

Manual for the Excel to compute the IBICAT2b fish index

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This is a short manual to complement an Excel that computes the IBICAT2b fish index and is given as a Supplement to García-Berthou (in review). The IBICAT2b index was originally described in Catalan in Sostoa et al. (2010) and is summarized in English in García-Berthou (in review). The Excel is given as an online supplement to this book chapter. Please read the book chapter for further information and before using the Excel.

Disclaimer: Hopefully there are no errors but the abovementioned Excel is provided 'as is' without warranty of any kind, either express or implied, including, but not limited to, the implied warranties of fitness for a purpose, or the warranty of non-infringement. The use of the Excel is done at your own discretion and risk.

If you use this Excel, please cite something like “We computed the IBICAT2b fish index, using the Excel provided by García-Berthou *et al.* (in review) and available at <http://invasiber.org/EGarcia/IBICAT2b.html>.”

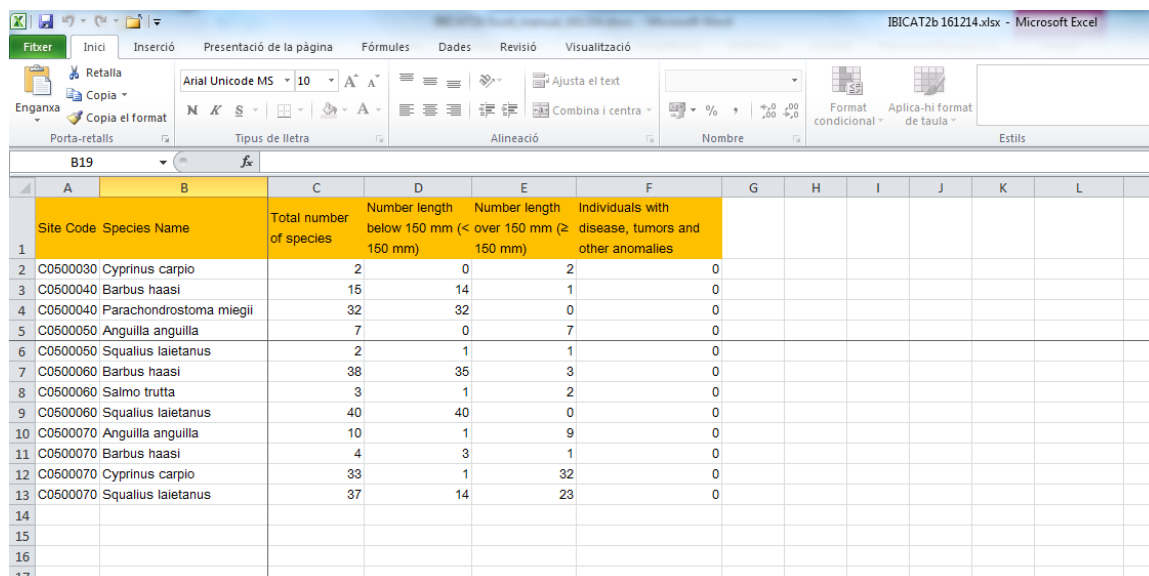
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If you need further information on IBICAT2b computation or you have any question or comment on the Excel file, do not hesitate to contact to Dr. Mi-Jung Bae (whialy@gmail.com) or Dr. Emili García-Berthou (emili.garcia@udg.edu).

IBICAT2b computation methods

The Excel file is composed of two sheets “Input” and “DB”. In the Input sheet (Fig. 1), you should enter the basic information on fish data: site name, species name (scientific name), total number of fish captured for each species, number of fish captured by species with length below and above 150 mm, and individuals of this species with DELT (diseases, erosions, lesions, and tumors) anomalies.



