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29	Abstract A new hoplichthyid species, <i>Hoplichthys mcgroutheri</i> , is described on the basis of
30	six specimens (188–244 mm standard length) collected off southwestern Australia. It is
31	clearly distinguished from its congeners by the following combination of characters:
32	dorsal-fin rays V-14; anal-fin rays 16–17, usually 16; pectoral-fin rays $13-14+4-5=17-18$,
33	usually $14 + 4 = 18$; infraorbitals mostly spineless; scales present on dorsal surface of body;
34	vomerine tooth patch constricted medially, mostly separating teeth into bilaterally
35	symmetrical patches; interorbit narrow [interorbital width 5.8–6.8 % of head length (HL)];
36	and orbit relatively large (orbital diameter 41.8–44.9 % HL). The form of the vomerine
37	tooth patch is unique to <i>H. mcgroutheri</i> in this genus.
38	
39	Keywords Hoplichthys mcgroutheri · Hoplichthyidae · New species · Australia

43 Introduction

44

45Ghost flatheads of the family Hoplichthyidae, which consist of only one genus Hoplichthys 46 Cuvier in Cuvier and Valenciennes 1829 and 12 valid species, inhabit the continental shelves and their slopes at depths of ca. 50-1,500 m in the central and western Pacific and Indian 47oceans (Matsubara and Ochiai 1950a; McGrouther 1999; Nagano et al. 2012, 2013a, b). 48 Hoplichthys is characterized by an extremely depressed head, the dorsal surfaces of the head 4950and body covered with many spines and serrated ridges, an elongated and mostly scaleless body, one or two rows of spines on the lateral scutes along the body, and the ventralmost three 5152to five pectoral-fin rays free. During our ongoing study of ghost flatheads, we found specimens of an undescribed 5354species of *Hoplichthys* (Fig. 1) collected from southwestern Australia and deposited in the 55ichthyological collections of the Australian National Fish Collection, Commonwealth Scientific and Industrial Research Organization, Division of Marine and Atmospheric 56Research, Hobart (CSIRO), Museum Victoria, Melbourne (NMV) and the National Museum 57of Nature and Science, Tsukuba (NSMT). These specimens resemble Hoplichthys haswelli 5859McCulloch 1907, which is known from southern Australia and New Zealand, in having 60 mostly spineless infraorbitals, scales present on the dorsal surface of the body, V-14 dorsal-fin rays, usually 16 anal-fin rays and usually 18 total pectoral-fin rays, but differ from it in other 61morphological characters (e.g., form of vomerine tooth patch, interorbital width and orbital 6263 diameter). We herein describe them as a new species. 64 65 Materials and methods 66

⁶⁸ Counts and proportional measurements follow Nagano et al. (2013b), except for head width 1

measured at the anterior margin of the eye, head width 2 at the inner base of the posteriormost 69 70preopercular spine, and head width 3 at the outer base of the posteriormost preopercular spine. 71Data for holotype are presented first, followed by those of paratypes in parentheses if different. 72Gill rakers were counted on the outer row of the first gill arch of the right side. Vertebrae were counted from radiographs. Sex was determined from the shape of gonads by 73microscope examination. Measurements were made with calipers to the nearest 0.1 mm. 74Standard and head lengths are abbreviated as SL and HL, respectively. Counts of spines on 7576the head are given as "left side/right side". The pectoral-fin ray count is shown as "joined pectoral-fin rays + free pectoral-fin rays = total pectoral-fin rays". The terminology for 77spines and ridges on the dorsal surface of the head is given in Fig. 2, following Nagano et al. 78(2013b). Institutional abbreviations follow Fricke and Eschmeyer (2014). 7980 81 82 Hoplichthys mcgroutheri sp. nov. (New English name: McGrouther's ghost flathead) (Figs. 1–2, 3a, 4; Table 1) 83 84 85 Holotype. CSIRO H.6395-03, 218 mm SL, female, 35°14.02'S, 118°39.84'E–35°13.67'S, 86 118°40.50'E, off Albany, Western Australia, 728–710 m depth, beam trawl, FR/V Southern Surveyor, 23 Nov. 2005. 87 Paratypes. Five specimens. CSIRO H.1704-06, 188 mm SL, sex undetermined, 88 29°14.2'S, 113°52.2'E, off Geraldton, Western Australia, 556 m depth, demersal trawl, 28 Jan. 89 1989; CSIRO H.2005-02, 208 mm SL, sex undetermined, 33°03.2'S, 114°25.2'E, off Bunbury, 90 91 Western Australia, 701 m depth, bottom trawl, 10 Feb. 1989; CSIRO H.2601-01, 223 mm SL, 92 female, 30°39.1'S, 114°27.7'E-30°39.0'S, 114°27.6'E, off Wedge Island, Western Australia, 1,058–1,080 m depth, demersal trawl, FR/V Southern Surveyor, 9 Feb. 1991; NMV A.9617, 93 240 mm SL, female, 32°03'S, 115°14'E-32°00'S, 115°15'E, 35 km west of Rottnest Island, 94 $\mathbf{5}$

