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# Murky Waters: The Law and Economics of Salvaging Historic Shipwrecks

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**Murky Waters: The Law and Economics of Salvaging Historic Shipwrecks**

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## **Abstract**

The salvage of historic shipwrecks involves a debate between salvors, who wish to maximize profit, and archeologists, who wish to preserve historical value. Traditionally, salvage of shipwrecks has been governed by admiralty law, but the Abandoned Shipwreck Act of 1987 transferred title of historically important wrecks in U.S. waters to the state in whose waters the wreck is found, thereby abrogating admiralty law. This paper examines incentives to locate and salvage historic wrecks under traditional admiralty law and proposes an efficient reward scheme. It then re-considers current U.S. and international law in light of the results.

**Journal of Economic Literature Classification:** K1, K33

**Keywords:** Historic shipwrecks, Law of salvage, Admiralty law, Archeological value.

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# Murky Waters: The Law and Economics of Salvaging Historic Shipwrecks

## 1. INTRODUCTION

The best available estimates put the number of shipwrecks in navigable waters of the United States at 50,000, 5-10% of which have historical value (Stevens, 1992, p. 575). As improving technologies increasingly allow these wrecks to be located and salvaged, conflicts have emerged among archeologists, who value wrecks largely for their historical value; sport divers, who value them for recreation; and profit-motivated salvage companies, who primarily care about their market value (Bryant, 2001).

Traditional admiralty law entitles salvors to a share of the value of salvaged ships whose owners can be located (the law of salvage), and the full value of abandoned ships (the law of finds). While these doctrines provide some financial incentive for salvors to locate and salvage wrecks, we will argue that they do not provide efficient incentives for historic wrecks whose value is largely historical. In this case, salvage is essentially a public good best provided by the government. The enactment of the Abandoned Shipwreck Act of 1987, which awards ownership of wrecks to the state in whose waters they are found, therefore holds the potential for the creation of an efficient legal framework for the management of historic wrecks. However, inconsistent implementation and legal challenges have thus far impeded this goal.

The countless number of shipwrecks in international waters are also governed by admiralty law,<sup>1</sup> supplemented by the United Nations Convention on the Law of the Sea (UNCLOS III), which imposes a duty on salvors to protect the historical character of

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<sup>1</sup> UNESCO (2003) estimates that there are over three million undiscovered shipwrecks worldwide.

shipwrecks. It has recently been proposed, however, that UNCLOS III be replaced by UNESCO's *Convention on the Protection of the Underwater Cultural Heritage* (2001), which abrogates admiralty law outside of the U.S. and advocates preservation of wrecks *in situ* (Bryant, 2001). While purporting to protect historic value, this convention, if ratified, would leave known wrecks vulnerable to continuing decay while reducing or eliminating any incentive for salvors to locate additional wrecks (thereby rendering moot discussion of the best way to preserve their historical character). Hence, it is unclear how the convention improves on existing law.

The purpose of this paper is to provide an economic analysis of law governing the salvage of historic shipwrecks. Landes and Posner (1978) previously examined this question as a special case of their generalized model of rescue, but we argue that their approach, which is based on a hypothetical bargain between the owner of a lost vessel and the salvor, is inappropriate for historically valuable wrecks for two reasons. The first is the difficulty and expense of locating long lost wrecks, and the second is that much of their value is non-monetary in nature. The model in Section 2 highlights these issues by first showing that traditional admiralty law provides inadequate incentives both to locate and properly salvage historic wrecks. It goes on to derive an optimal reward scheme for salvaging these wrecks in the context of a principal-agent framework where society (the government) is the principal and a private salvor is the agent. Section 3 then re-examines salvage law (both U.S. and international) in light of the model. Finally, Section 4 concludes.

## **2. A MODEL OF SALVAGING HISTORIC SHIPWRECKS**

The model employs the following notation:

$p(y)$  = probability that the wreck will be located;

$y$  = dollar investment in search,  $p' > 0$ ,  $p'' < 0$ ;

$S(x)$  = social value of the wreck;

$M(x)$  = market value of the wreck;

$x$  = dollar investment in salvaging the wreck once it is located, reflecting the amount of time devoted to salvage, the choice of methods, etc. ( $S' > 0$ ,  $S'' < 0$ ,  $M' > 0$ ,  $M'' < 0$ ).

