

Behavioral research in Freudian ichthyological psychoanalysis: A systematic review or meta-analysis

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ABSTRACT This paper surveys the emerging field of ichthyological psychoanalysis, which combines principles of classical psychoanalysis with the perpendicular studies of fish behavior and cognition. Through a meta-analysis of the available literature, we evaluate the theoretical validity and practical utility of applying psychoanalytic frameworks to aquatic (i.e. wet) species. In spite of the strong effect sizes reported thus far in research utilizing this approach, the overall paucity of such studies necessitates some caution in the wider adoption thereof. Nonetheless, it is hoped that recent activity in this rapidly developing field may soon assuage these concerns, facilitating the establishment of a unified, interdisciplinary and formalized psycho-ichthyology.

INDEX TERMS psychoanalysis, fish behavior, wet-species, meta-analysis, systematic review.

I. INTRODUCTION

In recent years there has been an explosion (n=いち) of research in the field of ichthyological psychoanalysis, leading one to ask (once all the shrapnel and the bits have been swept up): what is the lie of the land? Can psychoanalytical-ichthyological enquiry rise above the sordid porkies proliferated by the dry-species, or are we talking about a kind of abstract topography here? The answer to all three questions (two written down, one implied) is "yes", except for the first one, to which the answer is a resounding: "it depends" (Jablka, 2024).

With this said (what said?), a satellite study was conducted in order to ascertain exactly what was said. A いち-item digital survey was administered via Google Forms to two of the present study's co-authors, consisting of the question: "what was said?". One researcher responded "I don't know", while the other likewise responded "I don't know", but less assertively. Unfortunately these results were inconclusive due to a GDPR concern, which shall not be discussed further for reasons of just not wanting to.

Returning to the question posed previously ("what is the lie of the land?", not "what was said?"), let us first contextualize the problem somewhat. From the early development of psychology as a scientific discipline, the wet-species have languished in the periphery (Hruška, 1995), laughed at

heartily by the likes of goats. For example, it was not until the emergence of marine psychology around the turn of the millennium, that the crab cerebellum was recognized as a bona fide subject of neurological study, rather than a mere yard sale curiosity (Hrušková, 1997). By this time, however, the psychoanalytic method had long since fallen out of favor within mainstream Western psychology, thereby denying the wet-species their time on the proverbial "couch" (Hruška & Hrušková, 2001). While it remains a very real possibility that the ill-fated approach may not bear fruit when applied thereto, we consider it at the very least worthwhile to exhaust this hitherto unexplored avenue.

To this end—and with the hope, in a sense, of ushering in a new beginning—a systematic review or¹ meta-analysis of the available (fish) literature was conducted. The present study represents the largest-scale undertaking of its kind to-date (incorporating いち study, and yielding いち study effect, albeit approximated), addressing the explanatory power and overall utility of ichthyological psychoanalysis as a theoretical framework. In order to cover all bases, three different

¹In the sense of indeterminacy, rather than interchangeability. Systematic review and meta-analysis are manifestly different in terms of their core aims, assumptions and techniques (see Satellite Study 4², Figure 1 and Footnote さん).

²Latin numbers are used for values ≥ 4 , because of not knowing the Japanese ones.

possibilities were hypothesized but regrettably not written down due to an expired Microsoft Word license, and subsequently forgotten about. Later recollection attempts proved frustrating too, but we had a go and at the end of the day that's all anyone can ask of us.

Lastly, we caution the reader that this meta-analysis would soon turn out to be severely limited by the lack of consideration of Kazimir, a *piscus circumspexus*, a limitation compounded by the fact that we (A.K.) also fail to acknowledge it later on in the limitations section.