95 Western Australia, 510 m depth, FR/V Southern Surveyor, collected by M. F. Gomon, 12 Feb.

96 1991; NSMT-P 112996, 244 mm SL, female, 31°32.9'S, 114°48.2'E, Western Australia, 603 m

97 depth, R/V Kaiyo-maru, 15 Nov. 1975.

Diagnosis. A species of *Hoplichthys* with the following combination of characters: dorsal-fin rays V-14; anal-fin rays 16–17, usually 16; pectoral-fin rays 13–14 + 4–5 = 17–18, usually 14 + 4 = 18; infraorbitals mostly spineless; scales present on dorsal surface of body; vomerine tooth patch constricted medially mostly separating teeth into bilaterally symmetrical patches; interorbit narrow (interorbital width 5.8–6.8 % HL) and orbit relatively large (orbital diameter 41.8–44.9 % HL).

Description. Counts and proportional measurements are provided in Table 1.

105Head extremely depressed, depth 3.4 (3.4–3.9) in head width 3. Body elongate, slightly depressed, depth 1.3 (1.1–1.7) in body width. Snout paddle-like; preoptic snout length 106107longer than vertical eye diameter, 1.2 (1.1–1.3) in postorbital length. Anterior nostril located 108 mesial to anterior part of lachrymal, possessing short tube and long cirrus on posterior margin; 109posterior nostril slit-like, located mesial to central part of lachrymal, of same size as anterior 110 Single cephalic sensory pore located anterior to anterior nostril. Upper jaw slightly nostril. 111 longer than lower jaw, but shorter than preoptic snout; posterior edge of maxilla not reaching 112below anterior margin of eye, but extending to base of posteriormost spine in inner ridge on 113first infraorbital. Teeth large and conical, forming tooth bands on jaws and palatines, and tooth patch on vomer; vomerine tooth patch constricted medially mostly separating teeth into 114115bilaterally symmetrical patches, a few small teeth in single row across midline (Fig. 3a). 116 Anterior margin of tongue concave. Orbit relatively large, its diameter almost equal to 117postorbital length. Eye relatively large; vertical eye diameter 1.9 (1.5–1.9) in preoptic snout 118 Interorbit concave and relatively narrow; interorbital width 3.2 (3.0-4.0) in vertical length. 119eye diameter. Posterior margin of opercle relatively rounded. Lower margin of 120 branchiostegal membrane fused with isthmus. Gill rakers extremely short and knob-like;