We assume that  $S(x) \geq M(x)$  and  $S'(x) \geq M'(x)$  for all  $x$ , reflecting the fact that much of the value of historic wrecks is historical or archeological and hence not marketable. The difference  $S(x) - M(x)$  therefore measures the dollar value of the scientific knowledge gained from salvage of the wreck, as opposed to the mere collection and sale of the artifacts. A recent survey of households in North Carolina attempted to measure this non-market component of value by asking households how much they would be willing to pay to establish a state park that would preserve the estimated 5,000 historic wrecks in North Carolina waters and protect them from treasure hunters (Whitehead and Finney, 2003). The results indicated that respondents would be willing to pay \$21.33 million in aggregate, or about \$4,266 per wreck.<sup>2</sup>

## 2.1. Socially Optimal Salvage

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<sup>2</sup> This reflects an estimated willingness to pay of \$32.82 per resident in a region whose total population is 650,000. In an alternative attempt to measure this value, Throckmorton (1990) estimated that one million tourists spend an extra day in Sweden to see the *Vasa*, a seventeenth century warship salvaged from Stockholm harbor in 1961 and displayed in a museum. At about \$300 per day per tourist, this adds several hundred million dollars per year to Sweden's economy. Throckmorton also found that almost 100,000 more people per year visited a museum in Kyrenia, Cyprus, after the artifacts and archaeological records of a 4<sup>th</sup> century BC ship had been placed there for public inspection.

As a benchmark for examining the incentives of profit-motivated salvors under admiralty law, we begin by deriving the conditions for socially optimal search and salvage. Based on the above model, the optimal choices of  $y$  and  $x$  maximize the expected social value of the wreck:

$$p(y)[S(x)-x] - y. \quad (1)$$

Since  $x$  is chosen after the wreck has been located, it maximizes  $S(x)-x$ . Thus, optimal salvage,  $x^*$ , solves the first order condition

$$S'(x) - 1 = 0. \quad (2)$$

The optimal search effort,  $y^*$ , then maximizes (1) evaluated at  $x^*$ . It therefore solves the first order condition

$$p'(y)[S(x^*)-x^*] - 1 = 0. \quad (3)$$

Given these results, we now consider the incentives of private salvage companies, first under traditional admiralty law and later under an optimally structured reward scheme.

## **2.2. Incentives for Salvage under Admiralty Law**

As noted, admiralty law awards property rights in shipwrecks to the finder of the wreck. The extent of property rights given to the salvor depends on whether or not the wreck is judged to be legally abandoned by the owner. We focus on the case where the finder is given exclusive rights (as under the law of finds for legally abandoned wrecks) as this is most conducive to efficient incentives.

If a single, profit-maximizing salvor is searching for a particular wreck, he will choose  $y$  and  $x$  to maximize

$$p(y)[M(x)-x] - y. \quad (4)$$

Comparing this expression to (1) immediately implies that the salvor will choose  $y < y^*$  (given  $M(x) < S(x)$ ) and  $x < x^*$  (given  $M'(x) < S'(x)$ ). Thus, he will underinvest both in efforts to locate historically important wrecks, and to salvage such wrecks once found. As noted, these inefficiencies suggest a role for the government in taking ownership of historic wrecks and in designing an optimal reward scheme for their location and salvage. We derive such a scheme in the next section.

First, however, we note a complicating factor that arises if more than one salvage company is searching for a particular wreck. Since admiralty law awards property rights to the first salvor to locate the wreck, it creates the classic conditions for a race for property rights, resulting in excessive search.<sup>3</sup> This factor therefore potentially offsets the underincentive to search noted above, leading to an ambiguous prediction regarding the aggregate level of search. (The details of the conflicting incentives with regard to  $y$  are provided in the Appendix. Note, however, that the possibility of a race has no effect on  $x$  since only the winner invests in salvage.) In situations like this, however, Lueck (1995, p. 405) notes that the extent of overinvestment will be small when there are few competitors and/or “plenteous” goods. Since both of these conditions describe the case of historic wrecks (given the high entry costs and large number of wrecks),<sup>4</sup> it would seem that the risk of excessive competition under admiralty law is minimal. In designing an optimal reward scheme in the next section, we therefore focus on the case of a single salvor.

### **2.3. An Optimal Reward Scheme**

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<sup>3</sup> See, for example, Mortensen (1982), Lueck (1995), and Shavell (2004, p. 45).

<sup>4</sup> As Bryant (2001, pp. 98-99) notes, however, innovations in the technology of salvage will likely increase the ability of salvors to enter the race, thus increasing the urgency to clarify the legal rights and duties of salvors regarding historic wrecks.

This section derives an optimal reward scheme for the location and salvage of historic wrecks based on the argument that admiralty law provides inadequate incentives for both search and salvage of these wrecks. As noted, we consider the case of a single salvor (the agent) who enters into a “contract” with the government (the principal) to search for a particular wreck.<sup>5</sup> The contract consists of a *payment schedule* that can be conditioned on the outcome of the search for a wreck--specifically,  $R_S$  = the reward for success and  $R_F$  = the reward for failure (where  $R_F < 0$  is allowed)--and a *minimum salvage effort level*,  $x$ . For example,  $x$  might specify the minimum number of days that must be devoted to salvage and/or the type of procedures that must be used.<sup>6</sup> In deriving this scheme, we assume that the principal can monitor the salvor’s choice of  $x$  but not his search effort  $y$ . We therefore write the principal’s problem as follows:

$$\max_{R_S, R_F, x} p(y)[S(x) - R_S] - (1 - p(y))R_F \quad \text{subject to:} \quad (5)$$

$$y = \operatorname{argmax} p(y)(R_S - x) + (1 - p(y))R_F - y \quad (6)$$

$$p(y)(R_S - x) + (1 - p(y))R_F - y \geq \pi_0. \quad (7)$$

Constraint (6) (the incentive compatibility constraint) reflects the principal’s inability to observe  $y$ , while (7) (the participation constraint) ensures that the salvor (the agent) is willing to participate in the contract.