	A	B	C	D	E	F	G	H	I	J	K	L
	Site Code	Species Name	Total number of species	Number length below 150 mm (< 150 mm)	Number length over 150 mm (≥ 150 mm)	Individuals with disease, tumors and other anomalies						
1												
2	C0500030	Cyprinus carpio	2	0	2	0						
3	C0500040	Barbus haasi	15	14	1	0						
4	C0500040	Parachondrostoma miegii	32	32	0	0						
5	C0500050	Anguilla anguilla	7	0	7	0						
6	C0500050	Squalius laietanus	2	1	1	0						
7	C0500060	Barbus haasi	38	35	3	0						
8	C0500060	Salmo trutta	3	1	2	0						
9	C0500060	Squalius laietanus	40	40	0	0						
10	C0500070	Anguilla anguilla	10	1	9	0						
11	C0500070	Barbus haasi	4	3	1	0						
12	C0500070	Cyprinus carpio	33	1	32	0						
13	C0500070	Squalius laietanus	37	14	23	0						
14												
15												
16												
17												

Fig. 1. Example of data input in the “Input” sheet.

Species information should follow Table 1 (see also García-Berthou, *in review*) and it should not include extra spaces. For instance, the Excel file recognizes largemouth bass when you type “*Micropterus salmoides*” but not if you type “*Micropterus salmoides* ”.

In the “DB” sheet (Fig. 2), you can only enter the information in the green colored columns: Site name, Catalan River type, River basin, and status of the research sites (Dry, fishless or water). Please note:

- Spanish River type will be automatically obtained when you input the Catalan River type (because there is a minor difference between them: type 15 corresponds to two different Catalan types)
- Site name should be exactly the same as the name in the “input” sheet.
- River types and River basins should be typed as “abbreviations”. You can input the river type and river based on Tables 2 and 3. Because metrics in IBICAT2b change depending on river types and rivers (e.g., invasive and native species, Table 4), please check the river name and river type carefully.
- a maximum of 200 sampling sites and 10000 species-by-sample rows can be input at a time in the Excel file.

Sites	River type	Spanish River	Dry, fishless or NOT (Dry, fishless: 2, Water: 3)	NSN	PIT_DEL	PII	PSI	PIT_Pisci	PST_Pisci	PST_Lithophi	PIT_Intol	PST_S	NIN_15cminto	PIT_theophi	PST_into	NSN	PIT_DEL	PII	PSI	PIT_Pisci	PST_Pisci	
11 C0500030	RMCV	FAN	9	8	0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0	5.0	1.0	1.0	NA	NA	
12 C0500040	RMCV	FAN	9	8	1	0.0	88.1	50.0	0.0	0.0	100.0	100.0	0.0	97.9	100.0	3.0	5.0	1.0	1.0	NA	NA	
13 C0500050	RMCV	FAN	9	8	2	0.0	0.0	0.0	77.8	50.0	50.0	0.0	0.0	22.2	0.0	5.0	5.0	5.0	NA	NA	NA	
14 C0500060	ZC	FAN	10	8	2	0.0	0.7	33.3	3.7	33.3	100.0	50.6	0.0	44.4	100.0	66.7	5.0	5.0	3.0	1.0	NA	NA
15 C0500070	ZC	FAN	10	8	3	0.0	39.3	25.0	11.9	25.0	50.0	4.8	0.0	3.6	48.8	25.0	5.0	5.0	1.0	1.0	NA	NA

Fig. 2. Example of IBICAT2b computation results in the “DB” sheet.