many minute spines on each raker. Several spines and ridges on dorsal surface of head (Fig. 1211222). Single paired ridges on dorsal midline anteriorly on head, without spines on snout, but 123with some spines on inner margin of orbit. Single strongly developed spine on posterior 124margin of orbit. Lachrymal without spines, but anterolateral margin minutely serrated. 125Two ridges on first infraorbital, inner ridge on dorsal surface and outer ridge on lateral side; inner ridge smooth and without spines, except for single well developed spine directed 126posterodorsally on posterior edge; outer ridge devoid of spines. Two ridges on second 127128infraorbital, inner ridge on dorsal surface and outer ridge on lateral side; inner ridge smooth 129and without spines, except for single well-developed spine directed posterodorsally on 130posterior edge; anterior part of outer ridge slightly serrated, and with minute laterally directed 131spines posteriorly. Ventral surface of lachrymal, and first and second infraorbitals smooth, without spines. Dorsal surface of third infraorbital mostly smooth, with single small spine 132133directed dorsally on central portion. Fourth infraorbital smooth, without spines and ridges. Single row of preopercular spines present laterally; those anteriorly minute and directed 134laterally; penultimate spine better developed, directed posterodorsally; posteriormost spine 135largest, directed posteriorly, not reaching posterior margin of opercle. Dorsal surface of 136137preopercle smooth, without spines and ridges. Single opercular spine directed posteriorly, 138not reaching posterior edge of opercle. Two ridges on dorsal surface of opercle directed 139posteriorly, radiating from anteromesial corner of opercle; outer ridge slightly serrated anteriorly, smooth (with a few spines) posteriorly, with terminal opercular spine; inner ridge 140with several small spines, directed toward posteromesial corner of opercle; no spines on 141142lateral, mesial and middle parts of these two ridges. Single parietal spine large, directed 143posterodorsally; no spines around parietal spine. Single small spine present lateral to 144parietal spine. No spines in area between posterior margin of orbit and parietal spine. 145Single well-developed posttemporal spine present anterior to more strongly developed spine on first lateral scute; two ridges directed anteriorly from posttemporal spine; small spines on 146

147inner ridge of posttemporal spine; no spines on outer ridge of posttemporal spine. No spines 148on ventral surface of lower jaw posterior to maxilla. Single ridge without humeral spine 149(with single humeral spine on its posterior edge on right side in one paratype) posterior to 150Single row of lateral scutes dorsolaterally along body; well-developed single spine opercle. directed posterodorsally on central portion of each scute, with small ridge on its inner base; 151spines becoming progressively larger posteriorly, posterior three spines becoming smaller 152posteriorly; no other spines on lateral scutes; terminal scute extending to caudal-fin base. 153154Scales embedded in skin on dorsal surface of body, between lateral scutes on both sides from posterior area of parietal spines to base of caudal fin; scales absent ventrally. First dorsal fin 155low, originating above third lateral scute (third or junction between third and fourth lateral 156157scutes) and ending above sixth lateral scute; length of first dorsal-fin base 7.4 (6.3–7.9) in HL; tip of adpressed dorsal fin not reaching origin of second dorsal fin; first to second dorsal-fin 158159spines longest, and third to fifth dorsal-fin spines progressively shorter posteriorly. Second 160 dorsal fin originating above junction between ninth and 10th lateral scutes and ending above 16122nd lateral scute (junction between 22nd and 23rd lateral scutes); length of second dorsal-fin 162base 1.1 in length of anal-fin base; second dorsal-fin soft ray longest and second to 14th 163dorsal-fin soft rays becoming progressively shorter posteriorly; last (14th) dorsal-fin soft ray 164 shortest. All dorsal-fin spines and soft rays neither elongate nor filament-like. Pectoral fin originating just behind posterior edge of opercle, reaching 14th (13th) lateral scute; fourth and 165166 fifth (fourth, or fourth and fifth) rays longest, length 1.8 (1.8–2.0) in HL. Lower four (four or five) rays of pectoral fin thick and free, shorter than remaining joined pectoral-fin rays, not 167168 reaching anus; its length 2.9 (2.7–3.1) in HL. Pelvic-fin base anterior to pectoral-fin base; 169distal tip of pelvic fin reaching below fourth lateral scute (third or junction between third and 170fourth lateral scutes); pelvic-fin length 4.2 (4.4–4.7) in HL. Anal fin lower than second 171dorsal fin, originating below 10th lateral scute (junction between 10th and 11th lateral scutes), 172ending below junction between 24th and 25th lateral scutes; first anal-fin ray short, its length

1.3 (1.0–1.4) in length of last anal-fin ray. Caudal fin almost truncate with upper lobe
slightly longer than lower lobe; depth of caudal peduncle 8.3 (6.7–7.8) in caudal-fin length.
Anus slightly anterior to origin of anal fin.