Consider first the incentive compatibility constraint. The first-order condition implied by (6) is

$$p'(y)(R_S - R_F - x) - 1 = 0, \quad (8)$$

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<sup>5</sup> If multiple salvors seek a given wreck, the government can avoid a race by designating a single searcher up front, for example by requiring a permit to search for wrecks in state waters. Alternatively, Mortensen (1982) shows how a reward scheme can be structured to eliminate the incentives of competitors to overinvest in search.

<sup>6</sup> Since the constraint will be binding, the minimum and actual values of  $x$  will coincide.

which implicitly defines the search function  $\hat{y}(R_S, R_F, x)$ . Differentiating (8) yields

$$\frac{\partial \hat{y}}{\partial R_S} = \frac{-p'}{p''(R_S - R_F - x)} > 0, \quad (9)$$

$$\frac{\partial \hat{y}}{\partial R_F} = \frac{\partial \hat{y}}{\partial x} = \frac{p'}{p''(R_S - R_F - x)} < 0. \quad (10)$$

Thus, a larger reward for success elicits greater search effort, while a larger reward (or smaller fine) for failure, and a larger required investment in salvage once the wreck is found, both reduce search effort.

One way to proceed in deriving the optimal scheme is to eliminate (6) by maximizing (5) subject to (7) with  $y = \hat{y}(R_S, R_F, x)$ . The resulting first-order conditions for  $R_S$ ,  $R_F$ , and  $x$  (after substituting from (8)) are

$$-p(1-\lambda) + p'(S-R_S+R_F)(\partial \hat{y} / \partial R_S) = 0 \quad (11)$$

$$-(1-p)(1-\lambda) + p'(S-R_S+R_F)(\partial \hat{y} / \partial R_F) = 0 \quad (12)$$

$$p(S'-\lambda) + p'(S-R_S-R_F)(\partial \hat{y} / \partial x) = 0, \quad (13)$$

where  $\lambda$  is the multiplier on (7). Using (9) and (10), we can combine (11) and (12) to show that  $\lambda=1$ , which implies that the participation constraint is binding. It follows that the optimal scheme satisfies

$$R_S = R_F + S(x) \quad (14)$$

and

$$S'(x) - 1 = 0. \quad (15)$$

Comparing (15) and (2) implies that  $x=x^*$ , while substituting (14) into (8) implies that  $y=y^*$ . Thus, the optimal scheme specifies both an efficient level of search and an efficient salvage standard once a wreck is found. This reflects the well-known result that

the principal's optimal scheme implements the first-best outcome when the agent is risk-neutral (Mas-Colell, Whinston, and Green, 1995, p. 482). Finally, we can solve (14) and (7) (written as an equality) simultaneously to obtain explicit expressions for  $R_S$  and  $R_F$ :

$$R_S = \pi_0 + y^* - p(y^*)[S(x^*) - x^*] + S(x^*) \quad (16)$$

$$R_F = \pi_0 + y^* - p(y^*)[S(x^*) - x^*]. \quad (17)$$

Figure 1 shows the locus of points defined by (14) (given  $x=x^*$ ) in  $(R_S, R_F)$  space. All points on this locus induce  $y=y^*$ , while points below it induce  $y<y^*$  and points above it induce  $y>y^*$ . As shown, the optimal scheme lies on this locus and hence induces efficient search effort. Also note that  $R_S>0$  but  $R_F<0$ , implying that, while the salvor receives a reward for locating the wreck, he must pay a "penalty" for failure.<sup>7</sup>

Figure 1 can also be used to illustrate the inefficiency of the reward scheme embodied in admiralty law.<sup>8</sup> Since both salvage law and the law of finds only reward success (i.e.,  $R_S>0$  and  $R_F=0$ ), the implied reward scheme is limited to points on the vertical axis. It follows that the salvor will only invest in optimal search if  $R_S=S(x^*)$ ; that is, if he expects to receive the full social value of the wreck. However, since  $R_S \leq M(x^*)$  as argued above (i.e., the reward is limited to the market value of the wreck), the salvor will underinvest in search for wrecks with  $M(x^*) < S(x^*)$ .<sup>9</sup> This is shown by the darkened segment in Figure 1, which depicts the set of rewards consistent with admiralty law.