Sites	PIT_theophi	PST_into	NSN	PIT_DEL	PII	PSI	PIT_Pisci	PST_Pisci	PST_Lithophi	PIT_Intol	PST_S	NIN_15cminto	PIT_theophi	PST_into	#specie	#individuals	DELT	IBICAT2b	IBICAT2b_class	EQR	EQR_class	Note
11 C0500030	0.0	0.0	1.0	5.0	1.0	1.0	NA	NA	1.0	1.0	NA	3.0	1.0	NA	1	2	0	1.8	Poor	0.2	Poor	Water
12 C0500040	100.0	100.0	3.0	5.0	1.0	1.0	NA	NA	5.0	5.0	NA	5.0	5.0	NA	2	47	0	3.8	Good	0.7	Good	Water
13 C0500050	22.2	0.0	5.0	5.0	5.0	5.0	NA	NA	1.0	1.0	NA	3.0	1.0	NA	2	9	0	3.3	Moderate	0.6	Moderate	Water
14 C0500060	100.0	66.7	5.0	5.0	3.0	1.0	NA	NA	NA	NA	NA	NA	NA	4.0	3	81	0	3.6	Good	0.7	Good	Water
15 C0500070	48.8	25.0	5.0	5.0	1.0	1.0	NA	NA	NA	NA	NA	NA	NA	1.0	4	84	0	2.6	Moderate	0.4	Moderate	Water

Fig. 3. Example of IBICAT2b computation results in the “DB” sheet.

After inputting the data, IBICAT2b metrics and values will be computed automatically as in Fig. 3. If one of four input variables is not typed, the index cannot be computed.

In Metrics, you can see each metric value (1 to 5) included in your river type. Total number of species (#specie), total number of individuals (#individuals), DELT, IBICAT2b value, status of sites (IBICAT2b_class) and Note (Dry, fishless or Water) is shown in the results.

In Metrics_values, you can get all the metric values, although not all are used in all river types.

Table 1. Features of the freshwater fish fauna from Catalonia used for development and computation of the indices. T = tolerant; I = intolerant; B = benthic; WC = water column; RH = rheophilic; LI = limnophilic; LITH = lithophilic; PHYT = phytophilic; OMNIV = omnivore; PISC = piscivore; INSV = invertivore; LONG = long migration (diadromous species); POTAD = short migration; SL = short longevity; IM = intermediate longevity; LL = long longevity

Family	Species	Tolerance	Feeding habitat	Habitat	Reproduction	Feeding group	Migration	Longevity
Acipenseridae	<i>Acipenser sturio</i>	I		RH	LITH	OMNI	LONG	LL
Anguillidae	<i>Anguilla anguilla</i>	T	B			PISC	LONG	LL
Balitoridae	<i>Barbatula quignardi</i>		B	RH	LITH	BENT		SL
Blenniidae	<i>Salaria fluviatilis</i>		B		LITH	INSV		SL
Centrarchidae	<i>Lepomis gibbosus</i>	T	WC	LI		INSV		SL
Centrarchidae	<i>Micropterus salmoides</i>		WC	LI		PISC		LL
Clupeidae	<i>Alosa alosa</i>	I		RH			LONG	LL
Clupeidae	<i>Alosa fallax</i>	I		RH			LONG	LL
Cobitidae	<i>Cobitis bilineata</i>							SL
Cobitidae	<i>Cobitis calderoni</i>	I		RH		INSV		SL
Cobitidae	<i>Cobitis paludica</i>	T		RH		INSV		SL
Cobitidae	<i>Misgurnus anguillicaudatus</i>	T	B	LI		OMNI		IM
Cottidae	<i>Cottus hispaniolensis</i>	I	B	LI	LITH	INSV		SL
Cyprinidae	<i>Achondrostoma arcasii</i>		WC					SL
Cyprinidae	<i>Alburnus alburnus</i>	T	WC			OMNI		SL
Cyprinidae	<i>Barbus haasi</i>	I	B	RH	LITH	INSV		IM
Cyprinidae	<i>Barbus meridionalis</i>	I	B	RH	LITH	INSV		IM
Cyprinidae	<i>Carassius auratus</i>	T	B		PHYT	OMNI		LL
Cyprinidae	<i>Cyprinus carpio</i>	T	B		PHYT	OMNI		LL
Cyprinidae	<i>Gobio lozanoi</i>		B	RH		INSV		SL

