

Table S1. List of studies that investigated adaptive adjustments in signal design. Summaries of behaviors studies of jamming avoidance responses (JAR) in weakly electric fish. This list is an overview of papers describing jamming avoidance and active jamming literature in weakly electric fish of both lineages. It does not include all papers on the subject, (notably the extensive neurophysiologic studies into the mechanisms of the JAR are not included) but is rather an overview of behavioral reports and field studies describing JAR behaviors. Abbreviations: IPI- inter-pulse interval

Species/Lineage	Electrolocation type	Study Site	Number of fish	Source of interference	Type of interference	JAR		Author/Year
						Spectral	Temporal	
<i>Gymnarchus niloticus/Mormyrid</i>	wave	lab	Single	Mimic EOD	Passive	Bidirectional frequency shift		(Bullock et al., 1975)
	wave	Lab	Single	Mimic EOD	Passive	Bidirectional frequency Shift		(Metzner, 1993)
<i>Gnathonemus petersii/Mormyrid</i>	pulse	lab	Single+pairs	Mimic EOD + Conspecific	Passive		echoing	(Russell et al., 1974)
	Pulse	Lab	Pairs	Conspecific	Active		Echoing	(Russell et al., 1974)
<i>Brienomyrus niger/Mormyrid</i>	pulse	lab	Single+pairs	Mimic EOD+Conspecific	Passive		Bidirectional IPI shift+echoing	(Heiligenberg, 1976)
<i>Pollimyrus isidori/Mormyrid</i>	Pulse	Lab	Single	Mimic EOD	Passive		echoing	(Kramer, 1978)
<i>Hypopygus sp./Gymnotid</i>	Pulse	lab	Single	Mimic EOD	Passive		Bidirectional IPI shift	(Heiligenberg, 1974)
<i>Gymnotus carapo/Gymnotid</i>	Pulse	Lab	Single	Mimic EOD	Passive		Bidirectional IPI shift	(Westby, 1975)
<i>Gymnotus carapo/Gymnotid</i>	Pulse	Lab	Pairs	Conspecific	Passive		Bidirectional IPI shift	(Westby, 1979)
<i>Brachyhypopomus sullivani/Gymnotid</i>	Pulse	Lab	Single	Mimic EOD	Passive		IPI Decrease	(Field et al., 2019)

<i>Microsternarchus cf. bi lineatus/ Gymnotid</i>	Pulse	Lab	Single	Mimic EOD	Active		Bidirectional IPI shift	(Field et al., 2019)
<i>Steatogenys elegans/ Gymnotid</i>	Pulse	Lab	Single	Mimic EOD	Active		Bidirectional IPI shift	(Field et al., 2019)
<i>Sternopygus sp./ Gymnotid</i>	wave	lab	single	Mimic EOD	Passive	No JAR observed		(Bullock et al., 1972)
	wave	lab	single	Mimic EOD	Passive	No JAR observed		(Matsubara and Heiligenberg, 1978)
<i>Eigenmannia viscerens/ Gymnotid</i>	wave	Lab	Single	Mimic EDO	Passive	Bidirectional frequency shift		(Watanabe and Takeda, 1963)
	Wave	Lab	Single	Mimic EOD	Passive	Bidirectional frequency Shift		(Bullock et al., 1972)
	Wave	Lab	Single	Multiple Mimic EODs	Passive	Bidirectional frequency Shift		(Partridge and Heiligenberg, 1980)
	Wave	Lab	Single	Multiple Mimic EODs	Passive	Bidirectional frequency Shift (Social Envelope Response)		(Stamper et al., 2012)
<i>Eigenmannia vicentespelea/ Gymnotid</i>	Wave	Field	Groups	Conspecific	Passive	Few JARS observed		(Fortune et al., 2020)
<i>Eigenmannia trilineata/ Gymnotid</i>	Wave	Field	Groups	Conspecific	Passive	Few JARS observed		(Fortune et al., 2020)
<i>Distocyclus conirostris/ Gymnotid</i>	Wave	Lab	Single	Mimic EOD	Passive	Predominately downwards frequency shift		(Petzold et al., 2018)
<i>Apteronotus sp./ Gymnotid</i>	Wave	Lab	Single	Mimic EOD	Passive	Upwards frequency shift		(Bullock et al., 1972)
<i>Apeteronotus macrostomas/ Gymnotid</i>	Wave	Field	Groups	Conspecific	Active	Upwards frequency shift		(Benda, 2020)
<i>Apteronotus leptorhynchus/ Gymnotid</i>	Wave	Lab	Single	Mimic EOD	Passive	Upwards frequency shift		(Bullock et al., 1972)