As for the choice of  $x$ , admiralty law traditionally has not established legal standards governing salvage procedures once a wreck is located. Thus, as noted, salvors

<sup>7</sup>The fact that  $R_F<0$  follows from (17) and the assumption that the expected social value of the wreck exceeds the salvor's reservation profit level,  $\pi_0$ .

<sup>8</sup> See Shavell and Ypersele (2001) who undertake a similar comparison of rewards and patents (property rights) for innovators.

<sup>9</sup> Recall, however, that this underincentive to invest in search will be offset by excessive search if multiple salvage companies are racing to find the same wreck.

will choose  $x < x^*$  for historic wrecks given  $M' < S'$ . As we will discuss in more detail below, however, admiralty courts have begun to recognize the need to impose an “archeological duty of care” on private salvage companies as a pre-condition for awarding them rights to a wreck (Bryant, 2001). Thus, like a negligence rule in tort law,<sup>10</sup> this standard can be used to ensure that salvors will conduct the salvage operation in a socially responsible manner (i.e., that they will choose  $x = x^*$ ) as a pre-condition for recovery. (This is possible based on the assumption that  $x$  is observable to the court.)

### **3. APPLICATION OF THE ANALYSIS TO SALVAGE LAW**

In this section, we review the law governing the salvage of historic shipwrecks in light of the foregoing analysis. We first consider U.S. law and then turn to international law.

#### **3.1. U.S. Law**

As noted, the salvage of historic shipwrecks in U.S. waters has traditionally been governed by the ancient doctrines of admiralty law (Foster, 2000). The relevant doctrines are the law of salvage and the law of finds.<sup>11</sup> Under the law of salvage, the wreck remains the property of the owner, but salvors are legally entitled to a court-determined award, usually specified as a percentage of the value of the property rescued.<sup>12</sup> The law of salvage is therefore most applicable to modern shipwrecks whose owner is known and where most of the value is monetary. The law of finds, in contrast, applies to the salvage

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<sup>10</sup> See, for example, Shavell (2004, Chapter 8).

<sup>11</sup> Strictly speaking, the law of finds originated in the common law rather than admiralty law, but it is now also considered a maritime concept (Bryant, 2001, p. 119).

<sup>12</sup> The size of the salvage award depends on several factors, including the degree of marine peril; the value of the property recovered; the risks incurred by the salvagers; their promptness, skill, and energy; the value of the equipment used in the salvage operation; and the amount of labor expended (Bryant, 2001, pp. 122-123).

of abandoned ships, and hence is (generally) the more relevant doctrine for historic wrecks. Under the law of finds, the locator of a wreck becomes the sole owner once he makes certain affirmative efforts toward actually taking possession of the wreck. (Mere location is not sufficient to acquire title.)

By awarding property rights in a wreck to the finder, admiralty law provides some financial incentives for the salvage of property lost at sea, but it has been criticized for failing to adequately protect the archeological value of historic wrecks. This shortcoming prompted Congress to enact the *Abandoned Shipwreck Act* (ASA) of 1987,<sup>13</sup> which recognized that, in addition to their monetary worth, “shipwrecks offer recreational and educational opportunities to sport divers and other interested groups, as well as irreplaceable State resources for tourism, biological sanctuaries, and historical research.”<sup>14</sup> This reflects the assumption in the model that the social value of historic wrecks exceeds their monetary value (i.e.,  $S(x) \geq M(x)$  and  $S' > M'$ ).

Significantly, the ASA explicitly abrogates admiralty law for *abandoned* shipwrecks that are *embedded* in U.S. waters.<sup>15</sup> For these wrecks, title vests with the U.S. government, which then transfers it to the state in whose waters, or on whose submerged land,<sup>16</sup> the wreck is embedded. Salvors are thereby barred from asserting claims under admiralty law for wrecks covered by the ASA; instead, they must obtain a state-issued permit to proceed with salvage in a manner that is “consistent with the protection of historical values and environmental integrity of the shipwrecks and the sites.”<sup>17</sup> This

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<sup>13</sup> 43 U.S.C. §§ 2101-2106.

<sup>14</sup> 43 U.S.C. § 2103 (a).

<sup>15</sup> “The law of salvage and the law of finds shall not apply to abandoned shipwrecks to which section 6 of this act [43 U.S.C. § 2105] applies” (43 U.S.C. § 2106 (a)).

<sup>16</sup> Submerged lands means “lands beneath navigable waters” (43 U.S.C. § 2102 (f)).

<sup>17</sup> 43 U.S.C. § 2103 (a).

preemption of admiralty law reflects the view of Congress that states can better manage the salvage of historically important wrecks, “a view surely supported by archeologists” (Bryant, 2001, p. 128). (Interestingly, however, sport divers joined with salvors in initially opposing passage of the ASA out of fear that they would be denied access to wrecks (Stevens, 1992, p. 577)).

