Network-attached DAC/streamer
Made by: Mola-Mola, The Netherlands
Supplied by: Sound Design Distribution Ltd, Cardiff
Telephone: 0800 0096213
Web: www.mola-mola.nl; www.sounddesigndistribution.co.uk
Price: £8999

Mola-Mola Tambaqui

Adding Roon-ready capability to its highly customised DAC has given this curiously-named Dutch company another highly intriguing device. Nothing fishy here!
Review: **Andrew Everard** Lab: **Paul Miller**

For an insight into the digital audio product we have before us, the £8999 Mola-Mola Tambaqui, I turn to no less an authority than biologist, author and TV presenter Jeremy Wade, best-known for his series *River Monsters* and *Dark Waters*, in which he goes in search of – and catches – some of the world's largest and most predatory fish.

There, in a YouTube video entitled *The Terrifying Tambaqui*, he cradles in his arms the fish itself, which he has just hooked by accident while angling for an entirely different species in a South American river. He explains to the camera that this giant-sized member of the piranha family, while replacing that creature's needle-sharp teeth with a mouthful of grinding stumps, is one of the most powerful denizens of the deep he has ever caught.

So there's the backstory to the name of this DAC/headphone amp, from the also piscatorially-monickered Mola-Mola. Why all the fishy stuff? Well, the explanation goes that the sunfish logo and name – the scientific one for that creature – came from an industrial design consultancy in the early days of the company. But while founder Bruno Putzeys, of Class D/Hypex fame, liked those, he wasn't too sold on their ideas for the casework design, and decided to do the styling himself. Clients, eh?

GOING FISHING

Putzeys' original idea was also to call the first products 'Preamp' and 'Power amp', but his Japanese distributor wanted model names, 'So I went through Wikipedia hunting for interesting names. You wouldn't believe how boring and prosaic most fish names are: it took two days to find Kaluga (a type of sturgeon) [for the power amps] and Maku'a (Hawaiian for 'Mola mola' – I subsequently dropped the glottal stop) [for the preamp].'

Both the Makua and Kaluga have graced our front cover [*HFN* Aug '17], and the Tambaqui is basically the £4299 optional digital stage of the preamp rendered in standalone form – albeit somewhat modified. It's designed, the company says, to deliver 'digital that's as good as analogue'. While it certainly looks like a hefty piece of equipment when viewed from the front, the rear view gives away the fact that the Tambaqui is actually relatively compact, measuring 20x11x32cm (whd), while it weighs in at a mere 5.2kg. In fact, the review sample came in a black plastic case, robust and made waterproof – although from the outside in, or vice versa, was not entirely clear.

> 'It's enthralling – breathing new life into familiar music'

As well as being a digital-to-analogue converter and a headphone amplifier, the Tambaqui can even be used as a digital preamp, as both its headphone outputs – on a conventional 6.35mm socket and a four-pin balanced XLR – and its line outs, which are only on a pair of XLRs, can have their level adjusted using a lossless digital volume control. Add on a pair of Kalugas, and you have a simple system for those with no need of analogue sources, complete with two 12V trigger sockets to switch the power amps on and off.

NET BENEFITS

The inputs here are on an extended range of digital socketry – the usual coaxial, optical and AES/EBU, plus an asynchronous USB-B and an I²S input on an HDMI socket. In addition there's an Ethernet connection, allowing the Tambaqui to be connected to a home network, although this unit isn't exactly a streaming music player in the manner of, say, the Gato Audio DIA-250S NPM [see p68]. True, there is a Mola-Mola control app, available for both Android and iOS, but this is more about the set-up of the DAC, volume control and firmware updates, and exists as an extended alternative to the striking remote handset. Like the rest of the company's range this is milled from a single block of aluminium, has a shape evocative of a fish in motion, or perhaps an ocean wave, and is available as an option at £599.

RIGHT: Switchmode PSU [right] is separately screened inside the Tambaqui. The custom PWM DAC board [centre] includes a pair of SHARC processors while the networking solution is also screened alongside [left]

LEFT: Milled alloy casework evokes a fish, or is it a wave? Meanwhile controls are kept simple: central knob for volume, four small buttons access the unit's presets

As well as controlling the basic functions of the Tambaqui – and in essence its functionality is pretty basic – the app can also be used to set up a range of four presets for various listening configurations: selecting an input, whether the output is at line or variable level, whether or not the headphone output is on and the assignment of the 12V triggers.

ROON TO GROW

The Ethernet port is there to interface the Tambaqui with Roon music playback software, at which point the device stops being just a DAC/headphone amp, and becomes a complete music playback device as a Roon endpoint. The Tambaqui can handle digital sources up to 192kHz/24-bit via its S/PDIF inputs, this extending to 384kHz/32-bit via USB and Ethernet, and can also accept up to DSD512 via USB and its Roon connection. The DAC architecture is described by the company as a 'two board stack, in which all incoming data is upsampled to 3.125MHz/32-bit and converted to noise-shaped PWM on the first board, and then handled by two mono DACs on the second board' [see PM's boxout, below].