Color of fresh specimen (based on photograph of holotype, Fig. 1a, b). Dorsal surface
of head and body rusty brown to pale rusty brown; ventral side white. Dorsal fins light gray.
Pectoral fin rusty on anterodorsal area and paler on posteroventral area; free pectoral-fin rays
white. Pelvic fin white. Upper, posterior and lower margins of caudal fin gray; small
brown spot on ventral portion of caudal-fin base.

Color of preserved specimen. Color mostly faded, light yellowish-white on head and
body. Light gray on upper edges of opercles, dorsal fins, lower margin of anal fin and bases
of spines on each lateral scute. Margins of caudal fin gray. Peritoneum black.

Distribution. Off the southwestern corner of Australia, at depths of 510–1,080 m.

185 **Etymology.** The specific name "*mcgroutheri*" recognizes Mr. Mark A. McGrouther,

186 the collection manager of Ichthyology of Australian Museum (AMS), for his valuable

187 contributions to the taxonomy of the Hoplichthyidae.

188 Remarks. *Hoplichthys mcgroutheri* is most similar to *H. haswelli* and differs from its
189 other congeners [*Hoplichthys langsdorfii* Cuvier *in* Cuvier and Valenciennes 1829,

190 Hoplichthys citrinus Gilbert 1905, Hoplichthys platophrys Gilbert 1905, Hoplichthys gilberti

191 Jordan and Richardson 1908, Hoplichthys regani Jordan 1908, Hoplichthys acanthopleurus

192 Regan 1908, Hoplichthys ogilbyi McCulloch 1914, Hoplichthys fasciatus Matsubara 1937,

193 Hoplichthys gregoryi (Fowler 1938), Hoplichthys prosemion (Fowler 1938), Hoplichthys

194 smithi (Fowler 1938), Hoplichthys pectoralis (Fowler 1943), Hoplichthys filamentosus

195 Matsubara and Ochiai 1950b, *Hoplichthys mimaseanus* Nagano, Endo and Yabe 2013 and

196 Hoplichthys imamurai Nagano, McGrouther and Yabe 2013] in having five dorsal-fin spines,

197 14 dorsal-fin soft rays, usually 16 anal-fin rays, usually 18 total pectoral-fin rays, mostly

spineless infraorbitals, scales on the dorsal surface of the body and a black peritoneum (vs. six

dorsal-fin spines, 15 dorsal-fin soft rays, usually 17 anal-fin rays, usually 16 pectoral-fin rays, 199200many spines on infraorbitals, body naked except for lateral scutes and colorless peritoneum in 201other congeners). Hoplichthys mcgroutheri can be clearly distinguished from H. haswelli in 202having the vomerine tooth patch constricted medially, mostly separating teeth into bilaterally symmetrical patches (vs. vomerine tooth patch deeply notched posteromedially, but broadly 203continuous anteriorly in H. haswelli) (Fig. 3), a narrower interorbit (interorbital width 5.8-2046.8 % HL in H. mcgroutheri vs. 9.2-14.8 % HL in H. haswelli; Fig. 4a) and a relatively larger 205206orbit (orbital diameter 41.8–44.9 % HL vs. 37.3–41.0 % HL; Fig. 4b). In addition, H. mcgroutheri usually has larger eyes (19.7–22.8 % HL) and shorter pelvic fins (8.7–9.4 % SL) 207than H. haswelli (eye diameter 13.9–20.3 % HL and pelvic-fin length 8.5–10.9 % SL), 208209 although some overlap exists in proportional values (Fig. 4c, d). The form of the vomerine 210tooth patch is unique to *H. mcgroutheri* within the genus.