	Wave	Lab	Single	Mimic EOD	Passive	Upwards frequency shift		(Dye, 1987)
	Wave	Lab	Pairs	Conspecific	Active	Upwards frequency shift		(Zakon et al., 2002)
	Wave	Lab	Pairs	Conspecific	Active	Upwards frequency shift		(Tallarovic and Zakon, 2005)

Table S2. List of studies that investigated adaptive adjustments in signal design. Summaries of behaviors studies of jamming avoidance responses (JAR)* and adaptive signal responses (ASA) in echolocating bats. This is meant to give a broad overview of the major findings of numerous papers on the topic of jamming and jamming avoidance in electric fish and bats. It is important to note that authors may use different methods for obtaining spectrotemporal parameter values and care should be taken if making direct comparisons. Abbreviations are as follows: F_{\max} = highest frequency in a call, sometimes referred to as start frequency in FM bats (Frequency-Modulated bats produce frequency sweeping echolocation calls), denoted as F_{start} ; F_{\min} = lowest frequency in a call, sometimes referred to as end frequency in FM bats, denoted as F_{end} ; F_{bw} = total bandwidth of a call; F_{peak} = the peak frequency of a call; F_{call} = the dominant frequency used by CF-FM bats (bats that produce calls with both constant frequency and frequency modulated portions) in the CF component of the call.

*Not all studies were originally conducted in an effort to quantify bat JARs.

Species	Dominant Echolocation Type	Study Site	Number of bats	Source of interference	Type of interference	Task	JAR/ASA			Author/Year
							Spectral	Temporal	Intensity	
<i>Lasiurus borealis</i>	FM	Field	Pairs	Bat (Conspecific)	Passive	Free Flight	Increase: F_{start} , F_{peak}	Increase: IPI Decrease: call duration		Obrist 1995
<i>Tadarida teniotis</i>	FM	Field	Pairs	Bat (Conspecific)	Passive	Free Flight	Bidirectional frequency shifts	None		Ulanovsky <i>et al.</i> 2004
<i>Taphozous perforatus</i>	FM	Field	Pairs	Bat (Conspecific)	Passive	Free Flight	None	None		Ulanovsky <i>et al.</i> 2004
<i>Tadarida brasiliensis</i>	FM	Field	Group	Recording (Conspecific)	Passive	Free Flight	Increase: F_{call} , F_{bw}	Decrease: IPI, call duration		Gillam <i>et al.</i> 2007
		Lab	Single	Recording (Conspecific)	Passive	Free Flight	Not reported	Reduce emission rate		Jarvis <i>et al.</i> 2013
		Lab	Single	Recording (Broadband noise)	Passive	Free Flight	Not reported	Reduce emission rate		Jarvis <i>et al.</i> 2010

		Lab	Single	Recording (Broadband noise)	Passive	Stationary	Increase: F_{start} , F_{bw} , F_{peak} Decrease: F_{end}	Increase: call duration	Increase: amplitude	Tressler and Smotherman 2009
		Field	Pairs	Bat (Conspecific)	Passive	Free Flight	Greater difference F_{peak}	None		Ratcliffe <i>et al.</i> 2004
		Lab	Pairs	Bat (Conspecific) Recording (Conspecific)	Passive	Obstacle avoidance	Not reported	Reduce emission rate		Adams <i>et al.</i> 2017
		Field	Group	Recording (Conspecific)	Active	Tethered prey capture	Increase: F_{peak} , F_{min} , F_{max}	None		Corcoran and Conner 2014
		Field	Group	Recording (CF and FM sounds)	Passive	Free Flight	Increase: F_{start} , F_{end} , F_{max}	Not reported		Gillam and Montero 2016
<i>Rhinopoma microphyllum</i>	CF-FM	Field	Group	Bat (Conspecific)	Passive	Free Flight	Increase: F_{call} , F_{bw}	Decrease: call duration		Cvikel, Levin, <i>et al.</i> 2015
		Lab	Single	Noise	Passive	Free Flight	None	Not reported	Increase: intensity	Schmidt and Joermann 1986
<i>Eptesicus fuscus</i>	FM	Lab	Pairs	Bat (Conspecific)	Passive	Tethered prey capture	Increase: F_{start} , F_{end} , F_{bw}	None		Chiu <i>et al.</i> 2009
		Lab	Single	Moth Prey	Active	Tethered prey capture	None	Decrease: buzz phase duration Increase: call duration		Corcoran <i>et al.</i> 2011
		Lab	Pairs	Bat (Conspecific)	Passive	Tethered prey capture	Silence	Silence		Chiu <i>et al.</i> 2008