As the model in the previous section showed, government control of salvage is potentially desirable from an economic perspective because it theoretically allows an efficient approach to the management of historic wrecks both by providing efficient incentives to locate wrecks, and by establishing appropriate guidelines for their salvage once found. For example, a reward scheme along the lines discussed in Section 2 could easily be implemented by requiring a potential salvor to purchase a search permit for a fee,  $f$ , and then granting an award,  $A$ , for locating a wreck, where  $R_F = -f$  and  $R_S = A - f$ .<sup>18</sup>

In practice, however, while more than thirty states have passed legislation regarding the management of historic wrecks in their waters, the laws are not uniform and generally establish inadequate incentives for private salvage.<sup>19</sup> For example, some states do not permit salvage at all, while others only allow compensation based on *quantum meruit* (value of services rendered). As McLaughlin (1995, pp. 168-169) notes, such an award “is manifestly inadequate to inspire the discovery of sunken ships and the recovery of their cargo.” The bottom line is that current state law is far from establishing efficient economic incentives.

Faced with the lack of financial rewards under state law, coupled with daunting procedural hurdles, salvors have challenged the limits of ASA’s applicability in court.

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<sup>18</sup> The ASA contains no specific provisions regarding compensation of salvors, requiring only that their interests be recognized (43 U.S.C. § 2104 (a)). Thus, compensation issues are left to the states.

One avenue has been to challenge the constitutionality of the ASA's elimination of the admiralty law as the basis of recovery for finders of abandoned wrecks. However, courts have generally ruled against such claims.<sup>20</sup> Another avenue of challenges, however, has met with greater success. This concerns the legal definition of "abandonment," which a state must prove before the ASA applies.<sup>21</sup> Courts have recognized two forms of abandonment: express abandonment and inferential abandonment (Foster, 2000, p. 429). Since evidence of express abandonment is rarely available for historic wrecks,<sup>22</sup> most cases turn on the definition of inferential abandonment. Courts have considered several factors in this regard, including the lapse of time since a ship was lost, and evidence that the owner attempted recovery, or, conversely, that he gave up all hope of recovery (Bryant, 2001, p. 119).<sup>23</sup> In proving inferential abandonment under the ASA, the state must meet a clear and convincing evidence standard (Foster, 2000, p. 432).<sup>24</sup>

Wrecks not judged to be abandoned continue to be covered by admiralty law—specifically, the law of salvage. As we have seen, salvage law provides inadequate incentives to locate historic wrecks, but salvors still prefer it to the ASA. In contrast, archeologists view the law of salvage as inadequate because it fails to provide for the

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<sup>19</sup> See McLaughlin (1995, pp. 192-197) and Sweeney (1999, p. 202) for surveys.

<sup>20</sup> Specifically, courts have ruled that the ASA does not unconstitutionally restrict the scope of federal admiralty law in awarding title to abandoned shipwrecks to the states (Foster, 2000).

<sup>21</sup> See, e.g., *California v. Deep Sea Research, Inc.*, 523 U.S. 491 (1998), in which a salvor argued that the historically important vessel *Brother Jonathan* was not abandoned and hence not the property of California under the ASA.

<sup>22</sup> Such evidence is not, however, inconceivable. For example, under a 1763 treaty ending the Seven Years War, Spain transferred several of its territories in the New World to Great Britain. The court interpreted this treaty as expressly abandoning Spain's claim to a Spanish vessel that it knew had been shipwrecked in 1750 in the waters off Virginia. Thus, the court awarded ownership of the wreck to Virginia under the ASA. See Foster (2000, pp. 431-432) and *Sea Hunt, Inc. v. Unidentified Vessel or Vessels*, 47 F.Supp. 2d 228 (E.D. Va. 1999).

<sup>23</sup> However, a long lapse of time since recovery was attempted is not itself sufficient to signal abandonment if such recovery efforts would have had minimal chance of success given the state of technology at the time. See *Deep Sea Research v. The Brother Jonathan*, 883 F.Supp. 1343 (1995, ND Cal).

protection of the scientific value of wrecks once they are found. As noted above, however, admiralty courts have begun to address this deficiency by recognizing an “Archeological Duty of Care” (ADC), which ties salvors’ awards to their efforts to preserve archeological data and artifacts associated with historically valuable wrecks (Bryant, 2001, pp. 138-144).

For example, in *Marex Int’l, Inc. v. The Unidentified, Wrecked and Abandoned Vessel*, the court stated that, in order to claim an award, finders and salvors must “document to the court’s satisfaction the shipwreck’s archeological ‘provenance data’...by mapping or recording the location, depth and proximity of each artifact recovered in relation to other artifacts.”<sup>25</sup> Similarly, the court turned down a 1996 challenge to exclusive salvage rights to the *Titanic* because "the preservation of the archaeological integrity of the wreck as well as the preservation of the retrieved artifacts was evidence that the operation had been undertaken with due diligence" (Christie and Hildreth, 1999, p. 160). Conversely, in *Klein v. The Unidentified Wrecked and Abandoned Vessel*,<sup>26</sup> the court denied a salvage award to a private salvor who had made no effort to protect the archeological value of the wreck.