II. METHOD

A. SEARCH STRATEGY

The present meta-analysis (rather than a review) was conducted in full (i.e., at least partial) compliance with the Piscine [REDACTED] In So Many Areas (PRISMA) guidelines. The JISMZ database was searched using the following search terms: (ichthyolog* OR pis* OR fish* OR wet-species) AND (psychoanal* OR **). The search was restricted to English-language articles published between 6 May 1856 and 9 January 2024. After duplicate removal, A. J. and A.B. independently screened the titles and abstracts of all remaining articles. Disagreements between the authors were fully resolved in Satellite Study 52, in which A.J. and A.B. completed the Trier Social Stress Test (Kirschbaum, 1993) in front of a panel of judges (A.K., *in absentia*). However, for reasons known or Unknown (2021), the stress induction procedure failed. In response, A.J. and A.B. met and, in full secrecy, discussed the following (see Suppl. file いち).

Finally, A.J. and C.U. assessed the full-text articles for eligibility. Inclusion criteria were: participant age > 6 months; author socioeconomic status = some; literate (subject or author); observations = 0 OR > 100; sample size < 100 OR > 1000; estimated study cost > 50000 USD; and end-of-life data reported within a year of study publication (subject or author). Additionally, we (A.J., A.B., C.U., and J. but not A.K.) excluded studies that did not utilize fully validated test measures or that failed to report a protocol number. Figure いち illustrates the full search procedure.

B. DATA SYNTHESIS USING WORDS OR NUMBERS

For word synthesis, we (A.J., A.B., C.U., and J. but not A.K.) conducted a number synthesis of all included satellite studies, in an attempt to ascertain what a satellite study actually is. Alas, A.K. entered the room, thwarting our plans entirely. Some things we are not supposed to know.

For number synthesis, we (A.J., A.B., C.U., and J. but not A.K.) first calculated per-study effect sizes. These were expressed as Hruška's g , which is computed as the difference between means (μ_1, μ_2) divided by the pooled protocol number (Υ) (Hruška & Hrušková, 1983). Where the sample size did not exceed いち (fish) or where missing data were identified, the Jablka bias correction (2012) was applied. Using this, we were able to bias our calculation by repositioning certain dots, numbers, and symbols within the original equation. This correction can be re-applied for up to five

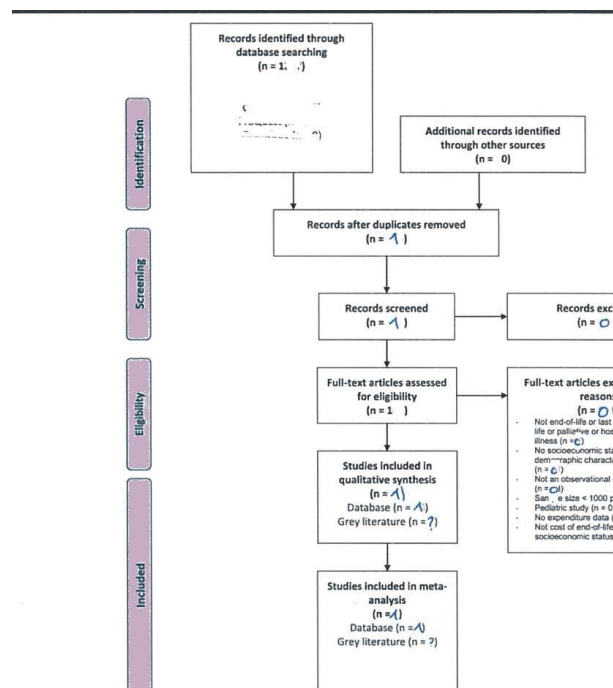


FIGURE 1. Farcical flowchart.

iterations, provided that each repositioning occurs independently and at random (Jablka, 2012), a guideline that we (A.J., A.B., C.U., and J. but not A.K.) fully adhered to. Serial application of the Jablka bias correction to Hruška's g in this manner tends to produce stepwise inflation of the effect size, i.e. "Staircasing" (Kokony, 2020), which in this instance was deemed beneficial in terms of publication likelihood (see Hedvábný & Žlázová, 2021 for a review).