It also claims a 130dB signal-to-noise ratio that, Mola-Mola says, 'is near the theoretical limit for 24-bit files and far beyond that of even quad-speed DSD', and said to 'keep distortion below the noise floor even with full-power signals'. I'll leave you to make up your own jokes about Mola-Mola's use of SHARC processors.

SNAPPY SOUNDS

With the Tambaqui connected to the balanced analogue inputs of a Gato Audio DIA-250S NPM amplifier and fed both by my usual Mac mini computer and via Ethernet from my Roon core, I listened to a wide range of music both using speakers and with a number of pairs of headphones, including B&W P9 Signature, Focal Spirit Pro and Oppo PM-1 [*HFN* Mar '17, Dec '15 and Jul '14]. And in every configuration, the Tambaqui turned in a standard of performance as impressive as it was enthralling, breathing new life into a selection of familiar music.

It's not just that it does all the hi-fi stuff right – deep, tightly-controlled bass, open and explicit midband and crisp, clean treble – but is more to do with the way it pulls it all together to drag you further into what you choose to play, rewarding your listening attention with class-leading insight into both recording and performance. There's a bite and richness to the way the Tambaqui plays music, whether from a computer feed, via the conventional digital inputs or over a Roon connection, that's totally addictive, and then it goes on to reward even more with each new track or album you select.

Even during the warm-up period, the Mola-Mola DAC was already delighting with the extended bass and snappy drive of the most recent Lenny Kravitz set, *Raise Vibration* [BMG 538397342; 44.1kHz/24-bit], with the details of the mixes as attractive as the way the rhythms grooved along on tracks such as 'Who Really Are ⇨

FEEL THE PULSE

Along with other very progressive audio brands – Chord and dCS in particular – Mola-Mola has its own, custom DAC solution executed in DSP. There are no off-the-shelf DAC chips inside the Tambaqui... Mola-Mola's software upsamples all incoming data to 3.125MHz, truncating the wordlength to 5-bits while using a 7th-order noise-shaper to retain full dynamic range right up to 80kHz. Each 5-bit digital 'word' is sufficient to describe one of 32 possible pulse widths that, in turn, describe the amplitude of the audio signal on an (over)sample-by-sample basis. The pulses vary in steps of 10nsec (the system clock is 100MHz) right up to a full width of 320nsec (0.32µsec). This Pulse Width Modulated (PWM) signal is fed into a 32-stage shift register, clocked at 100MHz, so a composite of 32 pulses ends up reproducing the full PWM signal every 10nsec.

The 32 outputs of the register are summed together so that the final DAC output is the moving average of the PWM signal over consecutive blocks of 32 clock cycles (*ie*, one PWM cycle), updating every 10nsec. The PWM signal is 'conditioned' by a comb filter whose teeth coincide exactly with the 3.125MHz repetition rate. Mola-Mola could have used the signal from any of the 32 outputs alone and simply low-pass filtered it. Instead, the moving average technique not only overcomes any slight mis-match in the summing resistors but it also removes the PWM carrier that could potentially demodulate clock jitter down into the audio band. This is innovative stuff... PM

ABOVE: Toslink optical, coaxial and AES/EBU digital ins (to 192kHz/24-bit) are joined by HDMI (I²S) plus USB-B and Ethernet (384kHz/32-bit and DSD512). Balanced (XLR) and single-ended (6.3mm) headphone outs are joined by balanced line outs (XLR)

The Monsters?'. With a little help from the Gato amp, that one really had the room moving without sacrificing any detail. The same was true with the unashamed swagger of Kasabian's *Empire* album [Columbia Paradise37; also 44.1kHz/24-bit], which often turns into an exercise in 'spot the influence', but is none the less big and magnificent for all that. The Tambaqui delves deep into the dense mixes here, while driving the stomp of the music relentlessly.

JUST GORGEOUS

That rhythmic acuity, along with the ability to reveal the subtlest detail of the way a bass string vibrates or the slightest tap of stick on cymbal, serves well the close-focused detail of a track like Red Norvo's take on 'Exactly Like You', from his *The Second Time Around* album [2xHD 2XHDJA1156; DSD256]. The pace of the playing is sprightly, and all the instruments are clear as day: it's really possible to lock onto any element and follow it through the track. Oh, and Norvo's vibraharp sounds just gorgeous on this set, whether soloing or supporting the stellar cast of instrumentalists.

LEFT: An optional 'premium' remote is available to replace this generic Apple Remote, the latter governing input and volume up/down

The Academie für Alte Musik Berlin's recent recording of Handel's *Concerti Grossi* 1-6 [on Pentatone PTC5186737; DSD 64] sees the Tambaqui grabbing the attention right from the upbeat just before the music starts, and then going at its task with breathtaking speed and definition. Even in slower movements the crispness of the sound brings precision and delight to the music, while when things get a bit more *allegro* the fabulous instrumental timbres are entirely delicious, making the set at turns stately and then thrilling.