Although these developments seem to be a step in the right direction, the archeological community remains concerned about the quality of data gathered by salvage companies. As they point out, there can be a vast difference between archaeological data gathered by non-specialists and by specialist archaeologists, even under an ADC. For example, whereas the latter emphasize the importance of subjecting

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<sup>24</sup> In addition to abandonment, the state must prove *embeddedness*; that is, that a wreck is “partially buried or firmly affixed” to its submerged lands (Foster, 2000, pp. 433-434).

their methods and data to peer review, Robert Neyland, Chairman of the *Advisory Council for Underwater Archaeology*, claims to know of no archaeological report written by a private salvor that has ever appeared in a peer-reviewed archaeology journal.<sup>27</sup>

Notwithstanding the legitimate concerns of archeologists regarding salvage standards, it remains the reality that, given the current state of technology, a few profit motivated salvors are the primary finders of historic wrecks. Consequently, “barring [them] from salvaging historic shipwrecks will bring about an end to the discovery and salvage of such wrecks in any meaningful number” (Bryant, 2001, p. 111).<sup>28</sup> This recognition underscores the necessity of striking a reasonable balance between the importance of establishing proper scientific standards for salvaging and preserving historic wrecks with the need to give salvors a financial incentive to search for them. Current U.S. law seems to fall short in this respect.

### 3.2. International Law

A similar conflict plagues the development of standards for the salvage of historic shipwrecks in international waters. Currently, these wrecks are governed by the United

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<sup>25</sup> 952 F.Supp. 825, 829 (S.D. Ga. 1997). Also see *Cobb Coin Co. v. The Unidentified, Wrecked and Abandoned Sailing Vessel*, 549 F.Supp. 540 (S.D. Fla. 1982); and *Columbus-Am. Discovery Group v. Atl. Mut. Ins. Co.*, 974 F.2d 450 (4<sup>th</sup> Cir. 1992).

<sup>26</sup> 758 F.2d 1511 (11<sup>th</sup> Cir. 1985).

<sup>27</sup> Private correspondence November 18<sup>th</sup>, 2002. Past chairman Toni Carrell is of the same opinion (private correspondence November 21<sup>st</sup>, 2002). However, Barry Clifford, a treasure hunter who became famous for discovering the pirate ship *Whydah* in the waters off Cape Cod in 1984, expresses a different opinion: “...one of our archeologists had been refused the opportunity to present a paper at the Society for Historical Archeology on the grounds that ‘no paper that results from, or reports on treasure hunting’ could be given. Although we were doing good archeology—and I had the bills and results to prove it—we were still considered thieves of history by many academic archeologists. It didn’t seem fair to me, but that’s the way it was” (Clifford and Perry, 1999, p. 162). Clifford has not sold any artifacts from his salvage of the *Whydah* but instead has created a museum for their display in Provincetown, MA.

<sup>28</sup> Also see McLaughlin (1995, p. 151), who argues that the ASA has failed because it “renounced the incentive rationale and other traditional principles of Federal admiralty law, but offered nothing in their stead.”

Nations Convention on the Law of the Sea (UNCLOS III),<sup>29</sup> which specifies that member countries recognize a “duty to protect objects of an archeological and historic nature found at sea” (Article 303(1)). (Thus, it embodies an ADC, though Bryant (2001, p. 131) notes that enforcement is generally lacking.) The Convention does not, however, abrogate admiralty law, thereby leaving in place the financial incentives, as embodied in the laws of salvage and finds, to locate wrecks.<sup>30</sup> In terms of economic incentives, current international law therefore resembles U.S. law for wrecks not covered by the ASA.

A promising trend in the management of wrecks found in international waters is the emergence of inter-state agreements among countries. UNESCO (1999) lists several examples: the agreement between France and the USA (1989) concerning the wreck of the *CSS Alabama*; the agreement between the UK and South Africa (1989) concerning the *HMS Birkenhead*; the agreement between the UK and Canada (1997) concerning the wrecks of *HMS Erebus* and *HMS Terror*; and the agreement among Estonia, Finland and Sweden (1995) concerning the wreck of the *Estonia*.

The agreement among the USA, the UK, Canada and France concerning the wreck of the *Titanic* illustrates several key aspects of this approach to managing historic wrecks. First, while emphasizing *in situ* preservation, the agreement allows for managed dives of both an archaeological nature and to protect artifacts from significant degeneration. However, it also provides that “project funding shall not require the sale of recovered... artifacts or other things recovered”, and the recovered artifacts “shall be kept together and intact in a manner that provides for public access...and its availability for

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<sup>29</sup> The U.S., however, has not ratified UNCLOS III (Bryant, 2001, p. 131).