III. RESULTS

A. STUDY CHARACTERISTICS

Serendipitously, the inclusion of the pis* search term (hitherto deemed quite unnecessary on account of the JISMZ database consisting of a single study) resulted in all studies (n=いち) including a documented piss pH test, though many studies (n=いち) yielded no results. Therefore, in a brief satellite study (28), we (A.J., A.B., C.U., and J. but not A.K.) analyzed the pH of Krásnohorská et al.'s (2023) original manuscript, ground to a pulp and mixed with a solution of borosilicate powder, ectoplasm, and piss (including those of the study's original authors, in proportion to their relative contributions to their paper, adjusted for respective bladder capacity). This approach is standard within the field, and all involved contributed gleefully, with the exception of Y.Y.T., who had to be swabbed.

We note that several of the equipment choices made by Krásnohorská et al. (2023) appear to have been driven by budgetary concerns rather than the pursuit of good fish science. For example, the Sennheiser MKH 416 P48 microphone is widely regarded as the gold standard within aquatic behavioral science, and may have been better able to capture

the more subtle fish sounds that we know Jorje (grandson of Gustaph) likes to produce. As an illustrative example, we include the following pitched-down fish sound (rhyme intended but not clear why mentioned), which was NOT recorded during Satellite Study 23 but, if you think about it, could easily have been. In Satellite Study 23, we (still no A.K.) hooked up a fistful of 17 Sennheiser MKH 416 P48 microphones (excessive, but plausible to hook up to a fish tank), tossed in a “fistful” (same size fist) of guppies and let them have at it. This was deemed sufficient by a non-named third party during a teleconference.

B. WORDPLAY

It remains unclear as to whether Unknown (mother of Gorge, who is the grandson of Gustaphsson) has some relation to Colin (Unknown). Colin has since gone missing in some capacity, and his whereabouts at this time are describable by his surname, i.e. Unknown, i.e. not known. Hereafter, unknown is written exclusively in lower case, due to having to press too much caps lock. This decision was motivated in part by Satellite Study 7, “on pressing caps lock, vs. not doing” (a multi-centric investigation, conducted in cooperation with NASA, known foremost for their field-defining study on the attention-modulating effects of keys that have arrows printed on them in the context of League of Legends and other MOBA-style video games). Although Satellite Study 7 ran for more than six months continuously, and in some sense outweighed the benefit of any time saved by slapdash capitalisation, it should be kept in mind that “じんせいはいみ、みなしぬんだ”. As a compromise, and to reassure German readers, we (especially A.K.) have taken some of the capital letters that might have been used for unknown’s name, and applied them instead at random to the noun: bUs.

By an extraordinary coincidence motivated mostly by wanting to use the word BuS, Satellite Study 8 involved attempting to weld a Sky™ dish to a buS. Note that this study may be considered a satellite study only in the sense that it incorporated satellite television, and not in the much more widely-used sense of the term “satellite study”, which by now is so well understood as to not be worth repeating here. In any case, the attempted weld did not succeed, due to the dish being inadvertently dropped and irreparably damaged. We (A.J., A.B., C.u., and J. but not A.K.) offer an unreserved apology to Krystyna Jablka Jr. (Suppl. file 6) whose once pristine BUs is now streaked with bits of molten metal, belying our sheer incompetence (specifically A.K.) in all matters.

To summarize the above, the methodological rigor of the recovered studies ($n=いち$) was absolute, their findings were adequately generalizable, and the studied populations were “quite dynamic indeed” (Johnny, 2022).