It should be noted that the line outputs showed the utmost clarity when the headphone output was turned off, but even switching from speakers to headphones failed to unearth any drawbacks in the Tambaqui's sound. The ultra-revealing Focal Spirit Pro 'phones, designed with studio use in mind, sounded as clean and 'organic' as any other, allaying any fears that this outstanding DAC had to have a chink somewhere in its armour.

HI-FI NEWS VERDICT

Unusual is one way to describe the Tambaqui, but then Mola-Mola doesn't do conventional. 'Remarkable' is another way, for whether with headphones or used via its line outs, this DAC has precision, outstanding depths of detail and dynamics, and a sound able to draw the listener deep into the innermost detail of any recording. Used with a computer or as a top-notch Roon endpoint, this is one DAC you must hear.

Sound Quality: 89%

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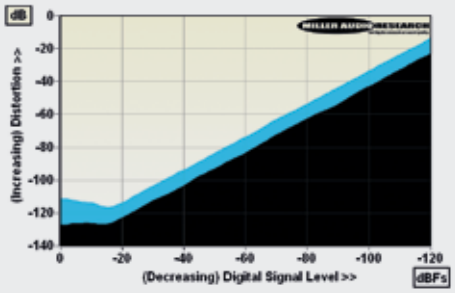
LAB REPORT

MOLA-MOLA TAMBAQUI

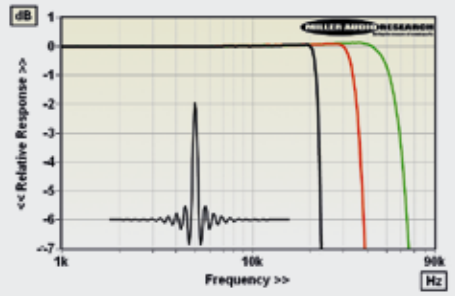
The technical performance of Mola-Mola's Makua DAC/preamp [*HFN* Aug '17] was exceptional in its own right but the Tambaqui's 'purist' implementation pushes still further at the state-of-the-art. Its balanced XLR output has the same 22ohm source impedance and although the maximum output (re. 0dBFs) is reduced here by 4.4dB from 9.8V to 5.88V, the S/N ratio is only 2.8dB lower at (a stupendous) 118.5dB. Moreover, the Makua's output is/was phase-inverting while the Tambaqui is phase positive – so beware even the most precisely level-matched listening comparisons!

Mola-Mola teases in its specification for the Tambaqui by stating 'THD not measurable – estimated –140dB' although, in practice, this rather depends on level and frequency. I was still able to discern residual 2nd-4th harmonics at higher frequencies, lower than recorded for the Makua (0.00014-0.003% re. 0dBFs, 20Hz-20kHz) but still fractionally higher than that achieved by another custom DAC – the Chord DAVE [*HFN* Apr '16] at 0.00002-0.00008%. Either way, the Tambaqui's 0.00005-0.0005% puts this exquisite DAC in the same class as those very few requiring a 'recalibration' of our distortion Y-axis from –120dB to –140dB [see Graph 1]. Subjectively, it's all rather academic, of course!

Again, the custom linear phase/apodising digital filter is unchanged, offering a 60dB attenuation of stopband images (26kHz re. 22kHz at 48kFs) with responses tailored by sample rate [see Graph 2]. Output is ruler flat to within ±0.02dB up to 20kHz with 44.1/48kHz media but rolls off slightly earlier at 36kHz and 59kHz (–3dB with 96kHz and 192kHz files). Low-level linearity is true to within ±0.1dB over a 110dB range while jitter is incredibly low: less than 10psec, all sample rates/all inputs. **PM**



ABOVE: Distortion versus 48kHz/24-bit digital signal level over a 120dB dynamic range (1kHz, black; 20kHz, blue). Note expanded 140dB Y scale



ABOVE: Time domain response (black) and frequency responses (48kHz, black; 96kHz, red; 192kHz, green)

HI-FI NEWS SPECIFICATIONS

Maximum output level / Impedance	5.88Vrms / 22ohm
A-wtd S/N ratio (S/PDIF / USB)	118.5dB / 118.5dB
Distortion (1kHz, 0dBFs/–30dBFs)	0.00005% / 0.00007%
Distortion & Noise (20kHz, 0dBFs/–30dBFs)	0.0005% / 0.00010%
Freq. resp. (20Hz-20kHz/40kHz/80kHz)	+0.02 to –0.01dB/–11dB/–24dB
Digital jitter (48kHz / 96kHz)	<10psec / <10psec
Resolution @ –110dB (S/PDIF / USB)	±0.1dB / ±0.1dB
Power consumption	23W (1W standby)
Dimensions (WHD) / **Weight**	200x110x320mm / 5.2kg