211Some species of Hoplichthys (H. langsdorfii, H. citrinus, H. gilberti, H. ogilbyi and H. filamentosus) have sexual dimorphism in the forms of the first and second dorsal fins and 212caudal fin (Nagano et al. 2013b). However sexual dimorphism, including the forms of the 213dorsal and caudal fins, was not observed in *H. haswelli* (in seven males and 13 females), 214215which has most similar morphological characters to *H. mcgroutheri*. Although all examined 216specimens of *H. mcgroutheri* are female or sex undetermined (in four and two specimens, respectively), we consider the forms of the dorsal and caudal fins of this new species not to be 217dimorphic sexually. 218

Comparative material. *Hoplichthys langsdorfii* (14 specimens including 12 males and
2 females, Tosa Bay, Japan): HUMZ 47450 (144 mm SL), HUMZ 75338 (151 mm SL),

221 HUMZ 79116 (153 mm SL), HUMZ 107569 (159 mm SL), HUMZ 110859–110860 (2

222 specimens, 158–167 mm SL), HUMZ 204809 (155 mm SL), HUMZ 205049–205054 (6

- specimens, 137–159 mm SL), HUMZ 207784 (153 mm SL). Hoplichthys citrinus (8
- specimens including 5 males and 3 females, Hawaii): USNM 51610 (holotype, 152 mm SL),

AMS I.12813 (paratype, 168 mm SL), USNM 51670 (paratype, 155 mm SL), USNM 51704 225226(5 paratypes, 135–185 mm SL). *Hoplichthys platophrys* (1 specimen, sex undetermined): 227USNM 51620 (holotype, 60.9 mm SL, Hawaii). Hoplichthys gilberti (10 specimens 228including 1 male, 4 females and 5 specimens sex undetermined, Suruga Bay, Japan): USNM 51271 (holotype, 127 mm SL), SU 20229 (2 paratypes, 110-162 mm SL), USNM 398507 (7 229paratypes, 78.2–140 mm SL). Hoplichthys regani (1 specimen, male): SU 22390 (holotype, 230145 mm SL, Kagoshima, Japan). Hoplichthys acanthopleurus (2 specimens including 1 231232male and 1 female): BMNH 1908.3.23.210-211 (syntypes, 150-157 mm SL, Saya de Malha 233Bank). Hoplichthys ogilbyi (2 specimens including 1 male and 1 female, Queensland): AMS E.2974 (holotype, 163 mm SL), AMS I.12812 (paratype, 132 mm SL). Hoplichthys 234fasciatus (11 specimens, sex undetermined): BSKU 8896 (47.0 mm SL, Tosa Bay, Japan), 235BSKU 9512-9513 (2 specimens, 45.6-48.5 mm SL, Tosa Bay, Japan), BSKU 11376 (43.4 236237mm SL, Tosa Bay, Japan), BSKU 45862 (52.2 mm SL, Tosa Bay, Japan), BSKU 64453 (44.6 mm SL, Tosa Bay, Japan), BSKU 80757 (48.2 mm SL, Tosa Bay, Japan), BSKU 94894 (51.5 238mm SL, Tosa Bay, Japan), BSKU 95743 (41.3 mm SL, Tosa Bay, Japan), FAKU 1816 (43.7 239mm SL, Mie, Japan), HUMZ 205016 (42.9 mm SL, Tosa Bay, Japan). Hoplichthys gregoryi 240241(5 specimens including 1 male and 4 females, Philippines): USNM 98862 (holotype, 168 mm 242SL), USNM 150813 (4 paratypes, 119–180 mm SL). Hoplichthys prosemion (1 specimen, male): USNM 98863 (holotype, 148 mm SL, Philippines). Hoplichthys smithi (1 specimen, 243sex undetermined): USNM 59588 (85.9 mm SL, Kagoshima, Japan). Hoplichthys pectoralis 244(1 specimen, sex undetermined): USNM 99503 (holotype, 61.1 mm SL, Philippines). 245Hoplichthys filamentosus (1 specimen, female): FAKU 11918 (holotype, 110 mm SL, Suruga 246Bay, Japan). *Hoplichthys mimaseanus* (2 specimens including 1 male and 1 female): 247NSMT-P 109034 (holotype, 218 mm SL, Tosa Bay, Japan), ASIZP 63198 (paratype, 206 mm 248249SL, Senkaku Islands). Hoplichthys imamurai (3 specimens, male, Western Australia): AMS I.22807-040 (holotype, 143 mm SL), AMS I.22807-066 (paratype, 144 mm SL), AMS 250