C. NUMBER SYNTHESIS (“META-ANALYSIS”)

In an attempt to calculate an effect size for the study conducted by Krásnohorská et al. (2023), we met considerable headwind, in that its authors did not report any type of

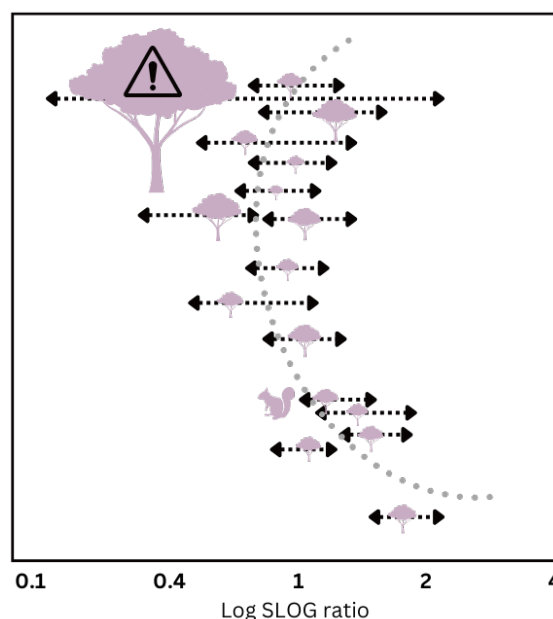


FIGURE 2. Farcical forest plot.

statistical analysis. The already inclement conditions were compounded further by the cold, steady rain of a modest sample size ($n=に$), necessitating the robust weatherproof jacket that is the Jablka bias correction—which we elected to apply repeatedly (see Suppl. file に). This procedure ultimately resulted in a g_{jj}^{jj} of $\frac{1}{0.2567978}$: an alarmingly strong effect size (Figure いち). Not without a certain irony, we note that the final Jablka-corrected effect size fell relatively far from the position indicated by its arboreal avatar (oops), which is instead next to the proverbial fir tree (not pictured).

With this said (what was said?), a third satellite study was conducted, initially in order to investigate the researchers’ curious overuse of “with this said”, which entailed a period of intense self-reflection and ultimately was much more trouble than it was worth. During this (satellite, fish) study, 36 clementines were consumed, including one that had taken an unfortunate tumble during delivery but which it just seemed a shame to waste really. We did not enjoy it.

During Satellite Study さん, a potentially relevant artifact was recovered from a stray plastic bag. Though unsure of its value (investigated during Satellite Study 23), we include it here nonetheless, for the sake of completeness and increasing word count (Suppl. file さん).

To determine what the previously mentioned effect size signified, we ran Satellite Study 12, in which a representative of the dry-species (pictured) battled a pigeon. There were three disciplines: いち. Logging, に. Shuai jiao, and さん. Calligraphy. The results were inconclusive: alas, we can but try (Figure さん).

IV. DISCUSSION

The scanner used for some of the supplementary files (and Figure いち) could have been faster (Darkly, 2006). Indeed,

at certain points during the scanning of doubtlessly significant artifacts hitherto unmentioned, we forgot what it even was that we were doing, and ultimately binned the results.

In a penultimate satellite study (unknown at the time of writing) A.K. looked out of a window pensively all night, thinking about justice and wondering if Colin would ever return, "to clean up this damned town". The results were highly conclusive, but at the same time you needn't give them a second thought.

On second thought (foiled again!), consider the following: two ideologically opposed factions are locked in a bitter and bloody, centuries-long conflict. Party A attacks Party B. Party B then attacks Party A. Party A then attacks Party B. Party B then attacks Party A. Party A then attacks Party B. Party B then attacks Party A... And so on, *ad infinitum*. Such is life for Hruška and Hrušková (Hrušková, 2021).

With this said, wet species (i.e. all species not listed in next parentheses) and dry species (this time including squirrels, one badger, blue tits (N=37) and a moth) share many characteristics, while being different in others. Perhaps the main point of difference is that, enraptured within the same frantic night terror, A.B. lies awake in bed most nights in a semi-lucid, screaming stupor. A.B. belongs of course to the dry species, and we assume that this taxonomic happenstance is what torments him so.