Cyprinidae	<i>Gobio occitaniae</i>		B	RH		INSV		SL
Cyprinidae	<i>Luciobarbus graellsii</i>	T	B		LITH	OMNI	POTAD	LL
Cyprinidae	<i>Parachondrostoma miegii</i>	I	B	RH	LITH			IM
Cyprinidae	<i>Phoxinus phoxinus</i>	I	WC	RH	LITH	OMNI		SL
Cyprinidae	<i>Pseudorasbora parva</i>	T				OMNI		SL
Cyprinidae	<i>Rutilus rutilus</i>	T	WC			OMNI		IM
Cyprinidae	<i>Scardinius erythrophthalmus</i>	T	WC	LI	PHYT	OMNI		LL
Cyprinidae	<i>Squalius laietanus</i>		WC	RH	LITH	OMNI		LL
Esocidae	<i>Esox lucius</i>		WC		PHYT	PISC		LL
Gasterosteidae	<i>Gasterosteus gymnurus</i>		WC			INSV		SL
Gobiidae	<i>Pomatoschistus microps</i>		B			INSV	LONG	SL
Ictaluridae	<i>Ameiurus melas</i>	T	B		LITH	OMNI		IM
Mugilidae	<i>Chelon labrosus</i>	T					LONG	LL
Mugilidae	<i>Liza ramada</i>	T					LONG	LL
Mugilidae	<i>Mugil cephalus</i>	T					LONG	LL
Percidae	<i>Perca fluviatilis</i>	T	WC			PISC		LL
Percidae	<i>Sander lucioperca</i>		WC		PHYT	PISC		LL
Petromyzontidae	<i>Petromyzon marinus</i>	I		RH	LITH		LONG	LL
Poeciliidae	<i>Gambusia holbrooki</i>	T	WC	LI		INSV		SL
Salmonidae	<i>Oncorhynchus mykiss</i>			RH	LITH	PISC		IM
Salmonidae	<i>Salmo trutta</i>	I		RH	LITH	PISC		IM
Siluridae	<i>Silurus glanis</i>	T	B		PHYT	PISC		LL

Table 2. Rivers and their abbreviations in Catalonia and the Ebro River.

Rivers	River code
ARRIU GARONA	GAR
RIU DE LA SÉNIA	SEN
EBRO	EBR
RIERES DE CALAFAT-GOLF DE SANT JORDI	CAL
RIERES DE LLABERIA-VANDELLÒS	LLA
RIERA DE RIUDECANYES	DEC
RIERES DEL BAIX CAMP	BAI
EL FRANCOLÍ	FAN
EL GAIÀ	GAI
RIERES DE CALAFELL-TORREDEMBARRA	TOR
EL FOIX	FOI
RIERES DE GARRAF	GARR
EL LLOBREGAT	LLO
EL BESÒS	BES
RIERES DEL MARESME	MAR
LA TORDERA	TORD
RIERES DEL CAP DE BEGUR-BLANES	BEG
EL DARÓ	DAR
EL TER	TER
EL FLUVIÀ	FLU
LA MUGA	MUG
REC MADRAL (MUGUETA)	MAD
RIERES DEL CAP DE CREUS	CRE

Table 3. River typology (the official Catalan and Spanish types are given) and number of sites.