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I.31156-016 (paratype, 129 mm SL). Hoplichthys haswelli (25 specimens including 7 males, 25125213 females and 5 specimens sex undetermined): New South Wales: AMS I.7892 (holotype, 253369 mm SL), AMS I.15968-009 (2 specimens, 259-336 mm SL), AMS I.15970-013 (232 mm SL), AMS I.15990-003 (247 mm SL), AMS I.18125-005 (384 mm SL), AMS I.18838-030 254(376 mm SL), AMS I.18838-031 (299 mm SL), AMS I.18838-032 (345 mm SL), AMS 255I.25318-006 (1 of 15 specimens, 357 mm SL), AMS I.31947-007 (1 of 3 specimens, 197 mm 256SL), AMS I.33436-001 (325 mm SL), AMS I.43247-002 (1 of 2 specimens, 269 mm SL), 257CSIRO CA.3208 (161 mm SL), USNM 399491 (182 mm SL); Victoria: CSIRO H.3522-03 258(303 mm SL), NMV A.2988 (249 mm SL); Bass strait between Victoria and Tasmania: NMV 259A.12322 (1 of 2 specimens, 222 mm SL); Western Australia: CSIRO H.1807-01 (377 mm SL), 260CSIRO H.3012-01 (336 mm SL), CSIRO H.6414-15 (346 mm SL), CSIRO H.6414-16 (334 261mm SL), CSIRO H.6414-17 (340 mm SL), CSIRO H.6414-18 (362 mm SL), NMV A.12324 262263(1 of 2 specimens, 159 mm SL).

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Table 1 Counts and proportional measurements of *Hoplichthys mcgroutheri* sp. nov. and *H*.

- 329 haswelli

	H. mcgroutheri		H.haswelli	
	Holotype	Paratypes	Holotype	Non-types
	CSIRO H.6395-03	(<i>n</i> = 5)	AMS I.7892	(<i>n</i> = 24)
Standard length (SL, mm)	218	188–244	369	159–384
Counts				
First dorsal-fin rays	V	V	Damaged	V–VI
Second dorsal-fin rays	14	14	14	14–15
Anal-fin rays	16	16–17	16	15–16
Pectoral-fin rays	14 + 4 = 18	13-14 + 4-5 = 17-18	15 + 4 = 19	13-15+4-5=17-19
Pelvic-fin rays	I, 5	I, 5	I, 5	I, 5
Gill rakers	3 + 14 = 17	3-4 + 13-15 = 16-19	3 + 14 = 17	3 + 12-15 = 15-18
Branchiostegals	7	7	7	7
Vertebrae	26	26	26	26
Lateral scutes	27	27	27	26–28
Head spines				
Spines on lachrymal	0/0	0/0	Uncounted	Uncounted
Inner ridge spines on first infraorbital	1/1	1/1	Uncounted	Uncounted
Outer ridge spines on first infraorbital	0/0	0/0	Uncounted	Uncounted
Inner ridge spines on second infraorbital	1/1	1/1	Uncounted	Uncounted
Outer ridge spines on second infraorbital	0/0	0/0	Uncounted	Uncounted
Preopercular spines	7/7	6-7/6-7	Uncounted	Uncounted
Spines on ventral surface of lower jaw	0/0	0/0	0/0	0/0
Proportional measurements (% SL)				
Head length (HL)	39.4	39.8–41.6	40.5	38.9–42.4
Body depth	7.9	6.6–8.2	9.7	5.8-8.7
Body width	10.3	8.6–11.0	9.7	8.4–12.9
Pre-first dorsal length	39.1	39.5–41.6	Damaged	37.6–41.8
Length of first dorsal-fin base	5.3	5.1–6.3	Damaged	5.5–7.2
Length of first dorsal-fin spine	5.9	8.3–9.5	Damaged	6.9–10.1
Length of second dorsal-fin spine	5.8	8.0-8.8	Damaged	7.8–9.9
Length of third dorsal-fin spine	5.9	7.0-8.8	Damaged	6.4–9.1
Length of fourth dorsal-fin spine	4.2	4.1–6.9	Damaged	4.3–7.6
Length of fifth dorsal-fin spine	2.6	2.8–4.6	Damaged	2.8–5.1
Pre-second dorsal length	51.9	53.1-55.0	55.6	51.1–55.7