<sup>30</sup> Article 303(3) of the United Nations Law of the Sea states that “nothing in this article affects the rights of identifiable owners, the law of salvage or other rules of admiralty, or laws and practices with respect to cultural exchanges.”

educational, scientific...purposes” (UK Consultation Paper, p. 6 [quoted in Dromgoole, 2003]). In this respect the agreement concurs with UNESCO’s *Convention* (to be discussed shortly) in that sale of goods by salvors is prohibited, yet it also allows for archaeological recovery – something that *Convention* does not allow. Second each signatory country is left to regulate its own flagged vessels and nationals, thereby obviating the need for an international regulatory institution. Third, the agreement is open for non-signatories to join, an important provision given that other countries may eventually acquire the technologies needed to locate and recover historic wrecks.

The recently proposed UNESCO *Convention on the Protection of the Underwater Cultural Heritage* (adopted in November, 2001), if ratified, would supercede UNCLOS III. While the *Convention* heavily favors archeological values, it appears to discount salvage value completely (Bederman, 1999). (For example, it would abrogate admiralty law in international waters.) This is evident from the first two rules abstracted from the annex to the document (UNESCO, 2001):

Rule 1. The protection of underwater cultural heritage through *in situ* preservation shall be considered as the first option. Accordingly, activities directed at underwater cultural heritage shall be authorized in a manner consistent with the protection of that heritage and subject to that requirement may be authorized for the purpose of making a significant contribution to protection of knowledge or enhancement of underwater cultural heritage.

Rule 2. The commercial exploitation of underwater cultural heritage for trade or speculation or its irretrievable dispersal is fundamentally incompatible with the protection and proper management of underwater cultural heritage. Underwater cultural heritage shall not be traded, sold, bought, or bartered as commercial goods.

The practical effect of these rules, if implemented, is that most historic wrecks in international waters will remain undiscovered because of the lack of financial incentives to expend the necessary resources. This reflects an extreme disregard of the economic realities concerning the location and salvage of historic wrecks. Moreover, even for wrecks that have been located, it is debatable whether preserving them *in situ* is consistent with the stated objective of the *Convention* since they will remain inaccessible to most scholars (not to mention the interested public) and are likely to “rot into nothingness” (Bryant, 2001, p. 136).<sup>31</sup>

A further aspect of UNESCO’s *Convention* is that it “makes no provision in respect to ownership of underwater cultural heritage and was not intended to interfere with existing ownership rights” (Dromgoole, 2004, p 194). As a result, a U.S. court could argue that the *Convention* applies only to abandoned wrecks, and thus, as with the ASA, the *Convention* could run afoul of the definition of “abandoned.” This would allow U.S. salvors to continue searching for historic shipwrecks located in international waters (as, for example, in the case of the *Titanic*) in hopes of claiming property rights under admiralty law. In addition, other questions remain open: for example, can an owner be prohibited from recovering his property in circumstances where *in situ* protection is considered a preferable option? And, are owners free to dispose of their own property entirely as they wish?

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<sup>31</sup> One possible justification for *in situ* preservation is that the archeological value of wrecks will increase over time if left unsalvaged. Archeologists often leave land-based sites only partially excavated so that future researchers using improved methods can learn more about the site. This argument is debatable, however, given the greater susceptibility of undersea sites to decay.

Despite these problems, the *Convention* was adopted with broad support by member states, passing by an 87-4 vote, with 15 abstentions.<sup>32</sup> The United States, not a member in 2001, indicated that it would have voted against adoption and joined with France and the U.K. in making strong statements against the *Convention*. Opposition in general came from developed nations, suggesting that those countries possessing the latest underwater technology do not intend to ratify, and hence will not be bound by, the *Convention*. The U.S. and U.K. especially opposed Rule 2, believing that private salvors have a legitimate role to play in the location and preservation of historic wrecks, and must be given an economic incentive to do so (Stemm, 2002). Their opposition resulted in an amendment to Rule 2 that allows limited recovery and sale of artifacts as part of a properly conducted archeological excavation.<sup>33</sup> It nevertheless remains the case that ratification of the *Convention* would seriously erode incentives for private salvors to search for historic wrecks in international waters.

#### **4. CONCLUSION**

This paper has applied economic analysis to the problem of salvaging historic shipwrecks. Compared to modern wrecks, historic wrecks present two problems: the difficulty of locating them, and the fact that much of their value is non-monetary. As a result, we argued that traditional admiralty law does not generally provide adequate incentives for profit-motivated salvors either to locate or properly salvage these wrecks. This leaves scope for the government to take ownership of wrecks and structure an

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<sup>32</sup> Countries voting against the *Convention* were Norway, Russia, Turkey, and Venezuela. Countries abstaining were Brazil, Columbia, the Czech Republic, France, Germany, Greece, Guinea-Bissau, Iceland, Israel, the Netherlands, Sweden, Paraguay, Switzerland, Uruguay, and the United Kingdom.

