	7.85	1.88	1.68	1.81
MPEF-PV 3964	9.27	2.13	2.09	2.06
MPEF-PV 3982	9.25	2.33	2.03	2.05
MPEF-PV 1354	8.26	2.26	1.78	1.82
MPEF-PV 3417	8.64	2.4	2.03	2.16
MPEF-PV 3422	8.07	2.41	1.94	2.14
MPEF-PV 3097	9*	2.95	2.27	2.28
MPEF-PV 3096	9.7*	2.82	2.13	2.14
MPEF-PV 3989	1.05*	2.57	2.05	2.26
MPEF-PV 1389	8.5*	2.72	1.94	2.02
MPEF-PV 3955	8.0*	2.14	1.68	1.74
MPEF-PV 3953	5.9	1.73	1.32	1.58
MPEF-PV 3937	10.32	2.67	2.18	2.66
MPEF-PV 3936	10.07	2.63	2.05	2.08
MPEF-PV 3186	9.71*	2.76	2.02	2.3
MPEF-PV 3431	6.39*	1.67	1.57	1.51
MPEF-PV 3951	4.92*	1.24	1.01	1.28
N=26	$\bar{x}$ =8.56	$\bar{x}$ =2.29	$\bar{x}$ =1.86	$\bar{x}$ =2.01

SUPPLEMENTARY TABLE S4. Body proportions (expressed as percentages, %) calculated from individual measurements of 28 specimens of †*Luisiella feruglioi* shown in Table S1. An “*” indicates estimated values.

Collection number	HL/SL	HD/HL	SNL/OD	SNL/HL	OD/HL	HL-HLP/HL
MACN 13069	24.67	78.85	85.45	20.70	24.22	31.71
MACN 14430	24.04*	84.65	87.75	21.28	24.25	26.23
MACN 13048	26.55	78.66	77.77	20.50	26.35	30.96
MACN 13031	26*	73.30	96	21.71	22.62	28.95
MACN 14431	25.65	80.70	96.36	20.86	21.65	29.13
MACN 13026	26.9	88.05	72.72*	17.86*	24.33	26.99
MACN 13043	24.77	84.40	84.21	22.01	26.14	25.22
MACN 14435	25.52*	88.01	84.74	23.04	27.18	28.11
MLP 35-III-1-4	26.87*	75.81	90.74	22.79	25.11	28.37
MPEF-PV 3884	22.79	87.09	80.48	21.29	26.45	28.38
MPEF-PV 3883	24.05	81.92	66.66	19.27	28.91	27.71
MPEF-PV 3846	28.49	71.69	98.36	22.64	23.01	22.64
MPEF-PV 3927	22.44*	99.48	90.38	24.35	26.94	30.56
MPEF-PV 3930	25.98	77.45	75	20.58	27.45	31.37
MPEF-PV 3964	24.48	82.37	82.45	20.70	25.11	26.43
MPEF-PV 3982	28.54	70.07	95.08	21.96	23.10	30.86
MPEF-PV 1354	29.41	69.54	87.87	23.86	27.16	34.15
MPEF-PV 3417	25.69	77.47	88.88	25.22	28.37	26.12
MPEF-PV 3988	24.61*	86.97	100	24.47	24.47	28.12
MPEF-PV 1389	25.29*	75.81	83.33	23.25	27.90	31.16
MPEF-PV 3961	27.83*	64.67	81.81	21.55	26.34	35.32
MPEF-PV 3948	27.83*	67.96	85.45	20.34	23.80	31.60
MPEF-PV 3949	23.33*	80.78	96.22	25.12	26.10	33.99
MPEF-PV 3934	28.06	72.46	92.18	23.88	25.91	27.93*
MPEF-PV 3936	27.6	79.71	90.24	26.81	29.71	25
MPEF-PV 3185	23.57*	82.42	86.84	20	23.03	30.30

SUPPLEMENTARY TABLE S4 (Continued)

Collection number	HL/SL	HD/HL	SNL/OD	SNL/HL	OD/HL	HL-HLP/HL
MPEF-PV 3431	26.76*	77.19	102.27	26.31	25.73	28.65
MPEF-PV 3421	24.45*	84.23	100	26.60	26.60	31.52
N=28	$\bar{x}$ =25.81	$\bar{x}$ =79.34	$\bar{x}$ =87.82	$\bar{x}$ =22.46	$\bar{x}$ =25.6	$\bar{x}$ =29.18

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FIGURE S1. Morphometric measurements used in this study.