(official no.)	River type	Abbreviation	River type no.
27	Siliceous wet mountain rivers <i>Ríos de alta montaña</i> <i>Rius de muntanya humida silícica</i>	MHS	27
26	Calcareous wet mountain rivers <i>Ríos de montaña húmeda calcárea</i> <i>Rius de muntanya humida calcària</i>	MHC	26
11	Siliceous Mediterranean mountain rivers <i>Ríos de montaña mediterránea silícica</i> <i>Rius de muntanya mediterrània silícica</i>	MMS	11
12	Calcareous Mediterranean mountain rivers <i>Ríos de montaña mediterránea calcárea</i> <i>Rius de muntanya mediterrània calcària</i>	MMC	12
15	High flow Mediterranean mountain rivers <i>Ejes mediterráneo-continentales poco mineralizados</i> <i>Rius de muntanya mediterrània d'elevat cabal</i>	MMEC	15
9	Variable flow Mediterranean rivers <i>Ríos mineralizados de baja montaña mediterránea</i> <i>Rius mediterranis de cabal variable</i>	RMCV	9
8	Siliceous Mediterranean lowland rivers <i>Ríos de la baja montaña mediterránea silícea</i> <i>Rius de zona baixa mediterrània silícics</i>	RMS	8
10	Rivers influenced by karstic areas <i>Ríos mediterráneos con influencia cárstica</i> <i>Rius de zona mediterrània d'influència càrstics</i>	ZC	10
16	Main watercourses <i>Ejes mediterráneo-continentales mineralizados</i> <i>Eixos fluvials principals</i>	EP	16
18	Coastal streams <i>Ríos costeros mediterráneos</i> <i>Torrents litorals</i>	TL	18
17	Large Mediterranean watercourses <i>Grandes ejes en ambiente mediterráneo</i> <i>Grans eixos mediterranis</i>	GEM	17
15	Large rivers with weak mineralization <i>Ejes mediterráneo-continentales poco mineralizados</i> <i>Grans rius poc mineralitzats</i>	GRPM	15

Table. 4 List of introduced and native species list according to the rivers. See Table 2 for river codes (first row).

Species	GAR	SEN	EBR	CAL	LLA	DEC	BAI	FAN	GAI	TOR	FOI	GARR	LLO	BES	MAR	TORD	BEG	DAR	TER	FLU	MUG	MAD	CRE
<i>Acipenser sturio</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
<i>Anguilla anguilla</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
<i>Barbatula quignardi</i>	A	I	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Salaria fluviatilis</i>	I	I	A															A	A	A	A	A	
<i>Lepomis gibbosus</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Micropterus salmoides</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Alosa alosa</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
<i>Alosa fallax</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A
<i>Cobitis bilineata</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Cobitis calderoni</i>	I	I	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Cobitis paludica</i>	I	A	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Misgurnus anguillicaudatus</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Cottus hispaniolensis</i>	I	I	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Achondrostoma arcasii</i>	I	A	A			A		A	A		A		I	I	I	I	I	I	I	I	I	I	I
<i>Alburnus alburnus</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Barbus haasi</i>	I	A	A	A	A	A	A	A	A	A	A	A	A	I	I	I	I	I	I	I	I	I	I
<i>Barbus meridionalis</i>	A	I	I	I	I	I	I	I	I	I	I	I	I	A	A	A	A	A	A	A	A	A	A
<i>Carassius auratus</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Cyprinus carpio</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Gobio lozanoi</i>	I	I	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
<i>Gobio occitaniae</i>	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I

Species	GA R	SE N	EB R	CA L	LL A	DE C	BA I	FA N	GA I	TO R	FO I	GAR R	LL O	BE S	MA R	TOR D	BE G	DA R	TE R	FL U	MU G	MA D	CR E	
<i>Luciobarbus graellsii</i>	I		A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Parachondrostoma miegii</i>	I	A	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Phoxinus phoxinus</i>	I	I	A	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	A	A	I	
<i>Pseudorasbora parva</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Rutilus rutilus</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Scardinius erythrophthalmus</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Squalius laietanus</i>	I		A	A	A	A	A	A	A		A		A	A	A	A	A	A	A	A	A	A	A	
<i>Esox lucius</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Gasterosteus aculeatus</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
<i>Pomatoschistus microps</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
<i>Ameiurus melas</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Chelon labrosus</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
<i>Liza ramada</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
<i>Mugil cephalus</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
<i>Perca fluviatilis</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Sander lucioperca</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Petromyzon marinus</i>	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	
<i>Gambusia holbrooki</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Oncorhynchus mykiss</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	
<i>Salmo trutta</i>	A	I	A	I	I	I	I	I	I	I	I	I	A	I	I	I	I	I	A			I	I	I
<i>Silurus glanis</i>	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	