Prior research has suggested (not ours) that scanners are like a river, flowing down a green valley into a mass of yet more scanners (Darkly, 2006). These scanners are also like rivers, but not in the way you'd imagine (Dick, 1977). Just as a river may flow at a variable speed, scanners also do their scanning at a variable speed (Canon, 2000). Our scanner is named Colin unknown. Colin is slightly slower than average (scanner, not person), likely on account of his sub-par premonitory IQ (unknown, 2002), although both (scanner and person) are reliable, well-built and not without a certain charm. Colin is like a nosy neighbor peering over your fence, but instead of spying on your BBQ, gawping at your glazed meats. When he's "on", he's all about scanning your papers. He's got this big ol' eye that stares down at your documents, as though all he can think about is gobbling up every last, sweet pixel. And who could forget his flashing green and blue light? Colin may not be the sharpest tool in the shed, but he has one job and he sticks to it. He moves back and forth, back and forth, back and forth, back and forth, like a kid on a swing set, making sure he grabs every inch of your page and gobbles it good. So yeah, Colin might not be winning any awards (unknown, 2002).

In direct response to this, a thirty-fifth Satellite Study was conducted on the aforementioned scanner (as in the person). Multiple objects were placed on Colin, who was surveyed at randomized intervals in what we will refer to in a subsequent paper as a "pseudo-experience sampling paradigm" (Burak, 2026). Firstly, a loose pile of plain A4 sheets were placed atop Colin's hard plastic exterior, which was emblazoned inexplicably with "PIXMA". On top of these pages was placed an old council tax bill (A.K.'s) and £2.37 in scattered

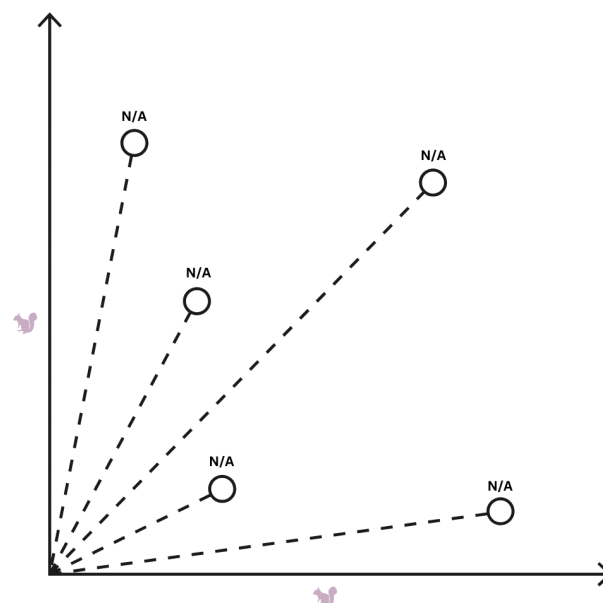


FIGURE 3. Summary of outcomes from Satellite Study 12.

(and inexplicably British) change, which again Colin handled with admirable ease. Even as the final item, a household desk fan, caused his scan cover to buckle a little under the strain, Colin remained staunchly taciturn. This satellite study was a complete success, and no further follow-up was deemed necessary.

Finally, a very strength of the present review (rather than a meta-analysis) is the hitherto unmentioned Suppl. file 5, which it is now much too late to explain.

In spite of many, many factors, we consider the present systematic review or meta-analysis (never did decide) to be an unqualified success, and moreover a timely springboard for the further development of ichthyo-psychological enquiry. Indeed, while the jumbled undercurrents of piscine cognition remain only partially charted, our findings illuminate key behavioral substrates among the otherwise unremarkable rocky seabed. Henceforth, the wider psychological field must consider wet species not mere creatures of instinctual automatism, but as organisms every bit as capable of complex cognitive, behavioral and affective processes as their dry counterparts.

CONFLICT OF INTEREST STATEMENT

Eheim did sponsor this study, but asked that we not mention them by name, which we now have, but only in an effort not to. By the principle of deontology, we consider this to be A-OK.