<sup>33</sup> UNESCO (2001), Annex, Rule 2, parts (a) and (b).

efficient reward scheme. For wrecks in U.S. waters, passage of the Abandoned Shipwreck Act of 1987, which abrogated admiralty law for abandoned wrecks, appeared to be a step in that direction. As currently implemented, however, the ASA, if anything, seems to offer inferior incentives for locating wrecks compared to admiralty law. Moreover, admiralty courts have begun to impose due standards of care for the salvage of historic wrecks not covered by the ASA in accordance with their historic value. This suggests that, when incentives for both location and salvage are taken into account, admiralty law may be superior to the ASA in terms of economic efficiency.

As for international law, admiralty principles still dictate salvage awards, while UNCLOS III establishes a duty of care for salvaging historic wrecks (though enforcement measures are largely absent). However, the recently proposed UNESCO *Convention on historic wrecks*, which abrogates admiralty law and advocates *in situ* preservation, would likely worsen matters by removing virtually any incentive for salvors to locate these wrecks and by preventing even responsible salvage of those that are located.

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## APPENDIX

This appendix examines search incentives under the law of finds when there are multiple salvors competing to be the first to discover a particular wreck.<sup>34</sup> Suppose there are  $n > 1$  salvors, each of whom invests  $y_i$  in search, where

$$y \equiv \sum_{i=1}^n y_i \quad (\text{A1})$$

is aggregate search, and  $p(y)$  continues to be the probability that the wreck will be located ( $p' > 0, p'' < 0$ ). Assume that the probability that any given salvor  $j$  will be first to find the wreck, conditional on its being located, is

$$g(y_j) \equiv \frac{y_j}{y}, \quad (\text{A2})$$

where

$$g' = \frac{\sum_{i \neq j} y_i}{y^2} > 0. \quad (\text{A2})$$

Under the law of finds, each salvor  $j$  therefore chooses  $y_j$  to maximize

$$p(y)g(y_j)[M(x) - x] - y_j. \quad (\text{A3})$$

The resulting first order condition is

$$(p'g + pg')[M(x) - x] - 1 = 0. \quad (\text{A4})$$

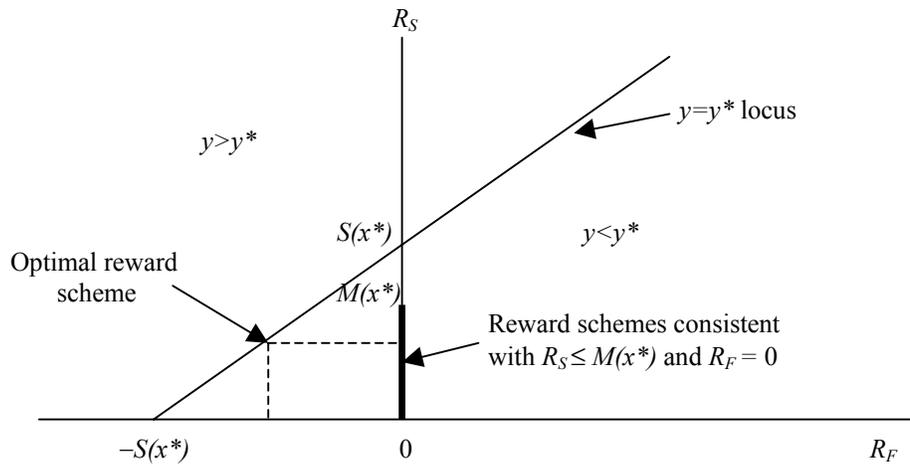
If all salvors are identical,  $y_i = y^n$  for all  $i$  in the Nash equilibrium. Thus,  $g = 1/n$  (i.e., all salvors have an equal chance of discovering the wreck), and  $g' = (n-1)/n^2 y^n$ . Substituting these expressions into (A4) and rearranging yields

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<sup>34</sup> The model follows that in Lueck (1995).

$$\left[ \frac{1}{n} p' + \frac{n-1}{n} \left( \frac{p}{ny^n} \right) \right] (M(x) - x) - 1 = 0. \quad (\text{A5})$$

Comparing this to the condition for optimal search in (3) reveals offsetting effects on  $y$ . First, note that the term in square brackets exceeds  $p'$  for  $n > 1$  given  $p'' < 0$ . This reflects the incentive for excessive search resulting from the race to be first. Further, this incentive is magnified as the number of salvors increases because more weight is attached to the average rather than the marginal product (Lueck, 1995, p. 405). Offsetting this is the fact that salvors will underinvest in search due to  $M(x) < S(x)$ . The net effect is therefore ambiguous; in aggregate, searchers may over- or underinvest in search compared to the first best.



**Figure 1.** The optimal reward scheme compared to reward schemes consistent with admiralty law.