		Lab	Single	Recording (CF tone)	Passive	Non-flying/target discrimination	Bidirectional shift of QCF component	None		Bates <i>et al.</i> 2008
		Lab	Single	Recording (Heterospecific)	Active	Tethered prey capture	Increase: F_{peak} Decrease: F_{bw}	Decrease: sweep rate Increase: call duration		Jones <i>et al.</i> 2018
<i>Pipistrellus abramus</i>	FM	Lab	Single	Bat (Conspecific) Recording (Conspecific)	Passive	Free Flight	Increase: F_{end}	Alter emission timing		Takahashi <i>et al.</i> 2014
<i>Corynorhinus (Plecotus) townsendii</i>	FM	Lab	Single	Recording (Broadband noise)	Passive	Obstacle avoidance	Not reported	Not reported		Griffin <i>et al.</i> 1963
<i>Pipistrellus nathusii</i>	FM	Field	Group	Bat (Conspecific) Bat (Heterospecific)	Passive	Free Flight	Increase: F_{peak}	Not reported		Necknig and Zahn 2011
<i>Pipistrellus pipistrellus</i>	FM	Field	Group	Bat (Conspecific) Bat (Heterospecific)	Passive	Free Flight	Increase: F_{peak}	Not reported		
		Lab	Group	Bat (Conspecific) Bat (Heterospecific)	Passive	Free Flight	Increase: differences in F_{peak}	None		Bartonička <i>et al.</i> 2007

		Field	Group	Bat (Conspecific)	Passive	Free Flight	Increased: differences in CF-portion of call	Not reported		Miller and Degn 1981
<i>Balantiopteryx plicata</i>	CF-FM	Field	Group	Bat (Conspecific)	Passive	Free Flight	Increase: difference F_{peak} , F_{max}	Not reported		Ibáñez <i>et al.</i> 2004
<i>Rhinopoma hardwickei</i>	CF-FM	Field	Group	Bat (Conspecific)	Passive	Free Flight	Utilized 3 different CF bands	Not reported		Habersetzer 1981
<i>Pipistrellus kuhlii</i>	FM	Lab	Single	Recording (Conspecific) Recording (Self)	Passive	Landing on platform; Obstacle avoidance	Increased: F_{bw}	Increase: call duration (QCF portion)	Increase: intensity	Amichai <i>et al.</i> 2015
<i>Craseonycteris thonglongyai</i>	CF-FM	Field	Group	Bat (Conspecific)	Passive	Free Flight	None	None		Surlykke <i>et al.</i> 1993
<i>Hipposideros speoris</i>	CF-FM	Lab	Group	Bat (Conspecific)	Passive	Free Flight	Bidirectional shift	Not reported		Jones <i>et al.</i> 1994
	CF-FM	Lab	Single	Recording (Conspecific) Recording (Self)	Passive	Obstacle avoidance	Small scale frequency changes	Not reported		Jones <i>et al.</i> 1994
<i>Hipposideros fulvis</i>	CF-FM	Lab	Single	Recording (Conspecific) Recording (Self)	Passive	Obstacle avoidance	Small scale frequency changes	Not reported		
<i>Asella tridens</i>	CF-FM	Lab	Group	Bat (Conspecific)	Passive	Free Flight	None	Not reported		Jones <i>et al.</i> 1993

<i>Miniopterus fuliginosus</i>	FM	Lab	Single	Recording (FM sounds)	Passive	Free Flight	Increased: F_{end}	Not reported		Hase <i>et al.</i> 2016
<i>Rhinolophus capensis</i>	CF-FM	Lab	Group	Bat (Conspecific)	Passive	Free Flight	Decrease: F_{min} in terminal FM component	Increase: duration of terminal FM component	Decrease: intensity	Fawcett <i>et al.</i> 2015
		Lab	Group	Bat (Heterospecific)	Passive	Free Flight	Decrease: F_{min} in terminal FM component	Decrease: call duration Increase: duration of terminal FM component		