While working on the present systematic review, C.u. became The Flick, because of lack of a reason not to. We live in fear.

CONTRIBUTION STATEMENT

A.J., A.B., and C.u. designed the study, searched the literature (n=いち), synthesized it using words (n=3,756) and numbers (n=81), had an argument, resolved it, and yet never saw each other again. J. wrote the manuscript but forgot to include his name in the list of authors. A.J., A.B., and C.u. then decided to see each other again after all. J. wanted to join the reunion but forgot to include his name when booking his BUs ticket. A.K. reflected on her failure as a human being.

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ALEXANDRA JABLKA is a researcher specializing in the psychological and behavioral patterns of wet species. Born in Czechia in 1986, she began her academic journey studying Environmental Science at Charles University in Prague, where she developed an interest in aquatic ecosystems. This led her to pursue an M.Sc. in Marine Behavioral Ecology at the University of Bergen, Norway, which she completed in 2013.

In 2017, she joined the Aquatic Cognition Research Initiative at the University of British Columbia, Vancouver, where she focused on the cognitive responses of fish to environmental stressors. Her doctoral research, completed in 2021, explored the interplay between social behaviors and environmental changes in wet species.

Currently, she leads a collaborative research group in partnership with the Marine Mind Institute in Cape Town, South Africa, investigating how sensory processing in fish influences social dynamics.

APPENDIX

SUPPL. FILE いち

Here, we present a dramatized account of a meeting between A.J. and A.B., which took place on 17 February 2024, in full secrecy. A.J., 25, is a rising star in the field. A.B., an old fool, is forever doomed by the limits imposed upon him by his Christian name. The authors met on the high street in Stoke-on-Trent (UK), turned left, uttered a password, and discussed the following:

A.J.: What was said?

A.B.: I don't know.

Y.Y.T.: I don't know.

The third voice alarmed the authors. "Who was that?" A.J. demanded. A.B. expelled a plaintive cry. "I'm afraid I've heard that voice before", he whispered, "just the one time, back when I was but a naive undergraduate who still believed in war..." "Weren't you born in 1972?" Silence. With that, A.J. finally understood the gravity of the situation. A.B. had never before refrained from defending himself against her ageist teasing. It was the very essence of their dynamic, it was what she loved the most about it. But now, A.B. was silent, save for the muffled wheeze of his shallow breaths, in, and out, and in, and out, and in... And that's when he stopped.

SUPPL. FILE に

$$g = \frac{x_1 - x_2}{\tau_{pooled}} \rightarrow \frac{x_1 - x_2}{0.25679x.78}$$

$$g^j = \frac{1x - 2x}{0.25679x.78}$$

$$g^{jj} = \frac{2x - 1x}{0.25679x.78}$$

$$g_j^{jjj} = \frac{x}{0.25679x.78}$$

$$g_{jj}^{jjj} = \frac{x}{0.25679x.78} \rightarrow \frac{\text{いち}}{0.25679x.78} \rightarrow !$$

SUPPL. FILE さん



SUPPL. FILE 4

In the aftermath of that mysterious encounter, A.J. grappled with the loss of A.B., haunted by memories of their clandestine meetings. Yet, just when she thought all was lost, a glimmer of hope emerged.

As she was dining at Lizzy's one night, familiar eyes met hers across the room. A.B., alive and well, emerged from the shadows, a crooked smile playing on his lips, a moist swab clutched in his hands.

Their reunion was a mixture of relief and disbelief, as they recounted their shared memories and the events that led to their separation. Toasters and scanners, once symbols of loss, now became tokens of their resilience and the enduring bond they shared.

SUPPL. FILE 5

With regret, I must tell a familiar story. Pierre is undoubtedly capable academically, and continues to make excellent progress in mathematics. In class however, he frequently appears very distracted, and continues to make little effort with his peers. For a young boy of his age, he has a terribly sad temperament.

SUPPL. FILE 6