Length of second dorsal-fin base	34.7	32.7–34.9	34.1	31.9–36.4
Length of first dorsal-fin soft ray	Damaged	10.6–12.4	11.5	10.6–13.0
Length of second dorsal-fin soft ray	13.4	11.6–12.9	12.2	11.8–13.3
Length of sixth dorsal-fin soft ray	10.6	9.7–10.4	10.2	9.6–11.3
Length of 13th dorsal-fin soft ray	5.7	5.0-6.3	5.7	5.0-7.0
Length of 14th dorsal-fin soft ray	3.9	3.1-4.0	4.4	3.4–5.4
Pre-anal length	53.8	54.8–57.8	58.3	53.2-59.2
Length of anal-fin base	39.4	36.0–39.2	36.2	33.8–39.6
Length of first anal-fin ray	3.4	3.1-4.2	2.1	2.6–4.6
Pectoral-fin length	22.0	20.7–21.9	23.3	22.0–29.2
Length of longest free pectoral-fin ray	13.4	13.3–14.6	11.2	10.5–14.7
Pelvic-fin length	9.3	8.7–9.4	9.8	8.5–10.9
Caudal peduncle depth	1.9	1.8–2.2	2.5	2.0–2.7
Length of upper caudal peduncle	14.0	12.1–13.3	10.3	10.3–14.4
Length of caudal peduncle	7.4	6.0–7.4	6.6	5.4-8.0
Caudal-fin length	16.1	14.5–16.6	13.9	12.8–16.9
Proportional measurements (% HL)				
Head depth	18.8	17.2–18.5	24.2	14.0–23.4
Head width 1	44.0	40.3–44.8	53.3	44.0–52.3
Head width 2	49.7	43.7–50.4	61.7	50.2-64.0
Head width 3	64.4	61.9–69.1	77.5	64.5-81.3
Preoptic snout length	37.0	34.3–38.0	36.3	34.8–38.9
Preorbital snout length	16.8	16.5–17.5	17.1	16.2–19.2
Orbital diameter	41.8	41.8–44.9	39.8	37.3–41.0
Vertical eye diameter	19.7	20.3-22.8	17.7	13.9–20.3
Horizontal eye diameter	14.3	14.3–17.6	13.3	9.2–14.9
Interorbital width	6.1	5.8–6.8	14.8	9.2–14.5
Postorbital length	43.7	41.6–44.6	46.7	43.9–47.7
Upper jaw length	33.9	33.4–36.8	37.6	33.2–37.9
Lower jaw length	32.0	31.0–34.3	38.4	32.9–36.5

333 Figure legends:

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Fig. 1 Lateral view in fresh condition (a), dorsal view in fresh condition (b) and drawing in
dorsal view (c) of *Hoplichthys mcgroutheri* sp. nov., CSIRO H.6395-03, holotype, female,
218 mm SL

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Fig. 2 Dorsal view of head of *Hoplichthys mcgroutheri* sp. nov., showing series of spines and ridges. *I* inner ridge of spines on the first infraorbital, *2* outer ridge of spines on the first infraorbital, *3* inner ridge of spines on the second infraorbital, *4* outer ridge of spines on the second infraorbital, *5* preopercular spines, *6* opercular spine, *7* parietal spine, *8* posttemporal spine and *9* spines on lateral scutes; *scale bar* 10 mm

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Fig. 3 Ventral views of vomerine teeth showing form of tooth patch of a *Hoplichthys mcgroutheri* sp. nov. (CSIRO H.2005-02, 208 mm SL, paratype) and b *H. haswelli* (CSIRO
CA.3208, 161 mm SL). *Scale bars* 4.0 mm

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Fig. 4 Relationships of a interorbital width to head length, b orbital diameter to head length,
c vertical eye diameter to head length and d pelvic-fin length to standard length relative to

351 standard length. *Red* and *pink Hoplichthys mcgroutheri* sp. nov., *blue* and *light blue H*.

352 *haswelli*, *triangle* holotypes









